

Computer Hardware & Networking & Server Configurations

2022/08/30

Unit 01

Introduction to Computer hardware, PC Components and functionalities

Basic Components of a Computer System

Total computer system consists of four main parts.

- Hardware
- Software
- Liveware
- Firmware

Hardware

The physical devices of a computer system that can be touched or tangible are called computer hardware.

Example: Ram, Monitor, System Unit, Keyboard, Mouse, VGA Card, SATA Cable etc...

Software

A set of instructions (Programs) that drive the hardware of a computer system.

Example: Windows7, Apple Snow Leopard, Ubuntu, Adobe Photoshop, Microsoft Office Word, MS Paint, VLC Player etc...

Liveware

The person who operates the hardware through the software

Example: System Entry Operator, Programmer, Network Engineer, Graphic Designer, Network Administrator, Web Engineer etc...

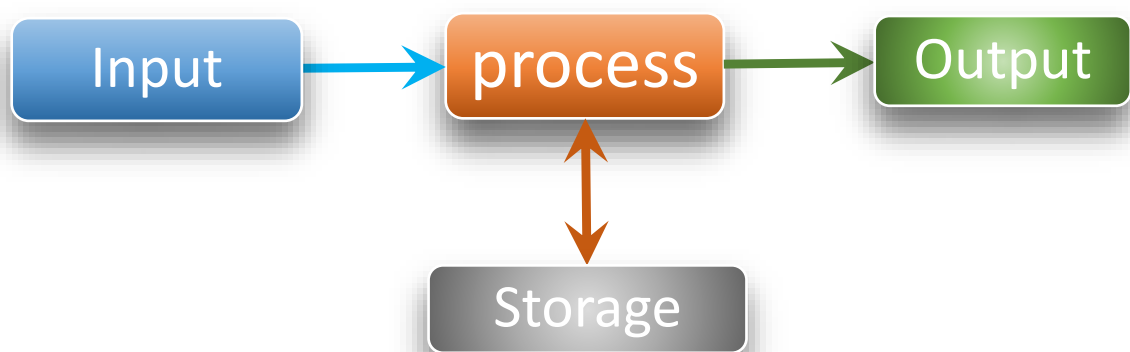
Firmware

Also, software which is stored inside the hardware

Example: Boot strap program (which is loaded at the start up)

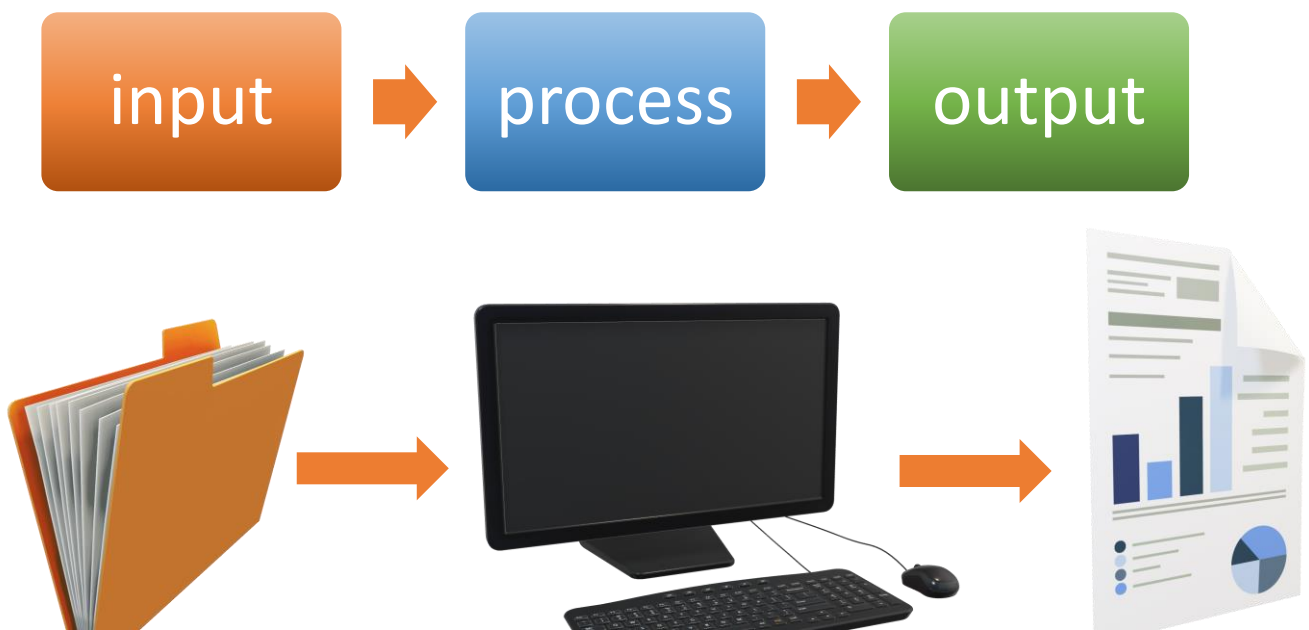
What is a Computer?

A computer is an electronic device that manipulates information, or data. It has the ability to store, retrieve, and process data.



How its Functions

A computer is an electronic machine that processes information - in other words, an information processor: it takes in raw information (or data) at one end, stores it until its ready to work on it, chews and crunches it for a bit, then spits out the results at the other end. All these processes have a name. Taking in information is called input, storing information is better known as memory (or storage), chewing information is also known as processing, and spitting out results is called output.

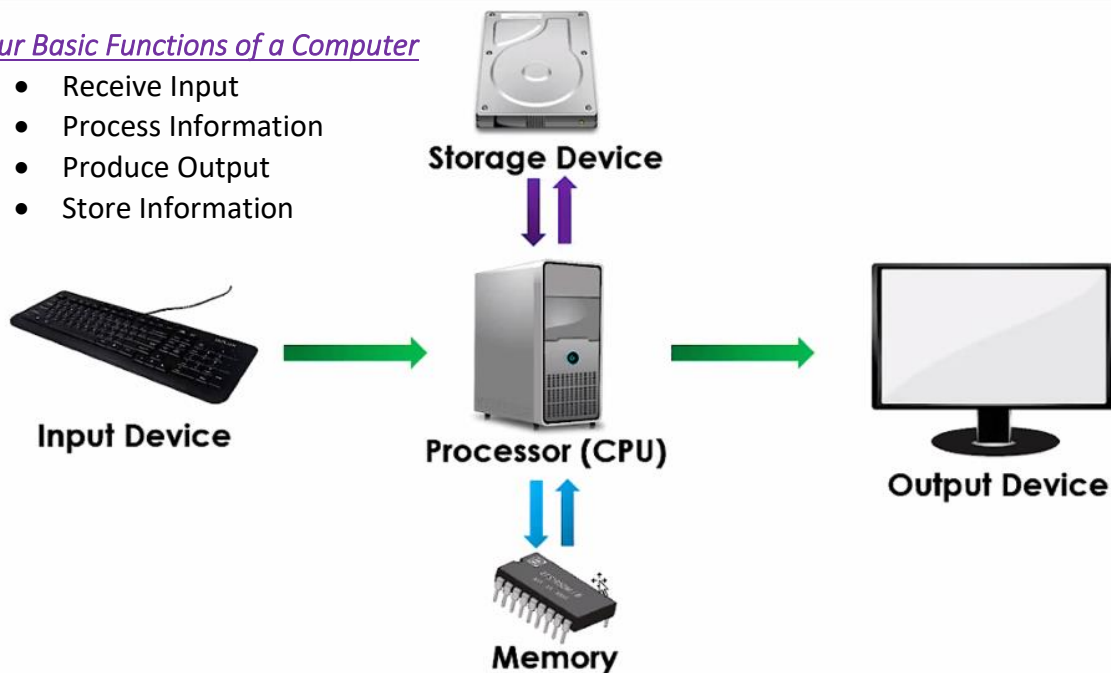


A computer can process data, pictures, sound and graphics. They can solve highly complicated problems quickly. And accurately. A computer performs basically five major computer operations or functions irrespective of their size and make. These are

1. It accepts data or instructions by way of input,
2. It stores data,
3. It can process data as required by the user,
4. It gives results in the form of output, and
5. It controls all operations inside a computer.

Four Basic Functions of a Computer

- Receive Input
- Process Information
- Produce Output
- Store Information



Input

Transferring of information into the system. This may be through a user input device – i.e. keyboard. Mouse, Scanner, etc... Or through Previously loaded software/ program, cd, etc...

Output

Output is the exact opposite of input. Output is the function that allows a computer to display information, from the system, for the user. This can be accomplished through the monitor (or other graphical display), printer, speakers etc...

Processing

This is where the computer actually does the 'work' = manipulating and controlling data the entire system.

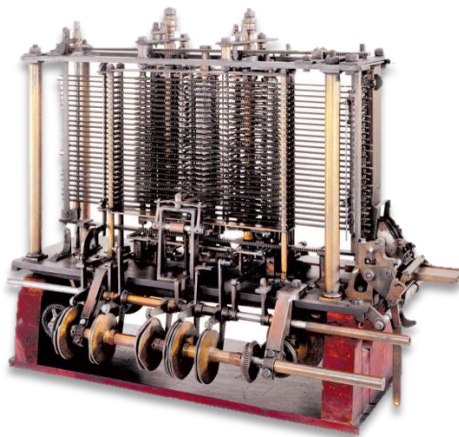
Storage

Most computers are able to store data both temporarily (in order to process), but also long-term (permanently). Storage takes place on hard-drives or external storage devices.

Evolution of the computer

The history of computer development is often in reference to the different generations of computing device. Each of the 5 generations of computers is characterized by a major technological development that fundamentally changed the way computers operate. Most developments resulted in increasingly smaller, cheaper and more powerful and efficient computing devices.

But ENIAC engine is the first computer (cause difference engine haven't storage)



difference engine



charles babbage

First generation (1940-1956) Vacuum Tubes

The first computer used vacuum tubes for circuitry and magnetic drums for memory. And were often enormous, taking up entire rooms. They were very expensive to operate and in addition to using a great deal of electricity, the first computers generated a lot of heat, which was often the cause of malfunctions.



First generation computers relied on machine language, the lowest-level programming language understood by computers, to perform operations, and they could only solve one problem at a time, and it could take days or weeks to set-up a new problem. Input was based on punched cards and paper tape, and output was displayed on printouts.

The UNIVAC and ENIAC computers are examples of first-generation computing devices. The UNIVAC was the first commercial computer delivered to a business client, the U.S Census Bureau in 1951.

ENIAC – Electronic Numerical Integrator And Computer

The first electronic general-purpose Digital computer, ENIAC was developed by army ordnance to complete World War II ballistic firing tables. It weighed 30 tons and used 200 kilowatts of electric power.

Second Generation (1956-1963) Transistors

Transistors replace vacuum tubes and ushered in the 2nd generation of computers. The **transistor was invented in 1947 but didn't see widespread use in computers until the late 1950s**. the transistor was far superior to the vacuum tube, allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable than their first-generation predecessors.



Though the transistor still generated a great deal of heat that subjected the computer to damage, it was a fast improvement over the vacuum tube. Second-generation computers still relied on punched cards for input and printouts for output.

2nd generation computers moved from cryptic binary machine language to symbolic, or assembly, languages, which allowed programmers to specify instructions in words. Languages were also being developed at this time, such as early versions of COBOL and FORTRAN. These were also the first computers that stored their instructions in their memory, which moved from a magnetic drum to magnetic core technology.

The first computers of this generation were developed for the atomic energy industry.

Third generation (1964-1971) Integrated Circuits

The development of the integrated circuit was the hallmark of the 3rd generation of computers. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers.

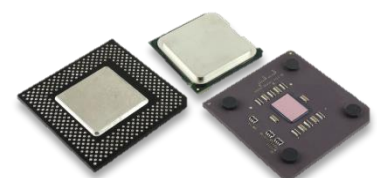


Instead of punched card and printouts, users interacted with 3rd generation computers through keyboard and monitors and interfaced with an operating system, which allowed the device to run many different applications at one time with a central program that monitored the memory. Computers for the first time became accessible to a mass audience because they were smaller and cheaper than their predecessors.

Ada, Basic, C, C++, Java, Pascal, Smalltalk Languages are used in this generation. It called as "High Level Languages".

Fourth generation (1971-Present (2022)) Microprocessors

The microprocessor brought the 4th generation of computers, as thousands of integrated circuits were built onto a single silicon chip. What in the 1st generation filled an entire room could now fit in the palm of the hand. The **intel 4004 chip, developed in 1971**, located all the components of the computer from the central processing unit and memory to input/output controls on a single chip.



Microprocessors now days



Intel 4004

In 1981 IBM introduced its first computer for the home user, and in 1984 Apple introduced the **Macintosh**. Microprocessors also moves out of the realm of desktop computers and into many areas of life as more and more everyday products began to use microprocessors.



As these small computers became more powerful, they could be linked together to form networks, which eventually led to the development of the internet. 4th generation computers also saw the development of GUIs, the mouse and handheld devices.

This generation Computers use “Very High-Level Languages”

Example: Maple, Mathematica, Postscript, SPSS, SQL, MySQL etc...

Fifth generation (researching now)

5th generation computing devices, based on artificial intelligence, are still development, though there are some applications, such as voice recognition, that are being used today. The use of parallel processing and intelligence is a reality. Quantum computing and molecular and nanotechnology will radically change the face of computers in years to come. The goal of 5th generation computing is to develop devices that respond to natural language (Ex-Prolog) input and are capable of learning and self-organization.

2022/09/01

Summary

Generation	Time Duration	Technology
1 st generation	1940 - 1956	Vacuum tubes
2 nd generation	1956 – 1963	Transistors
3 rd generation	1964 – 1971	Integrated Circuits
4 th generation	1972 – Present	Microprocessors
5 th generation	Present - Beyond	Artificial Intelligence

Classification of Computers

Computers can be classified into three major classes based on the mode of data representation used.

1. Analog computers
2. Digital computers
3. Hybrid computers

Analog Computers

- an analog computer is a form of computer that used continuous physical phenomena such as electrical, mechanical, or hydraulic quantities to model the problem being solved.
- If operators by measuring rather than counting.
- It used continuous signals as input.
- Examples: Thermometer, Speedometer etc...



Digital computers

- A computer that performs calculations and logical operations with quantities represented as digits, usually in the binary number system
- These are the systems that are computationally complete and capable of solving all of the problems that can be solved algorithmically.
- Example: , Laptop etc...



Hybrid Computers (Analog + Digital)

- A combination of computers those are capable of inputting and outputting in both digital and analog signals. A hybrid computer system setup offers a cost-effective method of performing complex simulations.
- It uses both types of signals – analog as well as digital – as input.
- Mostly used with process control equipment's in continuous production plants
- Example : oil refineries, Areas of application are nuclear power plants, mines, intensive care units of hospitals (ICUs), chemical process plants etc...



Classification of digital Computers on the basis of size

The digital computers that are available now a days vary in their sizes and types. The computers are broadly classified 4 categories based on their size type.

- Micro computers
- Mini computers
- Mainframe computers
- Super computers

Micro computers

- Microcomputers are small, low-cost and single-user digital computer.
- They consist of CPU, input unit, output unit, storage unit and the software.
- IBM pc based on Pentium microprocessor and Apple Macintosh are examples of microcomputers.
- Microcomputers include desktop computers, notebook computers or laptop, tablet computer, handheld computer, smart phones and netbook.



Desktop Computer or Personal Computer

- It is the most common type of microcomputer.
- It consists of three units – keyboard, monitor, and a system unit containing the CPU, memory, hard disk drives, etc...
- It is not very expensive and is suited to the needs of a single user at home, small business units, and organizations.
- Apple, Microsoft, HP, Dell and Lenovo are some of the PC manufacturers.

Notebook Computers or Laptop

- They are portable and have all the features of a desktop computer.
- The advantage of the laptop is that it is small in size, can be carried anywhere.
- Laptops can be placed on the lap while working.
- Laptops are costlier than the desktop machines.

Netbook/Mini LAP

- These are smaller notebooks optimized for low weight and low cost, and are designed for accessing web-based applications.
- Notebooks deliver the performance needed to enjoy popular activities like streaming videos or music, emailing, web surfing or instant messaging.

Tablet

- Tablet computer has features of the notebook computer but it can accept input from a stylus or a pen instead of the keyboard or mouse.
- It is a portable computer.
- Tablet computers are the new kind of PCs.

Handheld Computer or Personal Digital Assistant (PDA)

- It is a small computer that can be held on the top of the palm.
- It is small in size.
- PDA uses a pen or a stylus for input, instead of the keyboard.
- They have a limited memory and are less powerful.
- PDAs can be connected to the internet via a wireless connection.
- Example Casio and Apple are some of the manufacturers of PDA.

Smart phones

- These are cellular phones that function both as a phone and as a small PC.
- They may use a stylus or a pen, or may have a small keyboard.

- They can be connected to the internet wirelessly.
- They are used to access the electronic-mail, download music, play games, etc.
- Blackberry, Apple, HTC, Nokia and LG are some of the manufacturers of smart phones.

Wearable computer

- The size of this computer is very small so that it can be worn on the body.
- It has smaller processing power.
- It is used in the field of medicine.
 - For example:
 - To accurately calculate heart rate.
 - Insulin meter to find the levels of insulin in the blood.

2022/09/02

Mini computers

- Minicomputers are digital computers, generally used in multi-user systems.
- Minicomputers are mainly used as small or midrange servers operating business and scientific applications.
- They have high processing speed and high storage capacity than the microcomputers.
- Minicomputers can support 4-200 users simultaneously.
- The users can access the minicomputer through their PCs or terminal.
- Example:
 - Digital Alpha
 - Sun Ultra
 - Control Data's CDC 160A
 - Control Data's CDC 1700A
 - DEC PDP
 - DEC VAX series
 - HP 3000 series
 - HP 2100series
 - HP 1000 series

Mainframe computers

- Mainframe computers are multiuser, multiprogramming and high-performance computers.
- They operate at a very high speed, have very large storage capacity and can handle the workload of many users.
- Mainframe computers are large and powerful systems generally used in centralized databases.
- Computers with large storage capacities and very high speed of processing (compared to mini – or microcomputers) are known as mainframe computers.
- They support a large number of terminals for simultaneous use by a number of users like ATM transactions.
- They are also used as central host computers in distributed data processing system.

- Mainframe computers are used in organizations like banks or companies, where many people require frequent access to the same data.
- Example:
 - IBM zSeries
 - IBM System z9
 - IBM System z10 servers



Super computers

- Supercomputers are the fastest and the most expensive machines.
- They have high processing speed compared to other computers.
- The speed of a supercomputer is generally measured in **FLOPS** (Floating Point Operations Per Second)
- Some of the faster supercomputers can perform trillions of calculations per second.
- Supercomputers are used for highly calculation-intensive tasks, such as, weather forecasting, climate research (global warming), molecular research, biological research, nuclear research and aircraft design. They are also used in major universities, military agencies and scientific research laboratories.
- Example:
 - IBM Roadrunner
 - IBM Blue gene
 - Intel ASCI red
 - Cary JAGUAR



- Param is a series of supercomputer assembled in India by C-DAC (Center for Development of Advanced Computing), in Pune.
- Param padma is the latest machine in this series. The peak computing power of PARAM padma is **1 Tera FLOP (TFLOP)**



Basic personal computer system

- A computer system consists of hardware and software components.
- Hardware is the physical equipment such as the case, storage devices, keyboards, monitors, cables, speakers, and printers.
- Software is the operating system and programs.
- The operating system instructs the computer how to operate.
- Programs or applications perform different functions.

External components

Computer case

- Provides protection and support for internal components.
- Should be durable, easy to service, and have enough room for expansion.
- The size and layout of a case is called a **form factor**.
- Select a case that matches the physical dimensions of the power supply and motherboard.



Power supply

- Converts AC power from the wall socket into DC.
- Must provide enough power for the installed components and future additions.



2022/09/05

Internal components

Identify the names, purposes, and characteristics of:

- Motherboards
- CPUs
- Cooling systems
- ROM and RAM
- Adapter cards
- Storage drives
- Internal cables

Motherboards

- The motherboard is the main printed circuit board.
- Contains the buses, or electrical pathways found in a computer.
- Buses allow data to travel among the various components.
- Accommodates CPU, RAM, expansion slots, heat sink/fan assembly, BIOS chip, chip set, sockets, internal and external connectors, various ports, and the embedded wires that interconnect the motherboard components.



Motherboard form factors

- The form factor of motherboards pertains to the size and shape of the board.
- It also describes the physical layout of the different components and devices on the motherboard.
- Various form factors exist for motherboards.

Form factors

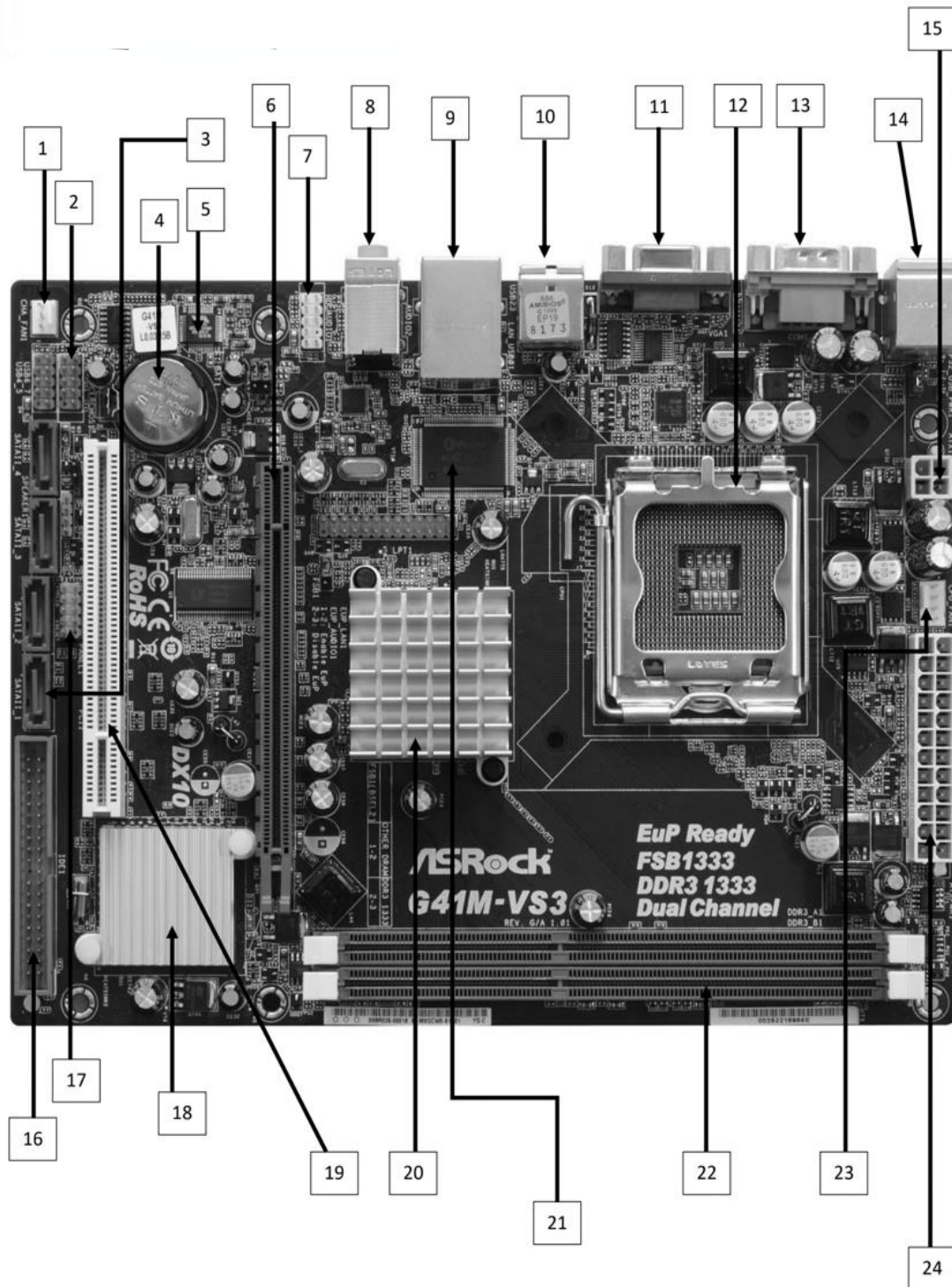
AT	Advanced Technology
ATX	Advanced Technology Extended
Mini-ATX	Smaller Footprint of Advanced Technology Extended
Micro-ATX	Smaller Footprint of Advanced Technology Extended
LPX	Low-Profile Extended
NLX	New Low-Profile Extended
BTX	Balanced Technology Extended
Mini-ITX	Smaller than the Micro-ATC format
Nano-ITX	Smaller footprint of the Mini-ITX
Pico-ITX	Half the size of the Nano-ITX
Mobile-ITX	Smallest ITX motherboard

Component of mother board

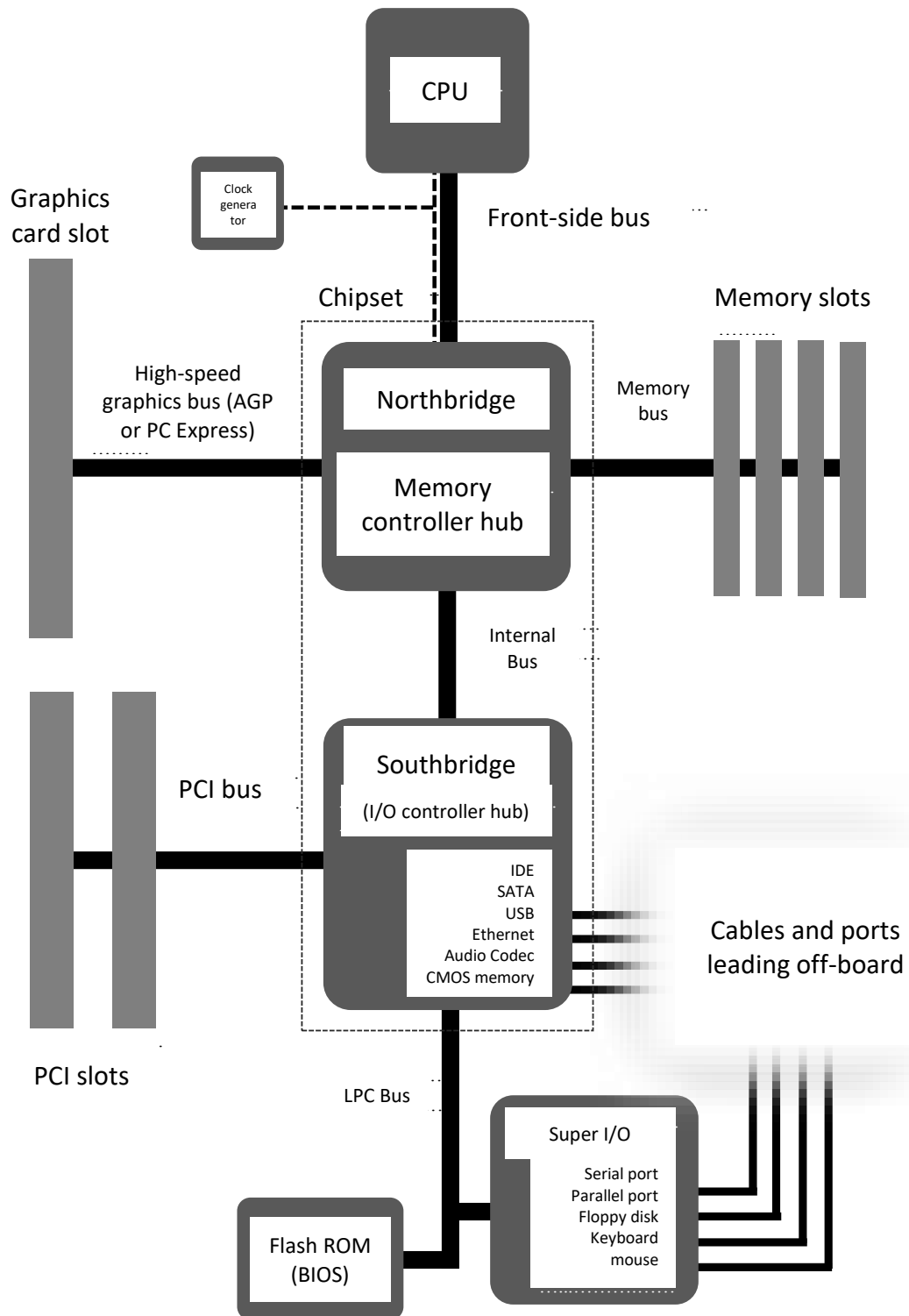
Component	Usage
1. Chasse fan connector	CPU එකේ chasse එකේ fan එක control කරන්න.
2. Front USB connector	casing එකේ කියන front USB වල wire connect වෙන්නේ මෙතනට.
3. SATA port	SATA වලින් data transfer කරන hard disk or DVD rom වල data cable එක connect වෙන්නේ මෙතනට.

4. CMOS battery	power off උන වෙලාවට bios program එක වැඩ කරන්නේ මේ battery එකේ
5. Super I/O chip	Motherboard එකේ back panel වල නියත codeවල input/output control කරන්නේ මේකෙන්.
6. PCI express slot	PCI express VGA card එක connect කරනවා.
7. Front audio connector	Computer casing එකේ front එකේ නියත headphone jack & mic එකේ wire connect වෙන්නේ මෙතනට.
8. Back panel audio port/connector	Speaker or mic එකක් connect කරන්න පුලුවන්. ඒ වගේම audio input එකක් ගන්නත් පුලුවන්. (3ම එකපාර නෙවේ)
9. RJ45 (Ethernet) / 2 USB connectors	RJ 45 - Computer network එකකට සම්බන්ධ වෙන්න පුලුවන්. USB - ඕනම USB device එකක් connect කරන්න. (USB version 3.0 එන්නේ ගොඩක් වෙලාවට)
10. 2 USB connector	ඕනම USB device එකක් connect කරන්න. (අලුත් motherboard වල USB version 3.0 එන්නේ)
11. VGA connector	Video signal out කරගන්න තමා මේක පාවිච්චි වෙන්නේ. (DVI, HDMI වගේ ඒව අලුත් ඒවගේ එනවා. VGA අලුත් ඒවගෙ එන්නෑ)
12. CPU socket	Processor එක motherboard එකට connect වෙන්නේ මේ socket එක හරහා.
13. Serial port/ port connector	Serial communication වලට මේක පාවිච්චි කරනවා.
14. PS/2 connector	PS/2 mouse and keyboards connect කරන්නෙ මෙතනට.
15. 4pin power connector	Processor එක වැඩ කරනකොට අවශ්‍ය වෙන extra power එක අරගන්න පාවිච්චි වෙන්නේ මේක. (Pentium 4 වලට වඩා උඩ motherboard වල තමා මේක තියෙන්නේ)
16. IDE connector	IDE technology එකෙන් data transfer කරන්න පාවිච්චි කරන port එක,
17. Front panel connector	Power button, Reset button. Hard LED, Reset switch කියන ඒවගෙ wires connect වෙන්නෙ මෙතනට.
18. South bridge	Motherboard එකේ සියලුම input & output control කරන්නෙ මේකෙන්.
19. PCI slot	සියලුම adaptor card (TV card, Sound card, Wireless network card, USB expansion card) connect කරන්නෙ මෙතනට.
20. North bridge	Motherboard එකේ සියලුම memory control වැඩ කිරීම.

21. BIOS chip	BIOS program එක තියෙන්නේ මේකේ.
22. Memory slot	RAM card connect කරන්න.
23. CPU fan connector	CPU cooling fan එක connect කරන්නෙ මෙතනට.
24. 24pin power connector	Motherboard එකට සියලුම main power supply කරන්නේ මේක හරහා.



The main circuit board has major components (CHIP SET)



Northbridge

- Alternatively referred to as the PAC (PCI/AGP Controller) and memory bus, the northbridge is an integrated circuit responsible for communications between the CPU interface, AGP, and the memory
- Unlike the southbridge the northbridge is directly connected to these components and act like a “bridge” of the southbridge chip to communicate with the CPU, RAM, and graphics controller.
- Today, the northbridge is a single-chip that is north of the PCI bus, however, early computers may have had up to three separate chip that made up the northbridge.
- Below is a graphic illustration of the ASUS P5AD2-F Motherboard and some basic explanations of each of the major portions of the motherboard, including the northbridge.
- As shown in the picture below, it's common for the northbridge and southbridge to have a heat sink; in addition, the northbridge is usually slightly larger than the southbridge and is the closest to the CPU and memory.
- When the CPU needs data from RAM, a request is sent to the northbridge memory controller.
- After the request has been received, it responds with how long the processor need to wait to read the memory over the front side bus (FSB).
- As manufacturers look for new ways to improve performance and lower the overall cost, they are moving the functions of the northbridge chip to other ports of the CPU and southbridge.
- Beginning with the AMD64 AMD and the intel Nehalem processors the memory controller was moved from the northbridge to the processor die.
- Later, the intel “Sandy Bridge” and the AMD accelerated processing unit processors placed all northbridge functions into the CPU.
- The southbridge is an IC on the motherboard responsible for the hard drive controller, I/O controller and integrated hardware.
- Integrated hardware can include the sound card and video card if on the motherboard, USB, PCI, ISA, IDE, BIOS, and Ethernet.
- Although the southbridge handles most of the I/O devices, less prominent input/output devices, such as a serial port, keyboard, and non-USB mouse are handled by the super input/output (SxO).



Super IO (SIO)

- Short for super input/output on super I/O, SIO is an integrated circuit on a computer motherboard that handled the slower and less prominent input/output devices shown below.
- When the super input/output was first introduced in the late 1980's it was found on an expansion card, later this chip was embedded into the motherboard and communicated over the ISA bus.
- As ISA began to no longer be used with computers SIO communicated over the PCI bus.
- Today, super I/O communicates through the Southbridge and is still used with computers to support older legacy devices.

Computer devices handled by the Super I/O

- Floppy disk controller
- Game port
- Infrared
- Intrusion detection
- Keyboard and mouse (PS 2)
- Parallel port
- Real-time clock (RTC)
- Serial port (UART)
- Temperature sensor and fan speed

Identifying the Super I/O on your motherboard is often easy if you look for an integrated circuit that is labeled with a company's name that manufactures Super I/O chips.

Some common Super I/O manufacturers are : *Fintek, ITE, National Semiconductor, Nuvoton, SMC, VIA, and Winbond*

Note:

Some newer chipsets are combining the Southbridge and Super I/O chips into a single chip and referring to this chip as the Super Southbridge chip. Some manufactures such as NVIDIA and SiS have even combined the Northbridge, Southbridge, and Super I/O into a single chip.

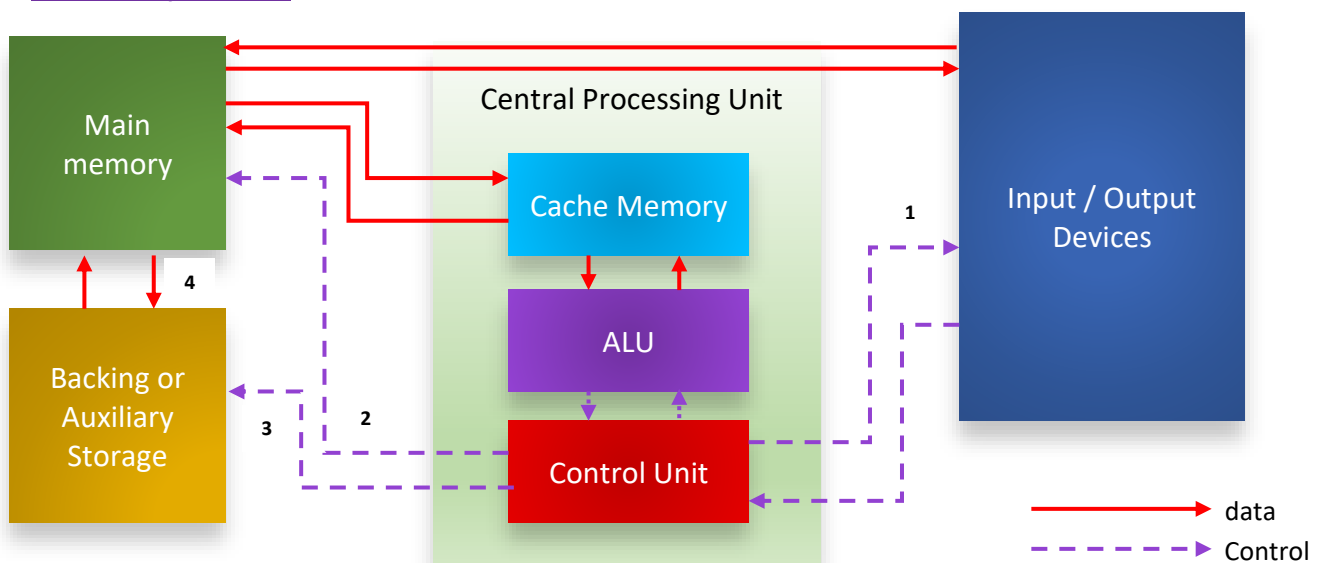
New motherboards are replacing the northbridge and the southbridge with PCH (Platform Controller Hub)

Central Processing Unit (CPU)

- The CPU is known as the brain of the computer.
- It's also referred to as the processor.
- The CPU execute a program, which is a sequence of stored instructions.
- Two major CPU architectures related to instruction sets:
 - **Reduced instruction set computer (RISC)**
 - **Complex instruction set computer (CISC)**
- Some CPUs incorporate **hyperthreading** or **hypertransport** to enhance the performance of the CPU.
- The amount of data that a CPU can process at one time depends on the size of the processor data bus.
- Speed of the CPU is measured in cycles per second- megahertz (**MHz**) or gigahertz (**GHz**).
- **Overclocking** is a technique used to make a processor work at a faster speed than its original specification.
- The latest processor technology has resulted in CPU manufactures finding ways to incorporate more than one UPU core onto a single chip.
 - **Single core CPU** – one core inside a single CPU chip that handles all of the processing capability. A motherboard manufacturer may provide sockets for more than one single processor, providing the ability to build a powerful, multi-processor computer.
 - **Dual core CPU** – two cores inside a single CPU chip in which both cores can process information at the same time.
 - **Triple core CPU** – three cores inside a single CPU that is actually a quad-core processor with one of the cores disabled.
 - **Quad core CPU** – four cores inside a single CPU in which all cores can process information. Simultaneously for enhanced software applications.
 - **Hexa core CPU** – six cores inside a single CPU.
 - **Octa core CPU** - eight cores inside a single CPU.



Elements of the CPU



The CPU consists of 3 Major Components

1. The arithmetic and Logical Unit (ALU)
2. The Memory Unit
3. The Control Unit

ALU (arithmetic and Logical Unit)

- Caries out mathematical tasks rapidly, performs calculations and logic operations in binary form 1 and 0 on data form the memory unit.
- The ALU transforms the digital data and outputs the resulting value.

Memory unit

- Memory unit consists of a small number of memories registered which will store item of data and send them to the ALU for processing.
- The result of the processing will be copied back to the memory unit for storage.

Control unit

- Is in charge of processing
- It interprets the software instruction and sends the right data and operation to the ALU.
- It accepts the result of the processing from the ALU and sends it back to the memory unit.
- The control unit will keep track of the sequence of instructions and the location of each item of data and software instruction in the memory unit.

Intel processor generations

1. Pentium 1,2,3,4
 2. Celeron
 3. Pentium Pro
 4. Pentium M and Celeron M for mobile devices
 5. Pentium Dual Core
 6. Core Solo
 7. Core Duo
 8. Core 2 Duo
 9. Core 2 Quad
 10. Core I Series (i3, i5, i7, i9)
- The concept of generations mainly comes after the release of core I series.
 - The difference in processor micro-processor micro-architecture is the main difference in processor generations.

Pentium processor Socket Types

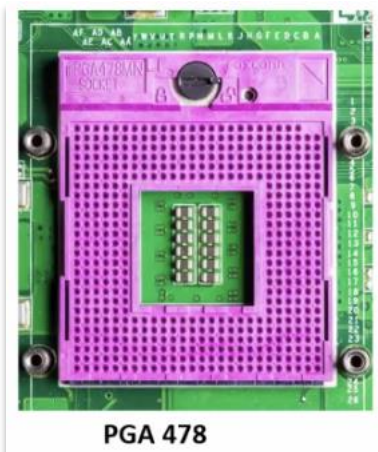
Pentium Slot

Slot One – Pentium 1, Pentium 2



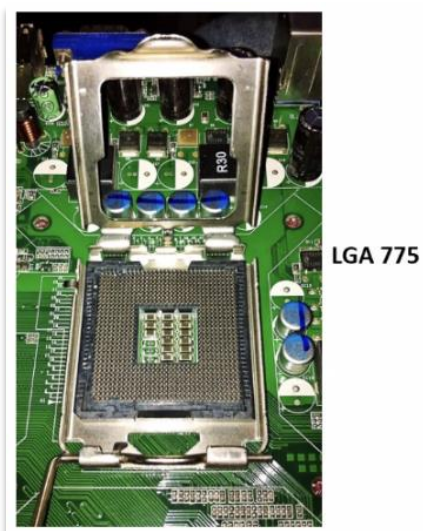
Pentium Pin

PGA 478 – Pentium 2, Pentium 3, Pentium 4, Celeron
(Pin 478 නියතවා ඒකයි PGA 478 කියලා කියන්නේ.)



Pentium Pin less

LGA 775 – Pentium 4, Dual Core, Core 2 Duo, Quad Core
(Pin 775 නියතවා ඒකයි LGA 775 කියලා කියන්නේ.)

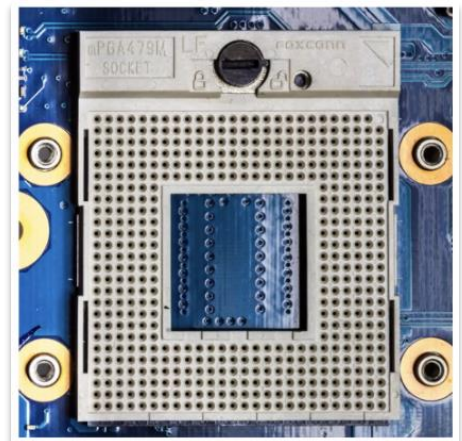


මේකෙදි processor එකේ
නෙවේ pin තියෙන්නේ.
Processor socket එකේ

Core i Series Generations Processor Socket Types

Generation	Processor Chip Size	Processors Core (Max)	Memory Support	Platform Socket	Launch
1 st	32nm	2	DDR3 1066/1333	LGA 1156	2011
2 nd	32nm	4	DDR3 1066/1333	LGA 1155	2011
3 rd	22nm	4	DDR3 1333/1600	LGA 1155	2012
4 th	22nm	4	DDR3 1333/1600, DDR3 1333/1600 @ 1.5V	LGA 1150	2013 - 2014
5 th	14nm	4	DDR3 1333/1600 @ 1.5V	LGA 1150	2015
6 th	14nm	4	DDR3 1333/1600 @ 1.35V DDR4 – 1866/2133	LGA 1151	2015
7 th	14nm	4/10	DDR4	LGA 1151	2016

- Socket and processors use different methods to make the contacts between them. Here is a list of the more important methods.
- A pin grid array (PGA) socket has holes aligned in uniform rows around of the processor.
- Early intel processors used PGA sockets, but they caused problems because the small delicate pins on the processor were easily bent as the processor was installed in the socket.
- Some newer intel mobile processors, including the Second-Generation Core i3, Core i5, and Core i7 processors, use the PGA988 socket or the FCPG988 socket in laptops.
- A land grid array (LGA) socket has blunt protruding pins on the socket that connect with lands or pads on the bottom of the processor.
- The first LGA socket was the LGA775 socket.
- It has 775 pins on the Motherboard.
- LGA sockets generally give better contacts than PGA sockets, and the processor doesn't have the delicate pins so easily damaged during an installation.
- Some sockets can handle processor using a flip-chip land grid- array (FCLGA) processor package or a flip-chip pin grid array (FCPGA) package..



- The chip is flipped over so that the top of the chip is on the bottom and makes contact with the socket.
- the LGA1155 socket has a flip-chip version, which is called the FCLGA1155 socket.
- The two socket are not applicable.
- A staggered pin array (SPGA) socket has pins staggered over the socket to squeeze more pins into a small space.
- A ball grid array (BGA) connection is not really a socket.
- The processor is soldered to the motherboard, and the two are always purchased as a unit.

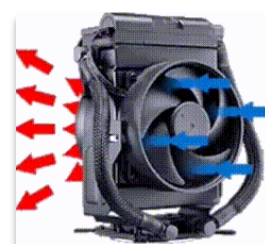
For example:

The little atom processor often uses this technology with a Mini-ITX motherboard in low-end computer or Home theater system

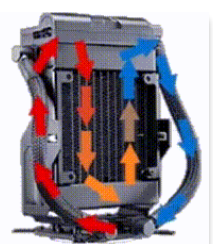
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Cooling systems

- Electronic components generate heat. Too much heat can damage components.
- A **case fan** makes the cooling process more efficient.
- A **heat sink** draws heat away from the core of the CPU. A fan on top of the heat sink moves the heat away from the CPU.
- Fans can be dedicated to cool the **Graphics-processing unit (GPU)**.



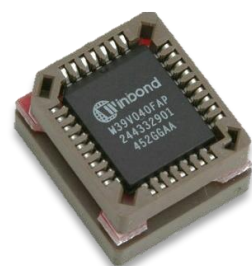
Air cooling



Liquid cooling

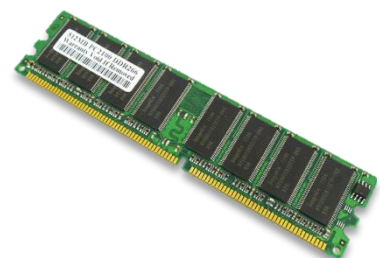
ROM - Read only memory

- Basic instructions for booting the computer and loading the operating system are stored in ROM.
- ROM chips retain their contents even when the computer is powered down.



RAM – Random Access Memory

- RAM is temporary storage for data and programs that are being accessed by CPU.
- RAM is volatile memory, which means that the contents are erased when the computer is powered off.
- More RAM means more capacity to hold and process large programs and files, as well as enhance system performance.



Memory modules

- Memory modules are memory chips that have been soldered on to a special circuit board for easy installation and removal.
- Dual inline package (**DIP**) is an individual memory chip.
- Single inline memory module (**SIMM**) is a small circuit board that holds several memory chips.
- Dual inline memory module (**DIMM**) is a circuit board that holds SDRAM, DDR SDRAM, and DDR2 SDRAM chips.
- RAM Bus inline memory module (**RIMM**) is a circuit board that holds RDRAM chips.
- Small Outline DIMM (**SODIMM**) is a smaller, more condensed version of DIMM which provides random access data storage that is ideal for use in laptops, printers, and other devices where conserving space is desirable.
- The speed of memory has a direct impact on how much data a processor can process because faster memory improves the performance of the processor. As processor speed increases, memory speed must also increase.



DIP Memory Modules



SIMM Memory Modules



DIMM Memory Modules



RIMM Memory Modules



SODIMM Memory Modules

DIMM – Dual Inline Memory Module



SD RAM – Synchronous Dynamic Random Access Memory



DDR RAM – Double Data Rate



DDR2 RAM



DDR3 RAM

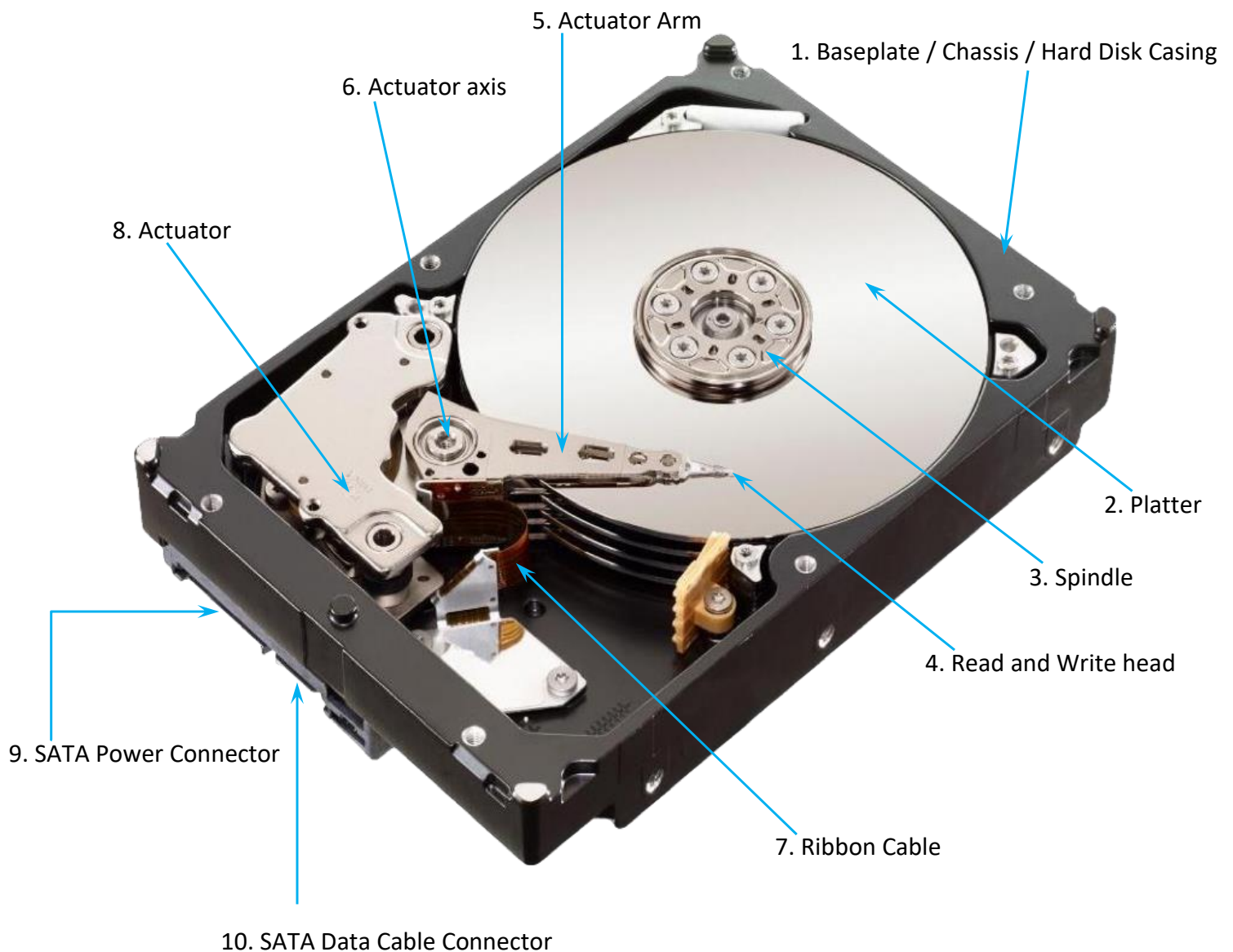


DDR4 RAM



DDR5 RAM

Parts of Hard disk



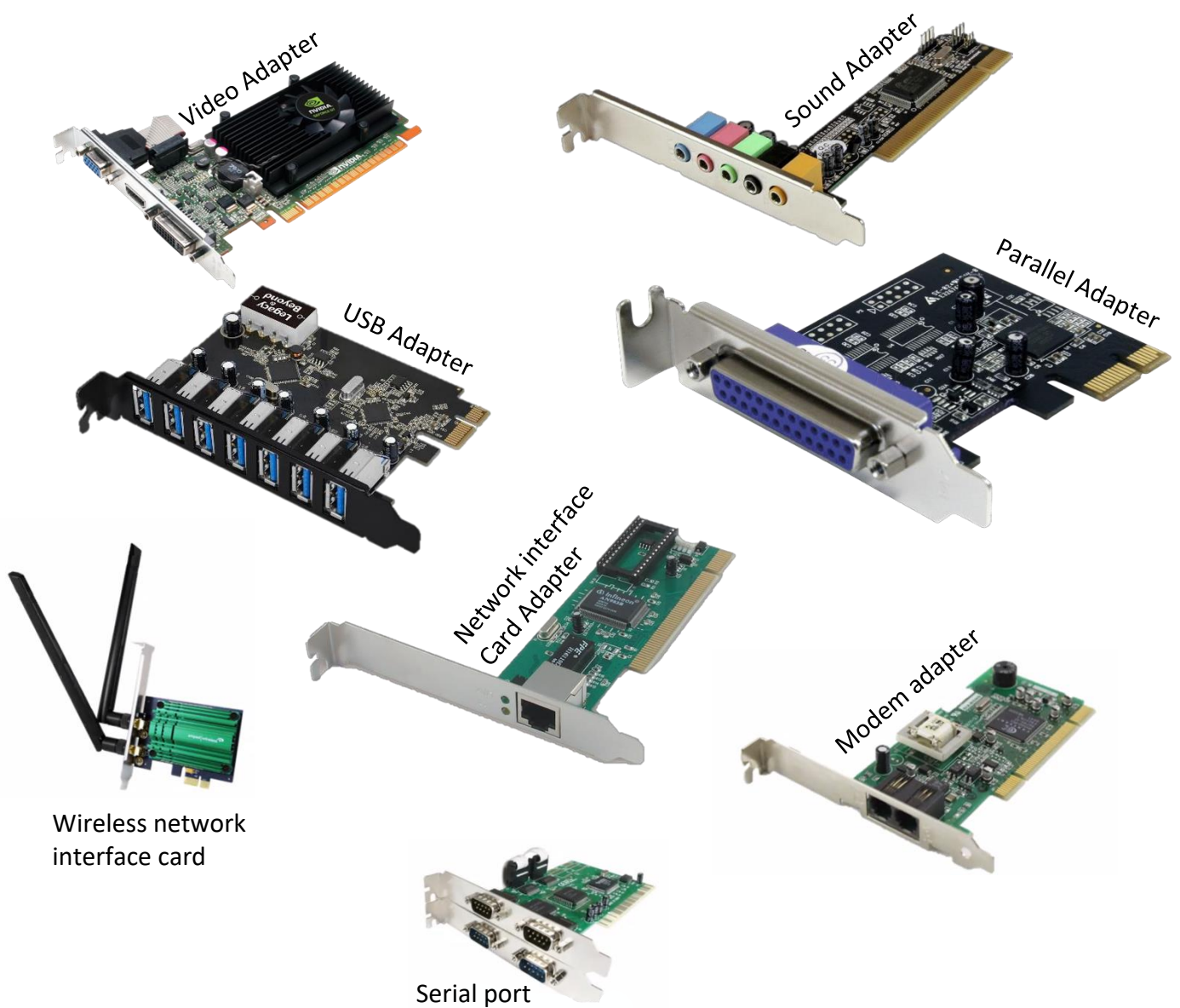
1. Hard disk එකේ ආරක්ෂාවට තියෙන්නේ.
2. Data save කරන්නේ platter එකේ. 7200 rotation per minute (RPM).
3. මේකෙන් තමයි platter එක කරකවන්නේ.
4. Data read කරන්න සහ write කරන්නේ මේකෙන්.
5. Read/Write Head move කරන්නේ මේකෙන්.
6. Actuator Arm එක stable ව තියාගන්නේ මේකෙන්.
7. Read/Write Head එකෙන් ගන්න data circuit board එකට අරන් යන්නේ මේ ribbon එකෙන්.
8. Actuator Arm එකේ movement එක කරන්නේ මේකෙන්.
9. Hard disk එකක් වැඩ කරන්න අවශ්‍ය power එක supply කරන්නේ connector එකෙන්.
10. Hard disk එකේ තියෙන data අරන් යන්නේ මේ cable එක හරහා.

Adaptor cards

Adaptor cards increase the functionality of a computer by adding controllers for specific devices or by replacing malfunctioning ports.

Example of adaptor cards

Sound adapter, Video adapter, USB adapter, Network interface card (NIC), Wireless NIC, Modem Adapter, Serial Port, Parallel Adapter

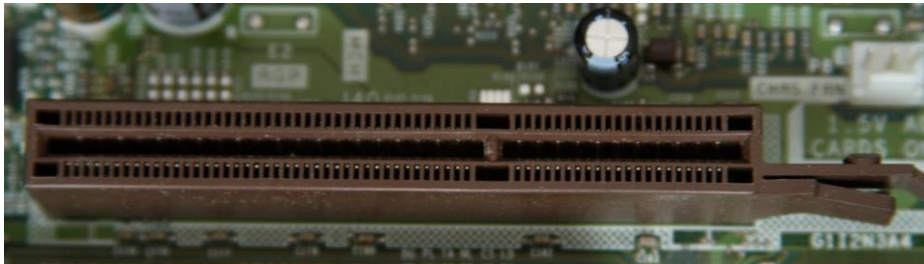


Types of expansion slots:

- Peripheral Component Interconnect (PCI)
- Accelerated Graphics Port(AGP)
- PCI-Express
- Mini PCI (laptops)




Peripheral Component Interconnect (PCI)



Accelerated Graphics Port (AGP)



PCI-Express



Mini PCI (Laptops)

Storage devices

- Storage devices read or write information to magnetic storage media.
- They may be fixed or removable.
- The **hard disk drive (HDD)** is a magnetic storage device.
- The storage capacity is measured in gigabytes (GB) or terabytes (TB)
- Magnetic hard drives have motors designed to spin magnetic platters and move the drive heads.
- **Solid state drives (SSDs)** do not have moving parts, which results in faster access to data, higher reliability, reduced power usage.



HHD



SSD

- A **Floppy Disk Drive (FDD)** is a storage device that uses removable 3.5-inch floppy disks that can store up to 1.44 MB of data.



Floppy Disk Drive (FDD)



Floppy Disk

Optical drives, flash drivers and driver interfaces

- An **optical drive** is a storage device that uses lasers to read data on the optical media. The three types are CD, DVD, and BD (Blue-ray).
- A **flash drive** is a removeable storage device that connects to a USB port. A flash drive uses a type of memory that requires no power to maintain the data.



Common drive interfaces are:

- Integrated drive electronics (IDE)
- Enhanced integrated drive electronics (EIDE)
- Parallel ATA (PATA)
- Serial ATA – **serial advanced technology attachment** (SATA) and external SATA (eSATA)
- Small computer system interface (SCSI)
- Power supply connectors – SATA, Molex, and Berg

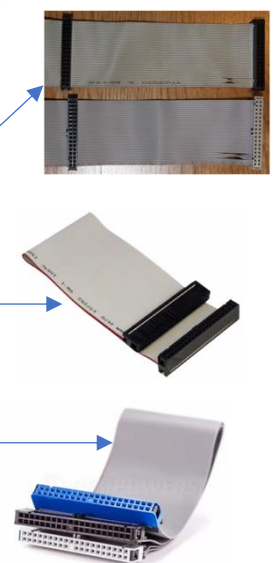


- Front panel cables connect the case buttons and light to the motherboard



Data cable connect drives to the drives controller

- Floppy disk drive (FDD) data cable (**pin count 34**)
- PATA (IDE) data cable (**pin count 40**)
- PATA (EIDE) data cable (**pin count 80**)
- SATA data cable
- SCSI data cable



Video ports and cables

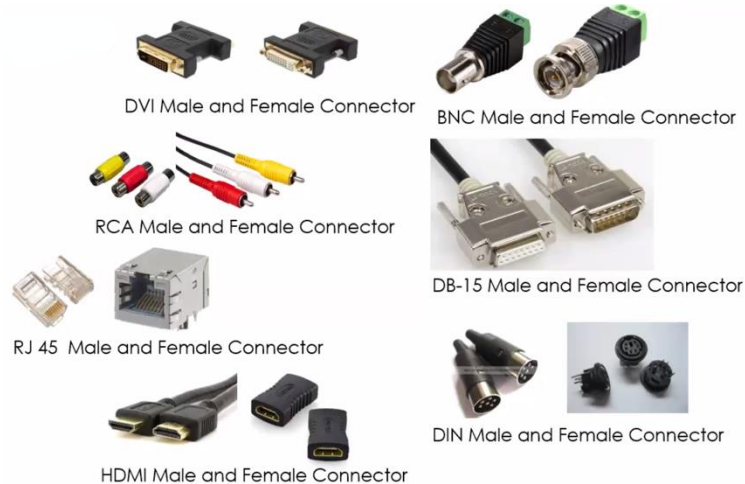
මේක පාවිච්චි කරන්නේ computer එකේ ඉඳන් වෙන display එකකට video signal එකක් යවන්න.

- A video port connects a monitor cable to a computer.
- Display cables transfer video signals from the computer to display devices.



Connector types:

- DVI
- RCA
- DB-15
- BNC
- RJ-45
- HDML
- Din-6



Display cable types:

- High-definition Multimedia Interface (HDMI)
- Digital Visual Interface (DVI)
- Video Graphic Array (VGA)
- Component / RGB
- S-Video
- Coaxial

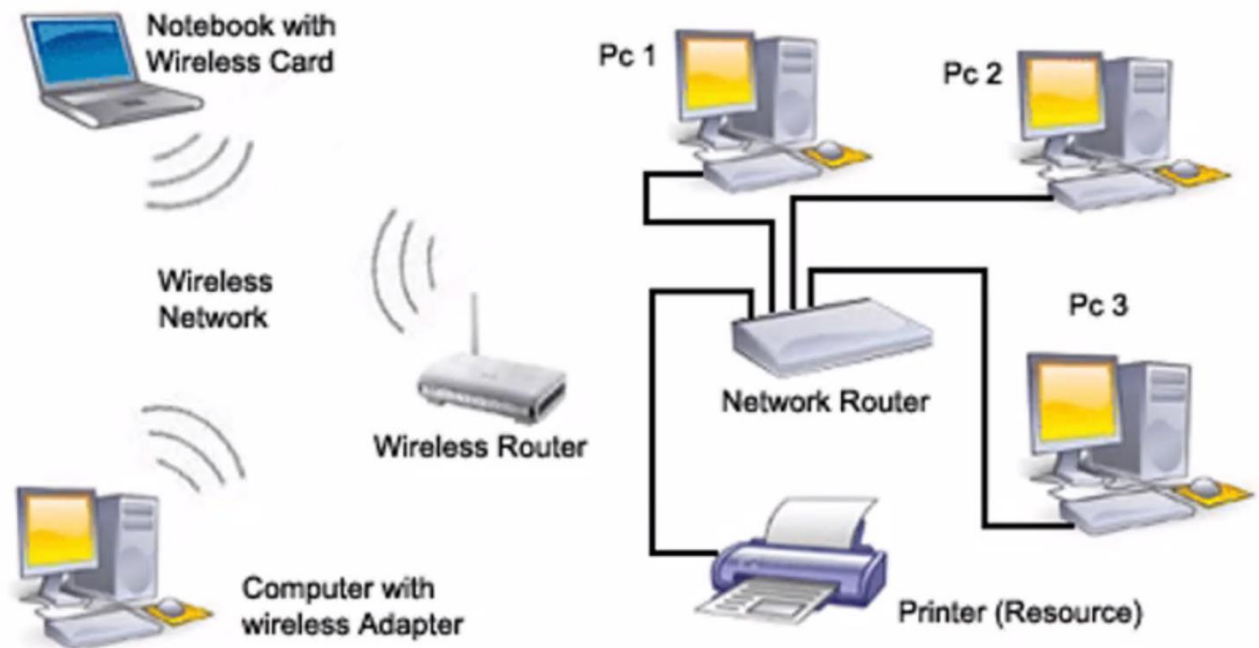


Unit 3

Computer Network Fundamentals

Network introduction & advantages

A simple network structure



- A network is two or more nodes or hosts connected by a cable or by a wireless connection so that they can communicate and exchange information or data.
- In other words, “Network Means a collection of interconnected computer network of stand-alone computer. Communicating on the computer for the exchange of information. The connection can be over copper, fiber optic, microwave and satellite communications”.

Computer network

Computer network devices and components

- **Host devices** – any devices that sends and receives information on the network (computer, printer, etc).
- **Intermediary devices** – exist in between host devices.
- **Media** – component over which the message travels from source to destination.

The importance of computer networks

- Cost reduction by sharing hard- and software resources.
- High reliability by having multiple sources of supply.
- Cost reduction by downsizing to microcomputer-based networks instead of using mainframes.
- Greater flexibility because of possibility to contact devices from various vendors.
- Sharing internet, Communication and Video Games.
- VoIP (voice over internet protocol) and POE.

Main Advantages and Disadvantages of Computer Networking

Computer networking has become one of the most successful ways of sharing information, where all computers are wirelessly linked together by a common network, Now, business and organizations heavily rely on it to get messages and information across to essential channels. Not only has that it benefited establishments, but also individuals, as they also need to share important information every day.

But no matter how useful computer networking is, it does not come without drawbacks. Here are its advantages and disadvantages.

List of Advantages of Computer Networking

- It enhances communication and availability of information
Networking, especially with full access to the web, allows ways of communication that would simply be impossible before it was developed. Instant messaging can now allow users to talk in real time and send files to other people wherever they are in the world, which is a huge boon for businesses. Also, it allows access to the fast amount of useful information, including traditional reference materials and timely facts, such as news and current events.
- It allows for more convenient resource sharing
This benefit is very important, particularly for larger companies that really need to produce huge numbers of resources to be shared to all the people. Since the technology involves computer-based work. It is assured that the resources they wanted to get across would be completely shared by connecting to a computer network which their audience is also using
- It makes file sharing easier
Computer networking allows easier accessibility for people to share their files, which greatly helps, them with saving more time and effort, since they could do file sharing more accordingly and effectively.

- It's highly flexible
This technology is known to be very flexible, as it gives users the opportunity to explore everything about essential things, such as software without affecting their functionality. Plus, people will have the accessibility to all information they need to get and share.
- It is an inexpensive system
Installing networking software on your device would not cost too much, as you are assured that it lasts and can effectively share information to your peers. Also, there is no need to change the software regularly, as mostly it is not required to do so.
- It increases cost efficiency
With computer networking, you can use a lot of software products available on the market which can just be stored or installed in your system or server, and can then be used by various workstations.
- It boosts storage capacity
Since you are going to share information, files and resources to other people, you have to ensure all data and content are properly stored in the system. With this networking technology, you can do all of this without any hassle, while having all the space you need for storage

List of Disadvantages of Computer Networking

- It lacks independence
Computer networking involves a process that is operated using computers, so people will be relying more of computer work, instead of exerting an effort for their tasks at hand. Aside from server, which means that, if it breaks down, the system would become useless, making users idle.
- It poses security difficulties
Because there would be a huge number of people who would be using a computer network to get and share some of their files and resources, a certain user's security would be always at risk. There might even be illegal activities that would occur, which you need to be careful about and aware of.
- It lacks robustness
As previously stated, if a computer network's main server breaks down, the entire system would become useless. Also, if it has a bridging device or a central linking server that fails, the entire network would also come to a standstill. To deal with these problems, huge networks should have a powerful computer to save as file server to make setting up and maintaining the network easier.

- It allows for more presence of computer viruses and malware
There would be instances that stored files are corrupt due to computer viruses. Thus, network administrators should conduct regular check-ups on the system, and the stored files at the same time.
- Its Light Policing Usage Promotes Negative Acts
It has been observed that providing users with internet connectivity has fostered undesirable behavior among them. Considering that the web is a minefield of distractions – online games, humor sites could be tempted during their work hours. The huge network of machines could also encourage them to engage in illicit practices, such as instant messaging and file sharing, instead of working on work-related matters.
While many organizations draw up certain policies on this, they have proven difficult to enforce and even engendered resentment from employees.
- It requires an efficient handler
For a computer network to work efficiently and optimally, it requires high technical skills and know-how of its operations and administration. A person just having basic skills cannot do this job. Take note that the responsibility to handle such a system is high, as allotting permissions and passwords can be daunting. Similarly, network configuration and connection are very tedious and cannot be done by an average technician who does not have advanced knowledge.
- It requires an expensive set-up
Though computer networks are said to be an inexpensive system when it is already running, its initial set up cost can still be high depending on the number of computers to be connected. Expensive devices, such as routers, switches, hubs, etc... can add up to the cost. Aside from these, it would also need network interface cards (NICs) for workstations in case they are not built in.

Conclusion

Computer networking will always be a fast and convenient means of transferring and sharing information, but people should be aware of its consequences as well. They should remember that often relying on this system can put them at certain risks that can be caused by its flaws and other malfunctions.

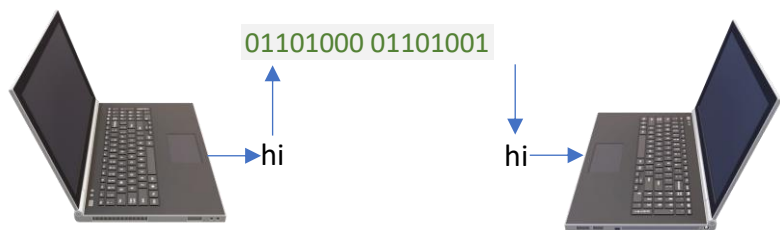
DATA COMMUNICATION AND TRANSMISSION

Data transmission – introduction

Data representation

The purpose of a network is to transmit information from one computer to another. To do this, you first have to decide how to encode the data to be sent, in other words its computer representation. This will differ according to the type of data, which could be:

- Audio data
- Text data
- Graphical data
- Video data



Data representation can be divided into two categories:

- **Digital representation:** which means that the information is encoded as a set of binary values, in other words a sequence of 0s and 1s.
- **Analogue representation:** which means that the data will be represented by the variation in a continuous physical quantity

Data transmission medium

- in order for data transmission to occur, there must be a transmission line, also called transmission channel or channel, between the two machines.
- These transmission channels are made up of several segments that allow the data to circulate in the form of electromagnetic, electrical, light or even acoustic waves. So, in fact, it is a vibratory phenomenon that is propagated over the physical medium.

Encoding of transmission signals

- In order for data to be exchanged, an encoding must be chosen for transmission signals. This depends basically on the physical medium used to transfer the data, the guaranteed data integrity and transmission speed.

Simultaneous data transmission

- Data transmission is called “simple” if there are only two machines communicating, or if only a single piece of data is sent. Otherwise, it is necessary to install several transmission lines or to share the line among several different communication actors. This Sharing is called **multiplexing**.

Communication protocols

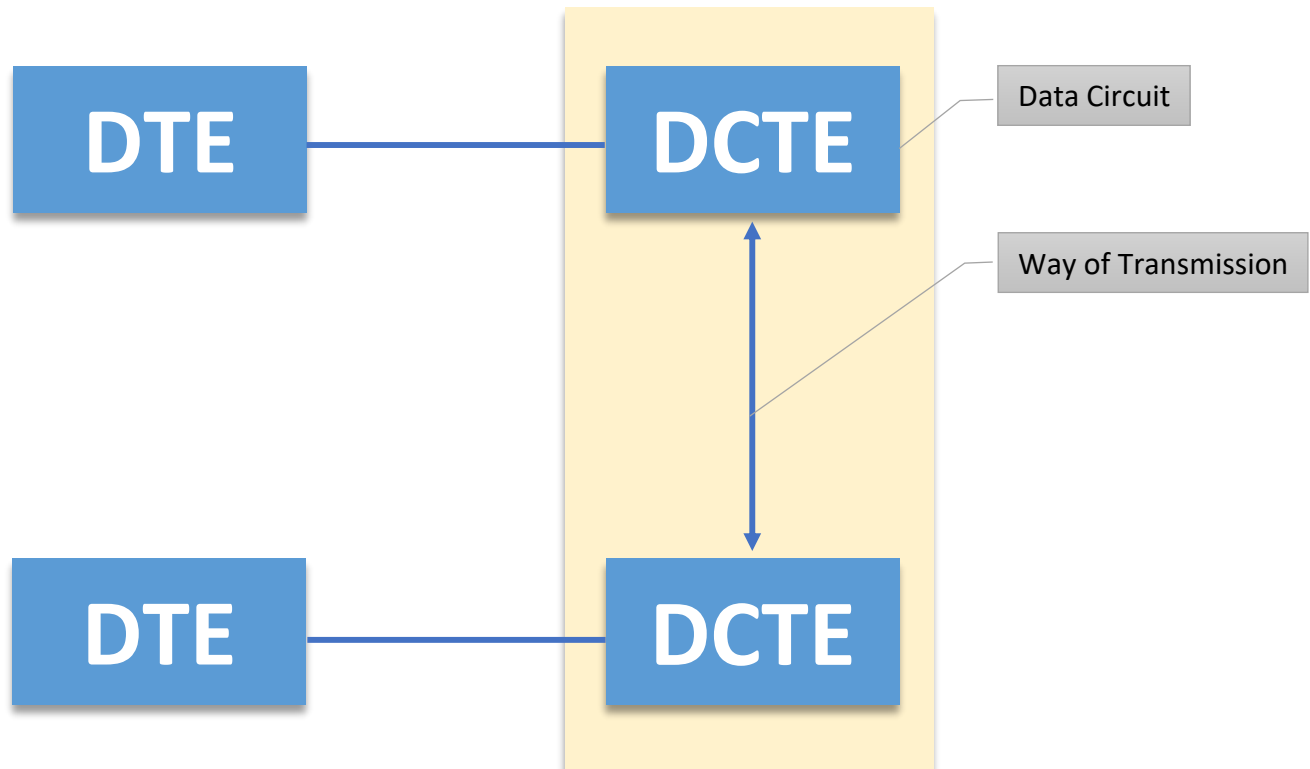
A protocol is a common language used by all actors in the communication to exchange data. However, its role does not stop there. A protocol also allows:

- Initiation of communications
- Data exchange
- Error detection
- A “courteous” end of communications

What is a Transmission Channel?

A transmission line is a connection between two machines. The term **transmitter** generally refers to the machine that sends the data while **receiver** refers to the one receiving the data. The machines can sometimes be both receivers and transmitters (this is generally the case with computers connected to a network)

A transmission line, also sometimes called a transmission channel, does not necessarily consist of a single physical medium, which is why the end machines (as opposed to the intermediary machines), called **DTE**, (Data Terminal Equipment) each have equipment for the physical medium to which they are connected called **DTCE** (Data Circuit Terminating Equipment) or **DCE** (Data Communication Equipment). The term **data circuit** refers to the assembly consisting of the **DTCE** of each machine and the data line.



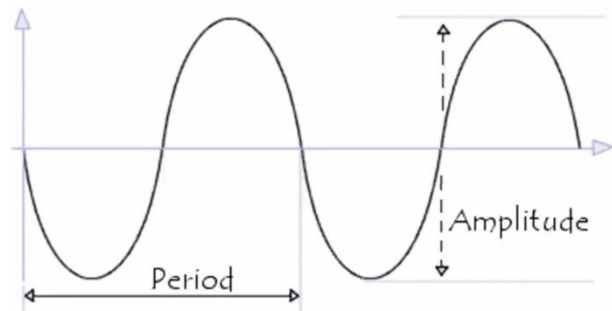
DTE – Data Terminal Equipment (*e.g.: mobile phone*)

DTCE – Data Circuit Terminal Equipment (*e.g.: transmission towers*)

The basics of electromagnetic waves

Data is transmitted on a physical medium by propagation of a vibratory phenomenon. An undulating signal results from this depending on the physical quantity that is being varied:

- In the case of light, it is a light wave.
- In the case of sound, it is a sound wave
- In the case of voltage or amperage of an electric current, it is an electrical wave.
- Electromagnetic waves are characterized by their frequency, their amplitude and their phase.



Types of physical media

The physical transmission media are the elements that allow information to flow between transmission devices. These media are generally divided into three categories, according to the type of physical quantity that they allow to circulate, and therefore according to their physical composition:

- **Wire media** allow an electrical quantity to circulate on a cable that is generally metallic.
- **Aerial media** refers to the air or a vacuum which allow the circulation of electromagnetic waves and various types of radio-electric waves.
- **Optical media** allow information to be sent in the form of light of light

The speed of the physical quantity will vary depending on the physical medium (for example, sound propagates through the air at a speed of on the order of 300 m/s whereas the speed of light is close to 300,00 km/s).

Upload and Download

Download refers to data transfer from the server to your computer and upload refers to data transfer from your computer to the server. It is of interest to know that upload and download occur on separate transmission channels (whether this be on a modem or on a special-purpose line). So, when you are sending (uploading) a document you are not losing any download bandwidth.