Computer Hardware 4 Girls

Reader 2.4
Gender Changer Academy.
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About Us 1

1.1 About the GCA - http://genderchangers.org

The Gender Changer Academy is a non-profit organisation started by women, run by women and established for women. It's primary goal is to improve women's understanding and skills with regards to information and communication technology. To attain this the GCA provides workshops, makes and maintains a website and mailing list, and distributes a reader. The initiative was borne out of the ASCII (Amsterdam Subversive Code for Information Interchange), a free internet workspace. Momentarily the GCA is run by a small group pf volunteer women. It was founded in Amsterdam, The Netherlands, in March 2000 by Tali, brbr and Sara. Sisi, Donna, Maya, Sol, Jane and others joined later. We encourage women to crash computers, turn them inside out and to put it all back together again; preferably with an improved installation.

It all started with that one girl who talked to two other girls about beginning a computer hardware course for women only. We worked (and still do) as volunteers in an internet-café, ASCII. At first we talked...blablabla...too many men and too few women. We talked some more....blabla...not enough help and support for absolute beginners like ourselves...blabla...eventually we decided it was time to stop talking and to start something on our own.

In early 2001, sisi, Sara and Tali boldly took the train to Utrecht and bravely gave the very first class of the GCA in the PUSCII (Progressive Utrecht Subversive Code fro Information Interchange). Like ASCII, PUSCII is a free internet workspace. The aim of the course is to get more hands-on practice on computer-hardware, and to give women a chance to look beyond the computer screen. None of us had any or very little experience with the mysteries of computer hardware when we decided to start the GCA. We all worked with computers in one way or another, using word processing programs and surfing the internet now and then, but none of us had tried to look inside the case and actually touch stuff.

1.2 What is a Gender Changer?

A genderchanger can be different things.

Technically speaking a gender changer is a small device, an adapter that changes the 'sex' of a computer cable, device or port. It as two sides with holes, or two sides with pins. The holes are femle and the pins

are male. Having a gender changer makes it irrelevant what gender the connection is; gender makes no difference.

In a more figurative sense we see a genderchanger as a graduate of the Gender Changer Academy or as someone who wants to change the way the world perceives things. A 'genderchanger' or a 'gender changer' makes any connection a possibility. At the Gender Changer Academy it is our aim to make gender irrelevant in terms of access to knowledge about computers and technology. Where else can women get such great, open and affordable information about hardware and other animals in this world?

1.3 Why a Hardware Course?

Of course women work a lot with computers! They write and print all those business letters; keep-up the spreadsheets and databases necessary in organisations; surf the net; design webpages and so on and so forth. But just like with cars, for example, women generally know less about what is under 'the hood' of this piece of equipment.

Hardware is a mystery, may seem difficult, but in fact is a lot of fun!

Playing is a way to get to know how stuff works. It is hands-on practice in an environment free of worry about breaking expensive stuff that encourages learning. Knowing how it works, being able to interact with it gives one a sense of control and independence. Secretaries of today should have a toolkit to be able to Do It Themselves; a new millenium witchbag.

1.4 Disclaimer

Genderchangers at the Gender Changer Academy can be beginners or experts (although we don't have any experts, yet) or something in between. The reason we exist is to share what we know. We believe that a co-operative learning environment where there is little difference between the teachers and the students is a good recipe.

Basically, we are all just here to learn more and to share our knowledge and expertise. The teachers for the course are learning just like the students and we hope that the course material and the course itself will develop each time we teach it. If you have a contribution to make or a chapter to add we would like to hear about it.

In other words this reader is a work in progress and only with input and criticism can it progress and become more complete. We would like the reader to become a good reference, but it will not likely ever be a complete hardware guide. From the course we hope you gain the confidence to just pick-up a screwdriver, open your chassis and try to figure it out.

Figure 1.1: Gender Changer

1.5 About the Course

We give classes in basic computer hardware. We cover the basic parts of the computer and concentrate mainly on hands-on demolition and re-construction. We weave in some history of computer hardware and women and technology. However, we concentrate mainly on learning/teaching the hardware. Excursions to computer-fares and stores are a fun and important follow-up to the course. We also encourage the use of second hand computer parts and open source products like Linux. You can do almost anything with a computer without actually having to buy software, and if you are really resourceful you can get hardware for cheap and often even for free. The classes are given in English and are for women only. As the GCA grows, so will our course selection, so stay tuned and join our discussion list at `http://lists.genderchangers.org/listinfo/gca`.

During the course there is usually a 1 to 2 teacher/student ration. We find small groups work best. The classes are given three evenings, once per week for three weeks. The times are between 19.30-22.00. There is officially a 15 minute break in the middle, but usually only the teachers take a break. The price of a course is 50 guilders or 23 euros which includes a course reader (in progress), a screw driver and superb coffee or tea. Copyright sucks!

1.6 About ASCII - http://squat.net/ascii

ASCII is located in the basement of the Fort van Sjakoo, an international bookshop in the center of Amsterdam at Jodenbreestraat 24. ASCII stands for Amsterdam Subversive Code for Information Interchange and provides free computer facilities and internet access. It is a non-commercial and microsoft-free workspace run by volunteers who have varying levels of computer experience and expertise. The machines in ASCII have either been salvaged or donated and then re-built and installed with the free and opensource operating system, Linux. As far as we know, it was the first squatted "cybercafe" in the world. Anyone can come in, check their email, have a cup of coffee, surf the web, have some more coffee and just hang-out. ASCII also offers scanner and printer services, streams a live radio news hour every Friday and so much more.

One of ASCII's aims is to demonstrate the fact that 'out-moded' ware is often perfectly suitable for the average computer user to surf the net, send and receive email and do word processing and other basic functions. However, computer stores, manufacturers and microsoft would have the user believe otherwise. The computers at the café are not only re-assembled for local use in the café, the intent is to also build machines and to donate them to the computer needy.

Another of aim of ASCII is to promote the use of opensource products like Linux. After the GCA graduates build a new machine, the graduates of the beginners Linux course can install the operating system and set-up the machine for use with all open source programs.

ASCII is a dynamic group of volunteers and new projects seem to be continually popping up. Check the URL for the latest news, upcoming courses, events and projects.

1.7 The Future of the GCA

WORLD DOMINATION and we want it now!

We have lots of dreams about the future. A very important one is to start giving a course in installing the free and opensource operating system, Linux. Your operating system is your personal choice and you should know that there ARE choices out there. After this, we want to offer courses in all alternative and especially opensource software: from browsers and email programs to programming and webpage design. In conjunction with our courses we hope to distribute course readers.

Last but not least there is already an absolutely fab non-profit tech carnival being home grown called the Eclectic Tech Carnival, or /etc for short. The carnival is meant to be an open space where women can experiment and learn about computer hardware and using free software products in publishing and communication. The location of the event will be Pula in Croatia. You are welcome to join one of the mailing lists where female geeks from all over the world co-operate in setting up this event `http://etc.genderchangers.org/`.

2 Open Source

'Open' means that something is known, in other words that it is not secret or hidden behind lock and key. It means that there is no patent or copyright on it, which means less rules and laws. In turn that means less enforcement and less bureaucratic do-ha.

'Source' refers to the code that makes up a program or script or application. An analogy of an open source product is a pot of peanut butter. On the label you can see whether the ingredients include salt or sugar or colouring or preservatives or animal products. This information allows the consumer to make a slightly more informed decision about what peanut butter to buy. Consumer behaviour is already far too influenced by aesthetics (ie. label design) and availability (marketing). Sales people are not the experts on products, although they are often approached as if they were.

When buying software one wants to make an informed decision just like in the situation of the pot of peanut butter. Open source goes beyond the the label onthe jar of peanut butter in its 'openess'. Open source software gives the consumer not only the ingredients, but also the recipe. Open source stands for access for all. It invites people to participate in the development and creation process of a product. It reflects a spirit of D.I.Y. and of cooperation, of collectivity and community. There is less money to made with open source products: one only pays for the organiation of making and distributing the installation od cd's, reference materials and other services such as consulting or maintenance. Open source is often linked to 'Free', but it more often refers to freedom of speech and expression and movement.

Perfume is an example of a product that is not open source. The recipe and the ingredients are kept top secret. Why is that we wonder...

What are the arguments for intellectual property laws like patents and copyright? The main reason is that research and development costs are so high that if people, companies, universities or governments are not assured of some returns on that investment they lose the incentive to research and develop.

Useful links for understanding more of the Open Source ideology are:
`http://www.opensource.org`
`http://www.gnu.org`

3 How a computer works

A computer is basically a big calculator PLUS some more. The fancy dress includes the fact that it can store stuff and that it can do much more complicated calculations a lot quicker than calculators. Computers can perform complex and repetative procedures quickly, precisely and reliably and can quickly store and retrieve large amounts of data.

The physical components from which a computer is constructed (electronic circuits and input/output devices) are known as "hardware". Most computers have four types of hardware component: CPU, input, output and memory/storage. The CPU (central processing unit) executes programs ("software") which tell the computer what to do. Input and output (I/O) devices allow the computer to communicate with the user and the outside world. There are several kinds of memory/storage - fast, expensive, short term memory (e.g. RAM) to hold intermediate results, and slower, cheaper, long-term memory /storage (e.g. magnetic disk and magnetic tape) to hold programs and data between jobs.

The command line is the shared ground between human and machine. When we type in an instruction, in code, and there are different languages that the computer understands, we get a reply. There is also a different way of communicating with the computer. Instead of the command line one can use a graphical user interface (GUI), the point and click cascading window layers system.

The noun "program" describes a single, complete and more-or-less self-contained list of instructions, often stored in a single file, whereas "code" and "software" are uncountable nouns describing some number of instructions which may constitute one or more programs or part thereof. Most programs, however, rely heavily on various kinds of operating system software for their execution. More on all this fascinating matter of fact and opinion in the next course.

Data gets processed in numerical form which are expressed in a binary system; binary digits, or bits are 0 and 1. Binary digits are easily expressed in the computer circuitry by the presence (1) or absence (0) of a current or a voltage. A series of eight consecutive bits is called a byte; the eight-bit byte permits 256 alphanumeric characters, and such an arrangement is called a single-byte character set (SBCS). The de facto standard for this representation is the extended ASCII character set.

You probably know that a gigabyte is bigger than a megabyte or a transfer rate in megabits per second is faster than one in kilobits per second, but you may not know how much bigger and how much faster. Let's try and sort out these tidbits.

Bit. A bit is short for BInary digiT. It is the smallest unit of information on a computer. All digital data inside a computer is represented using a binary number system where each number and character is comprised of 0's and 1's.

Byte. Eight bits of information is one byte, which is short for binary term. A byte is the amount of memory space it takes for the computer to store one character, such as the letter "A."

Kilobyte (KB). In the binary notation system, 1 KB equals 1,024 bytes. You will often see KB's used to measure system memory cache on a central processing unit (CPU).

Megabyte (MB). In binary terms, 1 MB is equal to 1,048,576 bytes, or 1,024 kilobytes. Old hard drives are measured in MB's, but today RAM is what you most often see measured in megabytes.

Gigabyte (GB). One gigabyte is equal to 1,073,741,824 bytes or 1,024 megabytes. Most hard drives today are measured in gigabytes such as 10 to 30 GB, but some hard disks can hold up to 73 GB of information.

Terabyte (TB). One terabyte is equal to 1,099,511,627,776 bytes or 1,024 gigabytes. As storage demands increase, we may see more terabyte sized hard drives in the future.

Storage Capacity - Whether you store data on diskettes or directly on your hard drive it is important to know how much space is available to fill with your important documents, multi-media files or programs.

Transfer Speeds - Where storage is measured in bytes, transfer speeds are measured in bits per second (bps). One of the most important measurements today is knowing how fast you can get information from a modem or over a network. Some early modems transferred data at a rate of 300bps, but today's modems transfer data at 56,600bps and newer technologies such as ISDN, ADSL and cable modems can transfer data in terms of megabits per second. In short, kilobits per second (Kbps) is 1,024 bits or 128 bytes transferred in one second and megabits per second (Mbps) is 1,048,576 or 131,072 bytes transferred in one second.

Test yourself:

1. How long does it take to transfer a 5 MB file over a 56.6 modem?
2. How long does it take to transfer a 5 MB file over a 14.4 modem?
3. How important is it to you to have a fast download rate?

Processing Speed - Now as if there wasn't already enough confusion of bits and bytes, the basic unit used for processing speeds is a Hertz (Hz), but nowadays things are so fast that they are measured in megahertz (MHz) which is equal to 1 million cycles per second. CPU's these days range from 400 MHz to 750 MHz and are getting faster all the time.

4 Electricity

4.1 Units in electricity

The three most basic units in electricity are voltage (V), current (I) and resistance (r). Voltage is measured in volts, current is measured in amps and resistance is measured in ohms.

A neat analogy to help understand these terms is a system of plumbing pipes. The voltage is equivalent to the water pressure, the current is equivalent to the flow rate, and the resistance is like the pipe size.

There is a basic equation in electrical engineering that states how the three terms relate. It says that the current is equal to the voltage divided by the resistance.

$I = V/r$

Let's see how this relation applies to the plumbing system. Let's say you have a tank of pressurized water connected to a hose that you are using to water the garden.

What happens if you increase the pressure in the tank? You probably can guess that this makes more water come out of the hose. The same is true of an electrical system: Increasing the voltage will make more current flow. Let's say you increase the diameter of the hose and all of the fittings to the tank. You probably guessed that this also makes more water come out of the hose. This is like decreasing the resistance in an electrical system, which increases the current flow.

Electrical power is measured in watts. In an electrical system power (P) is equal to the voltage multiplied by the current.

$P = VI$

The water analogy still applies. Take a hose and point it at a waterwheel like the ones that were used to turn grinding stones in watermills. You can increase the power generated by the waterwheel in two ways. If you increase the pressure of the water coming out of the hose, it hits the waterwheel with a lot more force and the wheel turns faster, generating more power. If you increase the flow rate, the waterwheel turns faster because of the weight of the extra water hitting it.

4.2 Electrical power

Electrical power is the rate at which electrical energy is converted to another form, such as motion, heat, or an electromagnetic field. The common symbol for power is the uppercase letter P. The standard unit is the watt, symbolized by W. In utility circuits, the kilowatt (kW) is often specified instead; 1 kW = 1000 W.

One watt is the power resulting from an energy dissipation, conversion, or storage process equivalent to one joule per second. When expressed in watts, power is sometimes called wattage. The wattage in a direct current (DC) circuit is equal to the product of the voltage in volts and the current in amperes. This rule also holds for low-frequency alternating current (AC) circuits in which energy is neither stored nor released. At high AC frequencies, in which energy is stored and released (as well as dissipated or converted), the expression for power is more complex.

Less technically, regular household appliances use DC and the power outlet in the wall is AC. The computer's power supply converts AC from the wall to DC for the computer.

Tools for demolition and Reconstruction

5

It is a good idea to collect a few basic tools before you tear apart your computer. The tools don't need to be fancy. The newer and more expensive the computer and its parts are, the more careful you may want to be with your computer. Here at the Gender Changer Academy it is not our goal to destroy computer hardware, but we do not want you to be afraid of breaking something. Sometimes 'breaking' just means learning the hard way. Remember to ground yourself (take any small electrical current out of your body) by touching something metal like your chassis or power supply and off goes the lid!

Screw drivers A (-) flathead and (+) phillips no 1, preferably de-magnetized. If you do use a magnetize screw driver (they can be handy) do not touch the cpu and microchips with it. Just use it for screws.

Antistatic bracelet this cool little thing keeps you grounded at all times.

Pen light torch allows you to see the small print on the motherboard.

Extractors and tweezers easier than fingers or shaking the case up-side-down

Egg box for the screws keeps your screws seperated and in order.

6 Parts of the Computer

6.1 Interconnection

6.1.1 Sockets

A socket is where there's a virtual and hardware connection between processes. Similarly an interface is a boundary across which two systems communicate. An interface might be a hardware connector used to link to other devices, or it might be a convention used to allow communication between two software systems, for example a graphical user interface: GUI.

6.1.2 Connectors

Connectors are often called 'ports'. A port is a logical channel or channel endpoint in a communications system. A genderchanger is an adaptor (type of connector) which fits onto for example a serial or parallel port. Serial ports have a COM1- generally for a mouse, and COM2- generally for fax or modem. The PS/2 port and connector, otherwise know as mini-DIN (Deustche Industrie Norm) is usually for the keyboard, and uses the ISA bus. ALL VERY CONFUSING HEY!? Oh well. The parallel port is mostly used for the printer. The basic difference between serial and parallel is that data travels in serie in the former and in parallel in the latter.

6.1.3 Cables

We find cables outside as well as inside the computer. There are basically two types of cable: one for power supply/electricity and the other is for data transport. These two types themselves also have all sorts of variations on the theme, something which one just gets used to. It all has to do with when in time something was developed and by what manufacturer in what part of the world....

6.1.4 Bus

A 'bus' is the route along which data is transported. The width of the data bus, i.e. the number of parallel connectors, and its clock rate determine its data rate (the number of bytes per second which it

can carry. This is one of the factors limiting a computer's performance. Most current microprocessors have 32-bit busses both internally and externally. 100 or 133 megahertz bus clock rates are common. The bus clock is typically slower than the processor clock.

The term is almost certainly derived from the electrical engineering term "bus bar" - a substantial, rigid power supply conductor to which several connections are made. This was once written "'bus bar" as it was a contraction of "omnibus bar" - a connection bar "for all", by analogy with the passenger omnibus - a conveyance "for all".

ISA and PCI and IDE and USB are types of bus design.

The USB or universal serial bus is used for many types of devices such as printers, modems, joysticks, scanners, zip drives, external hard drives, etc. The USB transfers data faster than the serial ports and parallel port and also has an important advantage that you can remove and add devices to the USB when the system is running. It can also support up to 127 devices at the same time through daisy-chaining (connecting each device to itself with a USB cable).

6.1.5 Flat ribboned cables

These cables are used between floppy, hard disk drives or cd-rom etc. One edge of the cable is generally red or marked with red dots. The red edge marks pin-hole number one and this should be connected to the corresponding pin number one on the IDE bus. The IDE bus is generally on the motherboard. The other end of the cable goes into the IDE device (hard drive or cd-rom) and again you should look for pin number one. No damage can be done if these cables are not connected properly, but nothing will work. New IDE cables and computers are now being manufactured so they only go in one way, so have a look to see what yours is like.

6.2 Chassis

A chassis (pronounced TCHAsee or SHAsee) is the physical frame or structure of an automobile, an airplane, a desktop computer, or other multicomponent device. Case is very similar in meaning, but tends to connote the protective aspect of the frame rather than its structure. People tend to choose one term or the other. The rest of this definition uses chassis but applies as well to the term case. Both terms (and casing) are derived from the Latin word for box. The plural form is also chassis.

For a computer, the chassis houses the main electronic components, including the power supply, motherboard, a basic speaker, power switch and a few LED's (light emitting diodes). Typically, there is room for a hard disk drive, floppy drive and a CDROM drive. The IBM PC chassis for its XT computers set an early de facto standard for a chassis configuration (sometimes referred to as the form factor). The desktop computer has since evolved through the AT model, the miniAT, and the smallfootprint PC. A later development was the vertical or tower chassis configuration, designed to be placed under a desk. Nowadays, we have minitowers, miditowers, fulltowers and much more. The outer dimensions of a chassis are said to form its footprint. The more room you have inside your chassis, the easier it is to keep your system cool. The chassis is rapidly becoming somewhat of a fashion statement. Sisi and I recently saw a chassis that looked more like a food processor than it did a personal computer.

Buying considerations:

- ATX (desktop or tower: mini, midi, maxi, and server), AT cases are the older models
- Power supply, ranges from 200 to 300 watts, for an AMD processor you need at least 250W that is also AMD approved.
- low noise, recooling or fan?
- easy to open and close?

- enough knobs, well placed, on the front? a real reset button on the front?
- USB openings on the front? can be very handy
- does it stand on two feet?
- a lot of space inside? enough places for extra devices?
- of what material is it made? does this matter?
- design
- a UPS device (Uninterruptable Power Supply) against power surges. In case the electricity supply crashes you have about 15 minutes of power supply stored to save and shut down.

The chassis, keyboard and the monitor are pretty much what we generally visualize as a computer. The mouse, though not essential in principle, is essential in practice for the modern day GUI or graphical user interface. A mouse isn't needed, for example, in a command line or text driven environment, and it is not needed when adjusting hardware settings in the computer's BIOS (basic input output system) which we will get to a little later.

6.3 External devices

6.3.1 Monitor

The monitor is an output device. It visually tells you what the computer is doing so that you can react with more input. Your monitor can either get its power by sharing your computers powers supply, or by plugging directly into the wall socket. We think the wall is better for two reasons. First, your power supply should last longer if it is not supplying power to your monitor. Second, if you have a sleepy monitor it is better that you turn it on first (in order to see when to enter the BIOS).

There are two main types of monitors: cathode-ray tube (CRT) monitors and liquid crystal displays (LCD). The former works the same as a TV, and it emits radiation and all that good stuff. The latter is relatively new technology, very expensive, but better for your health and your electricity bill.

You will spend a lot of time looking at your monitor, so it might be a good reason to invest. Also monitors last a long time, so you can invest and keep it even when you need to upgrade other parts. Larger monitors generally support high resolutions and high refresh rates. This gives you less eyestrain. The refresh rate is the number of times per second that your computer screen is re-drawn and is measured in hertz (Hz). You don't want anything less than 60 Hz, or you will get a head ache. Resolution is the number of pixels displayed on the screen. Moving from 800x600 to 1,600x1,200 results in a fourfold increase in relative display size. Note that pixel is not the same as dots per inch (DPI) which is a value for on paper and not for on a screen

The keyboard and mouse are what is known as an input devices. By typing on the computer keyboard or clicking with your mouse you can send messages, text and commands to the computer. For the personal computer user, the keyboard is an essential input device. For big mainframes and old monster computers, a more handsoff approach was often used to input data, for example punch cards.

6.3.2 Keyboard

Keyboards were originally part of terminals which were separate peripheral devices that performed both input and output and communicated with the computer via a serial line. Today a keyboard is more likely to be connected directly to the processor, allowing the processor to scan it and detect which key or keys are currently pressed. Keyboards vary in the keys they have, most have keys to generate the ASCII character set as well as various function keys and special purpose keys, e.g. reset or volume control.

The typing keys are the section of the keyboard that contain the letter keys, generally laid out in the same style that was common for typewriters. This layout, known as QWERTY for the first six letters in the layout, was originally designed to slow down fast typists by making the arrangement of the keys somewhat awkward! The reason that typewriter manufacturers did this was because the mechanical arms that imprinted each character on the paper could jam together if the keys were pressed too rapidly. Because it has been long established as a standard, and people have become accustomed to the QWERTY configuration, manufacturers developed keyboards for computers using the same layout, even though jamming is no longer an issue. Critics of the QWERTY layout have adopted another layout, Dvorak, that places the most commonly used letters in the most convenient arrangement.

6.3.3 Pointing device, eg mouse

The most commonly used computer pointing device, first introduced by Douglas Engelbart in 1968. Mice broke onto the public stage with the introduction of the Apple Macintosh in 1984.

In the beginning there was no need to point because computers used crude interfaces like teletype machines or punch cards for data entry. The early text terminals did nothing more than emulate a teletype (using the screen to replace paper), so it was many years (well into the 1960s and early 1970s) before arrow keys were found on most terminals. Full screen editors were the first things to take real advantage of the cursor keys, and they offered humans the first crude way to point.

Light pens were used on a variety of machines as a pointing device for many years, and graphics tablets, joy sticks and various other devices were also popular in the 1970s.

Since the introduction of the mouse it seems like non nerd users have stopped using the keyboard. Mouse use is more simplified than keyboard use. It is more cramped, single same sort of movements and hence more chance of getting repetitive strain injury from it. We recommend as much switching between different movements as possible, see also chapter 8 on health.

6.4 Outside the box

The external devices connect in some way or another to the motherboard or main board, inside the chassis through ports and buses that are basically places where we can plug things in. The different ports look different and have different functions and take different kinds of cables and connectors.

Keyboard DIN connector is the large round 5 pin connector and has been mostly replaced by the miniDIN, a 6 pin connector wheich resembles the PS/2 mouse connector.

Mouse can be connected through a serial port, but newer machines have a PS/2 connector integrated on the motherboard. The PS/2 connector is a small round 6 pin connector.

Cables The essential cables on the outside of the computer are the power cables for the chassis and the monitor, the monitor cable and the mouse and keyboard cables. There are many other types of cables such as SCSI, parallel or printer cable, UTP ethernet cable, coaxial ethernet cable and these will be covered later.

(Modem)

(Printer)

(External Storage Devices)

(Speakers) These external devices are not essential hardware. We will concentrate on demonstrating where and how they connect and not describe the hardware itself, for now.

As mentioned above under chassis, all these 'things' need to connect somewhere. If you look at the back of a computer you will see different shaped holes. Some holes have more holes than others and some

have little pegs. What hardware you have inside your computer will determine what kind of hardware you can attach to the outside of your chassis. These connector points all seem to have a different name, so just hang in there. You don't have to remember the name. The important thing is to be able to determine what device or "thing" can be connected to it. The technical term for these connectors is port or bus. Hopefully, the difference will become clearer later. The basic connectors are:

- The Parallel Port which is generally for a printer, but can also be used to connect external hard drives and even another computer with the right cable.
- The Serial Ports (aka COM 1 and COM 2 in Windows OS) where serial port 1 is generally for a mouse and serial port 2 is used for a modem or fax.
- The PS/2 ports are for the keyboard and mouse in newer computers.
- The USB or universal serial bus is used for many types of devices such as printers, modems, joysticks, scanners, zip drives, external hard drives, etc. The USB transfers data faster than the serial ports and parallel port and also has an important advantage that you can remove and add devices to the USB when the system is running. It can also support up to 127 devices at the same time through daisychaining (connecting each device to itself with a USB cable).
- The keyboard connector usually is connected directly to the motherboard and uses the ISA Bus. It is called a DIN if it is a large round 5 pin connector and a miniDIN if it is a smaller 6 pin connector.

6.5 Inside the box

6.5.1 Motherboard

A motherboard or main board is the physical arrangement in a computer that contains the computer's basic circuitry and components. On the typical motherboard, the circuitry is imprinted or affixed to a firm planar surface and usually manufactured in a single step. The most common motherboard design in desktop computers today is the AT, based on the IBM AT motherboard. A more recent motherboard specification, ATX, improves on the AT design. In both the AT and ATX designs, the computer components included in the motherboard are:

- Coprocessors or chipset
- Memory
- BIOS
- Expansion slots (PCI or ISA)
- Interconnecting circuitry (bus)

The Microprocessor or Central Processing Unit (CPU) can be obtained separately. Additional components can be added to a motherboard through its expansion slots. The electronic interface between the motherboard and the smaller boards or cards in the expansion slots is called the bus.

Style	Width	Depth	Where Found	Match to Case and Power Supply
Full AT	12"	11-13"	Very Old PCs	Full AT, Full Tower
Baby AT	8.5"	10-13"	Older PCs	All but Slimline, ATX
ATX	12"	9.6"	Newer PCs	ATX
Mini ATX	11.2"	8.2"	Newer PCs	ATX
LPX	9"	1113"	Older Retail PCs	Slimline
Mini LPX	89"	1011"	Older Retail PCs	Slimline
NLX	89"	1013.6"	Newer Retail PCs	Slimline

6.5.2 Power supply

A number of cables with connectors lead from the power supply to power the fan, the internal speaker, the mother board and then also internal drives and storage devices such as floppy drives, hard disk drives, cdrom players and burners, tape drives, etc.

There are three types of cable/connectors that come from the computers power supply:

the mother board power connector (black wires together for an AT power supply)

The largest of these cables and connectors are for the motherboard and it is important to keep the black wires together while connecting them to the motherboard. Connecting these cables correctly is essential as the wrong way around will burn up your motherboard. The newer ATX power connectors are one piece and go in only one way.

the floppy drive power connector The floppy drive gets the smallest of the three and it only works one way, but won't cause damage if it is plugged in backwards.

the hard disk (or cdrom) power connector The hard disk, cdrom and other internal storage devices get the medium sized connectors, and again it only works one way. It won't cause any damage if you plug it in the wrong way around, but that would be difficult on most devices as the receptacle is shaped in a way that only oneway fits.

6.5.3 Internal Cables

6.5.3.1 Power cables (inside and out)

The power cable is for most of us the easiest to recognize. The monitor, computer's internal power supply and external devices such as printers all need regular looking power cables. The monitor can either plug directly into the computer's power supply or take its power from the wall, like the computer. The power supply cables on the inside of the computer are described above.

6.5.3.2 IDE cables

IDE cables are gray flat cables with plastic connectors with two lines of holes. One edge of the cable is generally red or marked with red dots. The red edge marks pinhole number one and this should be connected to the corresponding pin number one on the IDE bus. The IDE bus is generally on the motherboard. The other end of the cable goes into the IDE device (hard drive or cdrom) and again you should look for pin number one. No damage can be done if these cables are not connected properly, but nothing will work. New IDE cables and computers are now being manufactured so they only go in one way, so have a look to see what yours is like.

6.5.3.3 Twisted IDE cables

The same as an IDE cable, but with a twist, and these cables were for the floppies, but no longer exist.

6.5.3.4 Floppy drive cables

Floppy drive cables have replaced twisted cables in newer computers with a similar looking flat gray cable, but with fewer pins and no twist. The floppy drive bus and the IDE bus look very similar, but the IDE has more pins.

6.5.4 CPU

CPU (central processing unit) is the main processor or main microprocessor of a computer. It plugs into a socket on the motherboard. The central processing unit in a computer contains the logic circuitry that performs the instructions of a computer's programs.

A microprocessor is a computer processor on a microchip. It's sometimes called a logic chip. It is the "engine" that goes into motion when you turn your computer on. A microprocessor is designed to perform arithmetic and logic operations that make use of small numberholding areas called registers. Typical microprocessor operations include adding, subtracting, comparing two numbers, and fetching numbers from one area to another. These operations are the result of a set of instructions that are part of the microprocessor design. When the computer is turned on, the CPU (the main microprocessor) is designed to get the first instruction from the Basic Input/Output System (BIOS) that comes with the computer as part of its memory. After that, the BIOS, or the operating system that the BIOS loads into computer memory, or an application program is "driving" the microprocessor, giving it instructions to perform.

Generally the CPU is located on the motherboard and is hidden under a heat sink and/or fan. The processor does a lot of work and gets very hot and must be cooled. Often while testing out hardware the fan is left off, so keep on eye on how hot your CPU gets and connect the fan as soon as you are ready to assemble other things. To get at the CPU you have to remove the heat sink and or fan and then lift a lever. Be careful with pins while removing and replacing the CPU. It only goes one way. If you bend the pins, you may ruin your CPU.

6.5.5 Chipset

If the CPU is your computer's brain, the motherboard is your computer's back bone and the chipset is your computer's heart. If your motherboard is the most important piece of computer hardware you will purchase, the chipset is the most important part of it. The chipset defines almost everything about the system. Physically, the chipset is the set of microprocessors that are integrated into the motherboard and can't be removed or upgraded. When you want to upgrade your chipset, you need to upgrade your motherboard which basically means you could potentially be changing your entire system.

The chipset controls the system and its capabilities and is the hub of all data transfer. The chipset controls the flow of bits that travel between the CPU, system memory, and the motherboard bus. It dictates the data to the memory controller, realtime clock, keyboard and mouse controller, secondary cache controller, DMA controller, PCI bridge and the EIDE controller. All data must go through the chipset and all components talk to the CPU through the chipset. To make order of all this chatting the chipset makes use of the DMA controller and the bus controller. `http://www.hardwarecentral.com/hardwarecentral/tutoriala/46/2/` has detailed information on kinds of chipsets and advantages and disadvantages.

Chipsets have compatibility requirements for CPU's, so it is important to know what kind of chipset you have and make an informed choice about the chipset you want on a new motherboard. `http:`

//www.geek.com/procspec/chipsets/chipsetkey.htm has an excellent chart of specs on chipsets to help sort things out.

6.5.6 Memory

Memory is the electronic holding place for instructions and data that your computer's microprocessor can reach quickly. When your computer is in normal operation, its memory usually contains the main parts of the operating system and some or all of the application programs and related data that are being used.

Memory is often used as a shorter synonym for **random access memory (RAM).** This kind of memory is located on one or more microchips that are physically close to the microprocessor in your computer. Most desktop and notebook computers sold today include at least 16 megabytes of RAM (which is really the minimum to be able to install an operating system). They are upgradeable, so you can add more when your computer runs really slowly. The more RAM you have, the less frequently the computer has to access instructions and data from the more slowly accessed hard disk form of storage. Memory should be distinguished from storage, or the physical medium that holds the much larger amounts of data that won't fit into RAM and may not be immediately needed there. Storage devices include hard disks, floppy disks, CDROMs, and tape backup systems. The terms auxiliary storage, auxiliary memory, and secondary memory have also been used for this kind of data repository. RAM is temporary memory and is erased when you turn off your computer, so remember to save your work to a permanent form of storage space like those mentioned above before exiting programs or turning off your computer.

Additional kinds of integrated and quickly accessible memory are **readonly memory (ROM),** programmable ROM (PROM), and erasable programmable ROM (EPROM). These are used to keep special programs and data, such as the BIOS, that need to be in your computer all the time. ROM is "builtin" computer memory containing data that normally can only be read, not written to (hence the name readonly). ROM contains the programming that allows your computer to be "booted up" or regenerated each time you turn it on. Unlike a computer's random access memory (RAM), the data in ROM is not lost when the computer power is turned off. The ROM is sustained by a small longlife battery in your computer called the CMOS battery. If you ever do the hardware setup procedure with your computer, you effectively will be writing to ROM.

Another kind of memory is Cache memory. There are many levels of cache memory, but most often references to cache memory refer to the secondary cache or L2cache. Cache memory is used in many parts of the modern PC to enhance system performance by acting as a buffer to recently used information. We will talk about the secondary cache, but other kinds of cache have the same basic principle in mind. The system cache is placed between the CPU and the RAM.

The system cache is responsible for a great deal of the system performance improvement of today's PCs. The cache is a buffer of sorts between the very fast processor and the relatively slow memory that serves it. (The memory is not really that slow, it's just that

the processor is much faster.) The presence of the cache allows the processor to do its work while waiting for memory far less often than it otherwise would.

Making fast memory costs lots of money, so instead of trying to make the whole 64 MB of RAM out of this fast, expensive memory, you make a smaller piece, say 256 KB. Then you find a smart algorithm (process) that allows you to use this 256 KB in such a way that you get almost as much benefit from it as you would if the whole 64 MB was made from the faster memory. How do you do this? The short answer is by using this small cache of 256 KB to hold the information most recently used by the processor. Computer science shows that in general, a processor is much more likely to need again information it has recently used, compared to a random piece of information in memory. This is the principle behind caching.

6.5.7 BIOS

The BIOS (basic input/output system) is the program a personal computer's microprocessor uses to get the computer system started after you turn it on. It also manages data flow between the computer's operating system and attached devices such as the hard disk, video adapter, keyboard, mouse, and printer.

The story of BIOS starts at the end of the seventies, when Intel Corp. introduced two new types of microprocessors, the 8086 and the 8088. IBM Corp. decided to develop a compact and "cheap" computer system for the home and office use, based on the Intel 8088 microprocessor. IBM made contact with a small and young company in Seattle, Microsoft, in order to develop the means to control this computer system. Both companies agreed, that the operating system should be divided into two parts. The one part, the Basic Input/Output System, should form a part of the hardware, and would be added to the computer as ROM. The other part, the actual operating system, would be available on disk, and should be loaded into RAM during bootup.

The BIOS consists of four parts:

1. The PowerOnSelfTest

   The PowerOnSelfTest or POST contains a series of diagnostics routines that test the various system components, initialize certain data structures and finally boot up the system. POST consists of various test and initialization routines for the onboard hardware and expansion cards such as the video adapter. If a failure is detected this can be made known by:

   - one or more audible beeps, the socalled beep codes; get your beep code reference at `http://www.matrixbios.nl/beepc.html`
   - an error message presented on screen;
   - a checkpoint code, sent to one of the system's output ports.

   When all tests have been performed and components have been initialized, control is transferred to the Bootstrap Loader, to load the available operating system on disk.

2. The BIOS Setup Utility

   The BIOS Setup Utility can be used to enter, modify and store system configuration data. Several screens are available to define simple and more or less advanced system characteristics, such as hard disk and floppy disk types, date, time, memory wait states, DMA clock, power management, etc.

   All BIOSes provide a Setup Utility, either built into ROM or on disk. This Setup Utility allows users to modify the basic system configuration. Data entered in Setup are stored in batterybacked RAM (CMOSRAM). Nowadays, the BIOS Setup Utility is divided into various sections. In known cases the Setup Utility can consist of numerous setup screens, one for each peripheral device, such as the MR BIOS.

3. Internal Diagnostics

   Internal Diagnostics used to consist of a extensive set up diagnostic utilities to check the various components of the system. If available in present BIOSes, the Internal Diagnostics will only contain a Hard Disk Utility, providing lowlevel format, auto interleave and media analysis.

4. The System BIOS

   The System BIOS provides the socalled Interrupt Service Routines (ISRs) which are available during the time the system is powered on. The ISRs perform fundamental services necessary to let the system operate correctly. Instructions from the operating system and/or application software are translated to commands that can be understood by the system hardware.

Homework Exercise: Identify your BIOS

The BIOS version/release, and lots of other information, can be obtained from the BIOS Identification String. Locate the BIOS on your motherboard, write down the name and numbers and visit this website to identify your BIOS.

`http://www.matrixbios.nl/bios\_id.html`

(BIOS notes from Alle Metzlar `http://www.matrixbios.nl/frames.html`)

6.5.8 Expansion Slots (ISA and PCI)

Located on the motherboard are a series of slots. Some are short and ivory and they are the newer PCI slots. Some are longer and black or brown and they are the older ISA slots. There are some expansion slots that are even older and you might see some motherboards around ASCII with such slots, but you are unlikely to buy a new or a relatively newused motherboard with these really old expansion slots.

Expansion slots are connected to the circuitry of the motherboard through the BUS. The function of the expansion slots are to add daughter cards (also know as cards) to expand the capabilities of your computer's motherboard. Some motherboards may integrate directly what other motherboards do with an expansion slot. For example, the keyboard, mouse plug into ports that are directly integrated into the motherboard. Whereas many mother boards use an expansion slot to insert a graphic card which is then connected to a monitor. Some motherboards have on board support for monitors. For many things (and in principle almost anything) can be connected to the motherboard through an expansion slot with the correct type of card. The following are some cards that are common to computers today. Since they generally all look alike to beginners, we have included some obvious features that make it easier to recognize a card.

6.5.8.1 Input/Output card

Actually, the input/output cards are not so common today, but were used in older computers to connect hard disks and floppy drives where the motherboard didn't have onboard IDE support. The typical feature of this card would be no holes to the outside and obvious looking IDE buses on the card.

6.5.8.2 Graphic card

The monitor plugs into the graphic card (also known as VGA card), so you can see what is happening (or not happening) on your computer. A graphic card will have one rounded trapezoid looking 15pin (holes lined up in three rows not two) female connector.

6.5.8.3 Modem card (internal)

An internal modem takes the shape of a card and then the telephone line is plugged into the modem card. The obvious feature of a modem is the telephone plug which will nicely fit a telephone line. Some modems are combination telephone and answering machine devices and can have space for 2 lines and small round holes for a speaker and microphone. I have heard that combidevices are a bit more difficult to configure.

6.5.8.4 Network card

Just like the name, a network card enables a computer to connect to other computers with a network cable. A network card will typically have an RJ45 plug which looks like a telephone jack, but is larger, and it will also have a protruding round connector for a UTP ethernet cable.

6.5.8.5 Sound card

A sound card is needed when you want to attach some decent speakers to your computer to play music or video. The little internal speaker is really only cable of making beeps sound good. A sound card will have generally have little round holes with audioin, line out and microphone engraved near them and also a 15pin (holes lined up in two rows not 3) for connecting up to two joysticks.

6.5.9 Storage Devices

6.5.9.1 Hard Disk

A harddisk is a box which contains a stack of disks (4 to 8) that spin 4500 to 10000 rotations per second. Harddisk are getting bigger by time: in 1985 20MB was a normal size for a hardisk, at time of writing (2002) 30GB is quite common.

Harddisk speed is about 10Mb per second.

6.5.9.2 Floppy Drive

A floppy drive is a removable disk that is very thin (hence its name). They are the same for several years now. Almost every computer has one, that's why they are still very popular. The size is 1.44 MB, spins at about 500 rpm, speed is about 30KB per second

6.5.9.3 Zip Drive

A Zip is (like LS120) an enhanced floppy drive, but very expensive and mot widespread. A Zip disk holds 100Mb or 250Mb, speed is about 500KB per second.

6.5.9.4 Jazz Drive

A Jazz drive is a true replaceble harddisk. The come in 1GB and 2GB sizes, speed is 1MB per second. The disks are very expensive though.

6.5.9.5 Tape Streamer

Tape devices are used for backup only, because they are slow to access. The data throughput for modern drives can be bigger than harddisks though. DAT is affordable, OnStream is both affordable and reliable, DLT and LTO are proffessional.

6.5.9.6 CdWritable

...

7 Do It Yourself

7.1 What do you want?

Before you decide what you want you need to determine your needs. A little bit of planning can save you a lot of headaches caused buy computer sales people. You know what you need, they don't. So...

1. PLAN what will you use your PC for? Web Page Design, Desktop Publishing, Word processing, Internet surfing, email, making music, playing games???? If you will be doing Web Page publishing, you might want to invest in a new big monitor, for example.
2. ASSESS what do you already have, if anything, and is it possible to recycle parts into your new PC?
3. BUDGET How much do you want to spend? And STICK to it. If your budget is only $ 1200, you might want to re-assess the need for a big monitor that might take up half your budget.
4. PLAN some more. If you already have a computer, which ones do you want to replace and which should you recycle. If you follow this plan you will buy new pats that are compatible with your old parts and get a nice new computer that matches your needs and your budget.

7.2 What to recycle or what can be got second hand:

- Diskette drives. Few advances have taken place in recent years, so it is likely you can use your old floppy, or easily save by finding one second hand.
- Hard Disk Drives. Many advances have and continue to take place in the technology of hard drives, so it is likely something you would replace or buy new. Hard drives less than a year old are still really good. The most important specs for a hard drive are: interface type (IDE, EIDE, SCSI), spindle speed and cache size. Also important is the data transfer rate and access time.
- Motherboard and CPU. For real upgrading you don't want to recycle the motherboard and CPU. However, if you are really on a shoestring budget and are planning to run Linux with command line interface instead of Windows and all the graphics that go along with it, I understand that you can get away with a lot less computer of a computer. This makes the determining your needs a very important step! It is your motherboard and CPU and their compatibility where you get the most

noticeable increases in speed and power. If you are not interested in a new motherboard or CPU, you should consider replacing some components of your current machine rather than building a whole new machine. If you are building everything from second hand parts, you will most likely be starting with the Motherboard and CPU and building up from there.

- RAM ? The older RAM chips don't necessarily contain the newest architecture and may not fit in a new motherboard, so depending on what motherboard you get will determine whether you can recycle you old RAM.
- Video Card. Have seen major improvements in features in recent years. You may want a new one, because a Video card with its own cache and image processing capabilities will free your CPU up for much more important processing. If you have a really fast CPU, but not such a good video card, your computer will appear sluggish when doing intensive graphics such as in games. Some old video cards are permanently attached tot he motherboard, so this may determine whether or not you can recycle it.
- Exterior Components. Recycling things like the case are a big money saver.

  Input devices: No major changes have happened to keyboards and mouses, and these devices are generally very compatible, so they are easy to recycle and to get second hand. Depending on how often you use your computer, you may want to consider ergonomic design of either the mouse or the keyboard, but a good desk and chair may be what your really need.
- Monitor. Unless you need a new big monitor for say graphic design or web page publishing, you may want to keep your old one, or keep tot he second hand market to keep your budget concentrating on the important processing improvements on the inside of your computer. You must make sure your monitor is compatible with your video card.

7.3 Money saving tips:

- Shop around because prices vary and also check return policies and the level of customer support a store offers.
- Consider Lesser-known brands. Well-known brands are generally more expensive. Lesser-known brands may have a higher component failure rate, but you can use the internet to check with other users about reliability of lesser-known brands.
- Don't always buy the newest. Things newer than 6 moths old cost significantly more and may have marginal improvements. Determine the newest improvements that are most important for your computing needs.

7.4 Where can you get it?

- PC Dump days
- Second hand computer stores
- Order through the interent
- New computer stores
- Trade with friends
- Test out the stuff you find onthe street

8 HEALTH ISSUES

Computers can cause damage to people and to the environment.

8.1 The People factor first?

If you're going to work with computers a lot you should keep the following health factors in mind: eyes, ears, muscles, skeleton, lungs, circulation, harmony. We don't as yet have crisp references to facts and researh but we have all heard of the side effects of looking at a video display unit too long, especially cathode ray tube monitors. The same applies to listening to the continuous whirring, buzzing sounds of the computer fans and electronics. Also keep in mind that if you're inside a lot you're getting lots of stale, smokey, toxic, germ filled, recycled air.

In addition the case for all that sitting around is not strong. Repetitive Strain Injuries (RSI) comes from not varying ones movements enough. It's the result of physical and mental stress. Not only minimal use of just one type of pointing device cause RSI but other stress factors also play a role: negative atmosphere on the workfloor, personal problems, and so on. One can imagine that discontent means taut muscles, which means less blood flow to the brains which means headaches. We encourage switching from mouse to keyboard and back. Try to make more use of command line prgrammes, not only graphic user interfaces that need pointing devices, like Windows. Of course tense and monotonous use of a keyboard can also cause RSI.

Being a computer worker often means having a serious deficiency in physical activity. We at the ASCII encourage you to jump up now, in the name the skeleton, the muscles and the circulation of bodily fluids. Dance a little caribbean jig and jive around the rest of the people in your space. It also stimulates social interaction and laughter.

8.2 The Environment factor last?

Computers are made up all sorts of not so natural ingredients: petroleum based plastics, lead, CFCs, halogen and (heavy) metals! These are mined in a destructive manner to say te least and are very damaging once discarded. These by-products ooze back into the earth and the air if not treated right. When you have no use for your old computer devices anymore, please don't throw them out on the street,

waste dump or landfill. They need to be deconstructed appropriately. And harass those responsible to act up now.

A lot of computer devices are still in the prototype phase. They have a relative low durability. Every week devices devaluate because a new and improved, faster, smaller, bigger, prettier version comes on the market. This is the sad ad bad news for the environment...

We found an organisation on the web which offers more information on these issues: www.svtc.or: the Silicon Valley Toxics Coalition which has a Clean Computer Campaign aimed at influencing policy and development around green design and eco-labelling of computer product.

9 FAIR TRADE

We at the ASCII were wondering about the money flow around computer hardware. When we pay for the parts we didn't get given as gifts or dragged from the streets in real recycling revalueing style, to whom does that cash go? We wonder where the motherboards get made, who makes them and what are the labour wages and conditions like? There's a sneeking suspicion that these mobos (motherboards) are made by people in the poorest, weakest countries of the world, by women and children with fine fingers and motoric skills. At this point we do not have any statistics to back this idea. But our general belief is that whenever consuming something one should question its origins, not only in the case of agricultural or textile prodcts like bananas or nike shoes....

Organisations following these issues are OXFAM and the Schone Kleren Kampanje: Clean Clothes Campaign.

Bibliography

[1] Praktijkboek, Het bouwen van een eigen pc, Victor Peters, Sybex Uitgeverij, 2000.

[2] Praktijkboek, EHBO voor de pc, Rob van Kempen, Sybex Uitgeverij, 2000

[3] Winn L. Rosch Hardware Bible, Fifth Edition, Winn L. Rosch, 2000

[4] In the Beginning there was the Command Line, Neal Stephenson, 1999. Printable version available at: `http://www.io.com/~mccoy/beginning\_print.html`

Your very own motherboard Manual. It comes with your pc. If you buy a pc second hand you can often get the manual off the internet.

Please add more written references that you find useful and share them with us.

Great Links

A

`http://www.pctechguide.com` Has info about PC motherboards, cpus, chipsets. It's a site from England that has info about the technical side of the computer. Useful. It also has info about multimedia, downloads, links and more. It is written in easy-to-understand English :)

`http://www.macgurus.com` This is a site about Macintosh hardware, mostly about memory upgrades, but also interesting for anyone wanting to explore the Macintosh computer (which is not as they claim on the site the coolest computer ever made...)

`http://library.cs.tuiasi.ro/hardware/mh-pc-lib-vol3-motherboards/` This is a useful site about motherboards, and only motherboards. It's mostly about the most popular motherboards and therefore concentrates on Pentiums. and Pentium chipsets, I think. But it is an enormous no graphics no nonsense text book online. A very useful resource but very technical.

`http://www.techadvice.com/` in their words: Techadvice.com is a web site with a mixture of PC related information. The older section is text based and has Company information along with products made by each company. Separate sections concentrate on issues with the Windows operating system and applications. The newer section is database driven and presents product descriptions, places to buy products and support related information as selected by the user.

`http://bubl.ac.uk/link/p/pchardware.htm` A catalogue of online computer hardware resources. a links page basically

`http://www.oreilly.com/reference/dictionary/` here you can search an online book for acronyms and meanings related to the computer. very nice indeed.

`http://www.mkdata.dk/click/` another guide to PC hardware. not so good i think, but all sites say different things, slightly, it's nice to have an overview, and many resources. and i don't like it because it has something about win98 but not about linux. it's a personal thing :)

`http://www.pcwebopedia.com/` another online look up dictionary about all things computerised. pretty good also.

`http://www.whatis.com` another online lookup

`http://www.howstuffworks.com/category-computers.htm` another on line look-up

`http://www.tomshardware.com/` an excellent hardcore hardware buying guide. Tom gives you all the details on the latest hardware.

http://www.smartcomputing.com lots of very simple articles about computer hardware and how computers work. It assumes micro$oft and Intel as defaults, but is nevertheless useful for beginners.

http://foldoc.org/ (free online dictionary of computing). This dictionary is a bit techie, but once you get the feel for it, it is really indispensable.

sun hardware info http://lios.apana.org.au/~cdewick/sunshack/data/

http://msowww.anu.edu.au/~kim/faq/hardfaq.html

http://www.cs.wisc.edu/~bolo/hardware.html

http://www.squirrel.com/squirrel/sun-nvram-hostid.faq.html

http://www.aball.de/~wpv/sun/faq/eeprom.html

http://www.utdallas.edu/pretext/PT2.1/haynes/intro.html this one is maybe my favourite URL of the day. a very good intellegent essay about women's language and the way they subsequently can communicate with technology, computers especially. written from an emotional and very personal point of view, with very academic sensibility.

http://women.cs.uiuc.edu/ this is a site *dedicated to creating a comfortable environment for everyone who studies and does research in computer science.* it is the site of Women in Computer Science.

http://www.wevh.org.uk/index.htm not so interesting, but none the less useful if people are interested in moving to manchester england and want to learn software skills... they call themselves the women's electronic village hall, which sounds nice.

http://www.wic.org/bio/ghopper.htm Grace Hopper, yea. no nonsense lady. as the site says, the mother of the computer. this is a short bio of this formidable lady.

this woman is all about compilers donna :)

http://www.neiu.edu/~empower/ Empowering Women for Life-Long Success Through Computer Expertise. what more can i say? it's an academic program at a university in the States that has a womens studies course...

and just now i am thinking about whether we can find an academic piece on the web about the history of women and computers, and then ask the author if we could copy it for the reader??

http://wicse.cs.washington.edu/ another Women in Computer Science and Engineering site. it's a nice site. mexican pink and blue...once again more interesting for people about to study or studying computer science academically...

http://www.wise-women.org/ An online community and network dedicated to supporting women web designers, developers, and programmers not too keen on this, seems to be a tendency to gear towards commerce and making money and not open source software promoting and so on. but maybe visit and see, might be useful. i haven't looked at it alot.

http://ftp.arl.army.mil/ftp/historic-computers/ historical computer images including the famous "first four" courtesy of mike muuss

http://www.mills.edu/ACAD_INFO/MCS/SPERTUS/Gender/gender.html Women and Computing Science includes the famous picture, "the first four" and has many links to articles about women and computing science.

Acronyms and Definitions

B

In english and nederlands, see also `http://www.foldoc.org` (free online dictionary of computing)

0 to 9

10base-T: 10 Mbps ethernet network that uses unshielded twisted-pair cables

100base: ten times faster version of 10base-T. Also called Fast Ethernet

3D sound: sound is not only produced in stereo from the left to the right, but also from the foreground and the background. for the best results you need four speakers.

4 speaker support: a sound card that supports 4 speakers has 2 independent stereo-out jacks in order to attach 4 speakers. with this you can create 3d sound.

A

a: floppy drive.

ascii: american standard code for information interchange; ascii is the standard encoding for characters which most computers use to send information; there are 128 standard-ascii-codenumbers (0-127) and each code is an alpha-numeric character, a system character or a specially assigned character; codes 128 to 255 should be defined by other encoding schemes that extend ascii with language (like ä) or application specific characters (lines, icons)

ascii-download: a download format that sends using only 7-bit ascii-characters;

de ASCII: Amsterdam Subversive Code for Information Interchange; a free and opensource internet workspace.

awg: american wire gauge: maateenheid voor de dikte van geleiders, meestal koperdraad; telefoondraad is bijv. 24 AWG, wat overeenkomt met een diameter van ongeveer 0.5 mm

AC: alternating current, see also DC

application: program; a software package that does something for you; examples, abiword, openoffice, netscape; toepassing

address, path: the 'name', or 'titel' of a specific part in memory.

ATA: AT Attachment; the connection standard for most harddisks and cd-rom drives to the motherboard.

anti-static wrist strap, aardings(pols)bandje: see chapter 5

B

bios: basic input output, het gedeelte van de computer dat los van het besturingsysteem de communicatie tussen moederbord en schijfstations regelt. See 6.5.7.

boot sector: de startsector op een schijf

bootable: het van de schijf kunnen laden en opstarten van een besturingssysteem

booten: het besturingssysteem opstarten

besturingssysteem: operating system, eg windows, linux

buffer: tijdelijke opslagplaats voor gegevens tijdens een bewerking

byte (karakter, dataword, word): een groep bits die door de computer als een aparte eenheid wordt verwerkt; een computerdatakarakter; bestaat normaal uit 7 of 8 bits

bit: BInary digiT; de kleinste eenheid in computerinformatie; de waarde is 0 of 1

bps: bits per second; bitrate.

binair: een telsysteem dat slechts twee cijfers gebruikt - 1 en 0; verwijst naar een systeem dat twee standen (1/0, aan/uit, hoog/laag, negatief/positief enzo) gebruikt om informatie weer te geven

binair bestand: een bestand dat niet in ascii-formaat maar in binair formaat wordt opgeslagen; wordt tevens gebruikt om naar bestanden te verwijzen die in 8-bits ascii-formaat zijn opgeslagen

bus: the highway (of copper on the motherboard for example) over which data travels; isa is older, pci is newer. See also 6.1.4.

backbone: snelle hoofdverbinding in een netwerk. letterlijk de ruggengraat

BNC-connector: oorspronkelijk ontworpen voor tv-toestellen, maar nu gebruikt in thin Ethernet; 'bajonetaansluiting'; Bayonet Neill Concelman-connector, of British Naval Connector

C

c: harde schijf van de pc, notebook, workstation?.

cache: tussentijdse geheugen naast bijv. een harde schijf of de processor waardoor de computer sneller kan werken

CD: oplsag ruimte van 4,7 gigabyte (GB)

CD-R: een cd die eenmalig beschreven (gebrand) kan worden

CD-RW: een cd die meermalen beschreven (gebrand), dus waar gegevens gewist kunne worden

cpu: central processing unit; de brein, de grootste chip in een computer; verwerkt gegevens

cmos: complementary metal oxide semiconductor; de veranderingen in het bios worden opgeslagen in het cmos-geheugen; geheugen chips die weinig stroom nodig hebben, maar die langzaam werken.

cmos-instellingen: een algemene term voor alle hardware-instellingen op een pc die kunnen worden gewijzigd, zoals tijd, geheugengrootte, schijftypen enzo; deze instellingen zijn normaliter toegangkelijk via een toets die wordt aangegeven bij het opstarten van de pc; op de meeste pc's kan het systeem beveiligd worden met een power-on wachtwoord in de cmos-instellingen. See 6.5.7

crt: cathode ray tube

chipset: the specific collection of chips that are on a motherboard in addition to CPU, RAM, and ROM. This includes the chips needed for keyboard, harddisk etc...

chip: an electronic part, usually plastic with many leads, that serves as an electronic subsystem.

circuit-switched network datacommunication network that is based on end-to-end connections, like phone lines. Opposite: packet-switched network.

cooling:

com ports: serial COMmunication channels. See serial port.

controller: a subsystem that takes care of a the connection between the computer and a device, usually in a bus to bus fashion. For example a scsi controller enables you to connect devices with a scsi bus to a computer with a pci bus.

coaxkabel: cylindrische, afgeschermde kabel die wordt gebruikt voor breedband-, baseband-, en kabeltelevisieverbindingen. Door de speciale opbouw zal in deze kabel de data niet verstoord worden door reflecties en echo's.

D

disk: schijf, space in the computer, literally and figuratively, one can make space on the hardrive through partitioning and one has space on for example the floppy of cd-rom drives?.

driver: software die ervoor zorgt dat programmas met bepaalde hardware kunnen communiceren.

DC: direct current, see also AC

Dimm: dual inline memory module. A RAM module with two rows of connections. See also Simm.

Dram: dynamic ram (refreshes). Cheap, small, but slow memory. See Sram.

device: integral (monitor, keyboard) and peripheral device (mouse, printer, modem); most devices require a programme (device driver) that acts as a translator, converting general commands from an application into specific commands that the device understands

dma: direct memeory access, directe toegang tot geheugen zonder tussenkomst van de processor

dos: disk operating system: het elementaire besturingssysteem dat nog steeds nodig is om windows op te starten

dot pitch: de afstand tussen twee beeldpunten op een beeldscherm

dvd: digitaal versatile disc; de opvolger van de cd - meer opslag capaciteit - 18 gigabyte (GB)

E

eprom: erasable progammable rom

eeprom: electronically erasable programmable rom

ems:

edo: extended data out

eidi: enhanced ide

ethernet: lokaal netwerk; busvormig

F

floppy: 1,44 megabyte (MB) opslag ruimte

fpm: fast page mode

firmware: between hardware and software, the bios for example

foil twisted-pairkabel (FTP): hetzelfde als STP (shielded twisted-paircable), not to be confused with ftp: file transfer protocol

fddi: fiber-optic distributed data interface; norm voor digitale glasvezel token-ringverbindingenmet snelheden van 100 mbits/s en hoger

G

gca: gender changers academy

gui: graphical user interface

genderchanger: a device that changes the end of a cable

geluidskaart, soundcard:

grafischekaart, videocard: agp-bus gebruiken

glasvezel: kabel voor optische verbindingen, sneller dan andere kabels

H

HDD led: het lampje dat oplicht als de harde schijf actief is

hma: high memeory area

hertz: unit for frequency, Hz. Number of repetitions per second. Humans can hear frequencies from 30 to 18000 hertz. Note that Mc (Mega-cycle) is equivalent to MHz.

hardware: The physical, touchable, material parts of a computer or other system. The term is used to distinguish these fixed parts of a system from the more changable software or data components which it executes, stores, or carries.

heatsink: usually a piece of metal with many wings, that drains the heat from a computer part.

hub: common connection point for devices in a network; contains multiple ports; hubs are used to connect segments of a LAN.

I

input device: something that gives signals to the computer like a mouse, keyboard, joystick or scanner.

isa: industry standard architecture; a bus 8/16 bits 8MHz that is found in all PC's (except really new ones).

i/o: short for input/output

i/o address: code waarmee een i/o aparaat in een computer geadresseerd wordt.

ide: integrated device electronics, ookn wel eide - een andere naam voor dezelfde bus op het moederbord als ATA.

interrupt: signaal dat door programmas of randaparatuur wordt gebruikt om de processor in te schakelen

irq: interrupt request, zie interrupt

J

jumpers: removable connections, usually tiny plastic blocks with a piece of wire that fits on two metal pins.

jack: stopcontact, contrastekker waarin een plug past

K

kaart / card: a PCB that (in case of a computer) should be inserted in a slot or socket.

kilobyte: KB of K; een eenheid die normaliter uitdrukt uit hoeveel bytes bestanden of geheugens bestaan; een KB is 1024 bytes.

L

lcd: liquid crystal display. Thin display found in laptops and fancy monitors

led: light emitting diode

lpd: line-printer daemon: program that sends data to a printer

lpt: DOS name for printer port

lszh: low smoke, zero halogen (ook wel ls0h); aanduiding dat een kabel in geval van een brand weinig rook produceert en geen halogeen bevat

LAN: local area network, a network within a building (see also WAN)

M

megabyte (MB): komt overeen met 1024 kilobyte; verwijst over het algemeen naar het aantal bytes in het RAM of de grootte van een bestand

modem: MOduleer-DEModuleerapparaat; een apparaat dat binaire signalen van een computer in toonsignalen omzet voor verzending over de telefoonlijn en vice versa

N

O

output device: a device that receives data from a computer, for example a monitor, printer or speaker.

P

partitioneren: een harde schijf in delen opsplitsen; de delen worden door het besturingssysteem gezien als afzonderlijke schijven

pcb: printed circuit board: mounting and interconnection board for electronic components. Found in every electronic device, except for the very simple (or old) ones.

pci: peripheral component interconnect, soort bus, fast.

prom: programmable rom

port: a one of many interface.

parallel port: lpt 1 and lpt 2

post: power-on self test

packet-switched netwerk (PSN): een datacommunicatiedienst die gegevens in pakketten van het ene naar het andere computersysteem stuurt. For example the internet, or the (snail) mail service. Opposite: circuit-switched network.

patch-kabel: kabel om snel een verbinding te maken op een patch-paneel, om bijvoorbeeld een gebruiker tijdelijk te verbinden

plenum: loze ruimte boven het hangende plafond

power-onwachtwoord (ook bootwachtwoord, opstartwachtwoord): een ww dat in het cmos wordt ingesteld en moet worden ingevoerd voordat de pc het besturingssysteem laadt

Q

R

resolutie: het aantal pixels, beeldpunten van een beeldscherm of een grafische bestand

ram: random access memory

ramdac: part of a graphic card that receives data from the video ram and converts that to color signals for the monitor.

rom: read only memory

rack: metalen frame voor het plaatsen van apparatuur, modules of kaarten

riser: kabelgoot, wordt tussen verdiepingen geplaatst

RJ-11: stekkersysteem met 6 aansluitingen

RJ-45: stekkersysteem met 8 aansluitingen voor ethernet, 10Base-T; wordt ook wel een modulaire jack genoemd

RJ-232: Recommended Standard 232; norm voor mechanische en elektronische kenmerken van een seriele adapter voor aansluiting van een modem, printer of andere apparatuur op een pc; heet nu EIA/TIA-232

S

scsi: small computer system interface, a bus that is used to connect computers to harddisk, scanner, cd-rom etc. Expensive, fast, very reliable. Supports hot swapping of devices.

svga: a standard for a set of display formats, up to 1024x768. Others are hercules, CGA, VGA, 8514, XGA.

Sram: static ram. Expensive, big, but very fast memory.

sdram: synchronous dram. Dram optimized for sequential access.

simm: single in-line memory modules. RAM module with a single row of connections.

serial port: com 1 and com 2, or the serial connections for mice, modems and (old) printers. Serial means: all data is transfered bit by bit, on one wire.

socket: a connection for a module or chip with many leads, for example for memory or CPU.

slot: de sleuf op een moederbord waarop een uitbreidingskaart word aangesloten

schijf (disk): een stuk van de ruimte, geheugen op een computer, je hebt de a:

schijf: de floppy drive, de c: schijf - de harddisk, enzo?

schrijven: storing data.

sample rate: de snelheid waarmee een geluidskaart digitaal data transformeert in een geluid dat door het menselijk gehoor begrepen kan worden (analoog); hoe hoger de sample rate hoe beter de geluidskwaliteit

software: programs

screened twisted-pair (ScTP): mengvorm van UTP en STP

shielded twisted-paircable: STP. See also FTP and UTP.

T

tcp/ip: netwerkprotocol voor informatie-uitwisseling binnen een netwerk of via internet

thick ethernet: ethernet met met 10-mm dikke RG-11 coaxkabel, bruikbaar tot maximaal 1000 meter.

token ring: lokaal ringnetwerk

twinaxkabel: twinaxiale kabel; twee geleiders in een afgeschermde kabel waarop randapparatuur kan worden aangesloten

twisted-pairkabel: kabel met gedraaide aderparen; hoe meer twists, hoe langer de crosstalk tussen de paren

U

umb: upper memory blocks, a DOS term.

usb: universal serial bus

utp: unshielded (onbeschermde) twisted-paircable

V

vga: vector graphics adaptor. Also a standard for a set of display formats, up to 1024x768. Others are hercules, CGA, SVGA, 8514, XGA.

vram: video ram. Two port memory: simultanous access from computer and ramdac is supported.

velcro: klittenband

W

WYSYWIG: what you see is what you get; zoals je het op het beeldscherm ziet (bijv een webpagina) word het uitgeprint

WAN: wide area network, a networks that connects buildings.

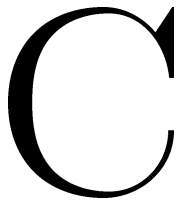
X

xms: extended memory (ram). All memory but the base 640Kb.

Y

Z

Excercise



C.1 Building your ideal computer

The purpose of this homework is to understand how computer use should be reflected in your computer hardware. What you use your computer for such as surfing the internet, doing heavy graphics,sound and video editing, playing games or serving a network all tax the hardware of a computer in different areas. The system's performance can be enhanced a great deal if you put importance on the parts that will be doing the most work. Therefore, before deciding what you want in computer hardware it is a good idea to first decide what you want to do with your computer.

Entering a computer store can be a very confusing process. Often you don't get to look at things or touch them. They are either kept behind glass or hidden in a flashy coloured box. It is a good idea to know what you are looking for before you go to one; or at least be prepared to ask questions and do not feel pressured to buy. Don't buy something if you don't know what you are buying, and always make sure there is a good return policy.

There are three main things that general users use their computers for:

1. Interneting and general office use (wordprocessing, layout, a bit of graphics);
2. Multi-media use (graphic design, sound editing, video editing);
3. Gaming (playing games with heavy graphics and sound).

With this in mind, we would like you to investigate what components are most important for each type of machine. Use the internet, ask friends or even visit a computer store to get inforamtion. If you go to a computer store, tell the sales person that you will be using your computer for one of the above uses and see what they suggest.

1. The Internet Machine (and general office type use): What components are most important? Accessing the interent and doing some mutli-tasking between an internet browser nd other applications will be the users main functions. Where should you concentrate your budget?
2. The multi-media machine: This machine will have to do lots of multi-tasking, image processing and video and sound editing. What parts will be most important for this type of machine.
3. The gaming machine: The owner of this machines will spend 60 to 70 percent of his or her computing time playing games. What type of hardware is most likely to boost the performance of the games.