

INTRODUCTION TO COMPUTER

By

Parth Lakhani

INTRODUCTION

➤ What is Computer?

“Common Operating Machine
Purposely Used for
Technological and Educational Research”

- A computer is a machine that can be instructed to carry out sequences of arithmetic or logical operations automatically via computer programming.
- A computer is electronic Device (Programmable Device) that is used for processing of information and is capable of calculating and storing information

COMPONENT OF COMPUTER



Hardware Component

Hardware component includes the physical parts of a computer.

- Case, central processing unit (CPU),
- Input and output devices like monitor, mouse, keyboard,
- Computer data storage device(ROM),
- Graphics card,
- Sound card,
- Motherboard.

Software Component

Software components of a computer system have no physical presence, they are stored in digital form within computer memory.

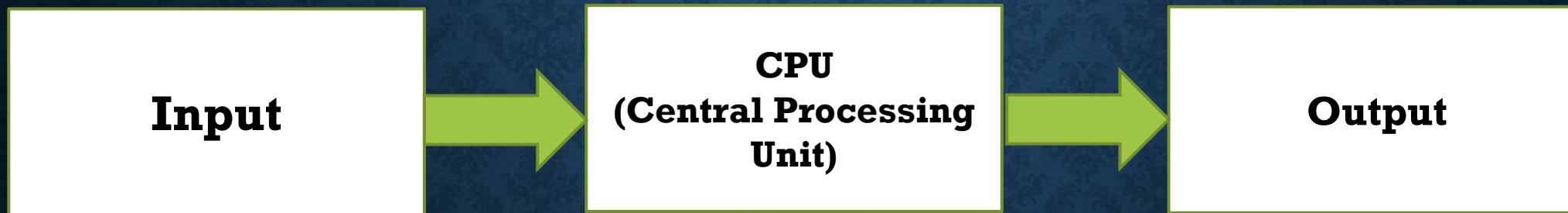
- System software
- Utilities
- Applications software.

Power supply Component

Power supply Component converts mains AC to low-voltage regulated DC power for the internal components of a computer.

- Power supply Component also known as PSU (Power Supply Unit)

HOW COMPUTER WORKS



HARDWARE COMPONENT OF COMPUTER

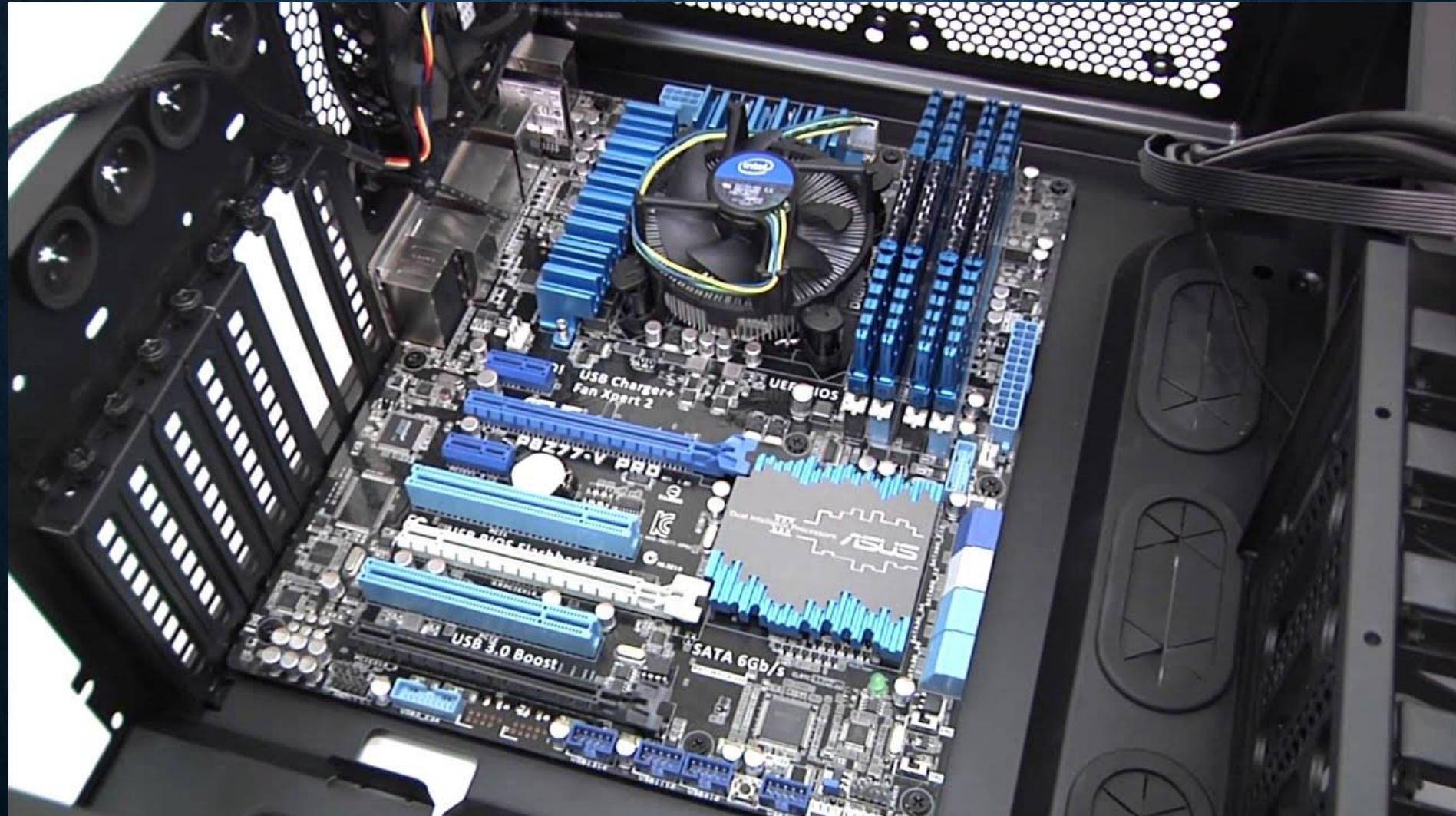
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HARDWARE COMPONENT OF COMPUTER

1. **Motherboard**: In motherboard, which connect all hardware components like CPU, RAM, Processor, External Hardware component like Mouse, Key board, Serial port, USB port, Parallel port, LAN cable port, Audio Port, CMOS Battery, Floppy port, PCI slot, AGP slot, Heat Sink, RAM slot, Power Connector
2. **Processor**: It's also known as CPU (Central Processing Unit), It's type of chip which receive input and after processing input it provide appropriate output.
3. **Memory**: It stores memory temporarily (RAM) or permanently (ROM).
4. **Storage device**: Same function as Memory component but it can be internal or external to computer, server or any computing device.
5. **Networking components**: It provide a link to connect network with multiple computing device. Network Hardware components are server, client, peer, transmission medium, and connecting devices

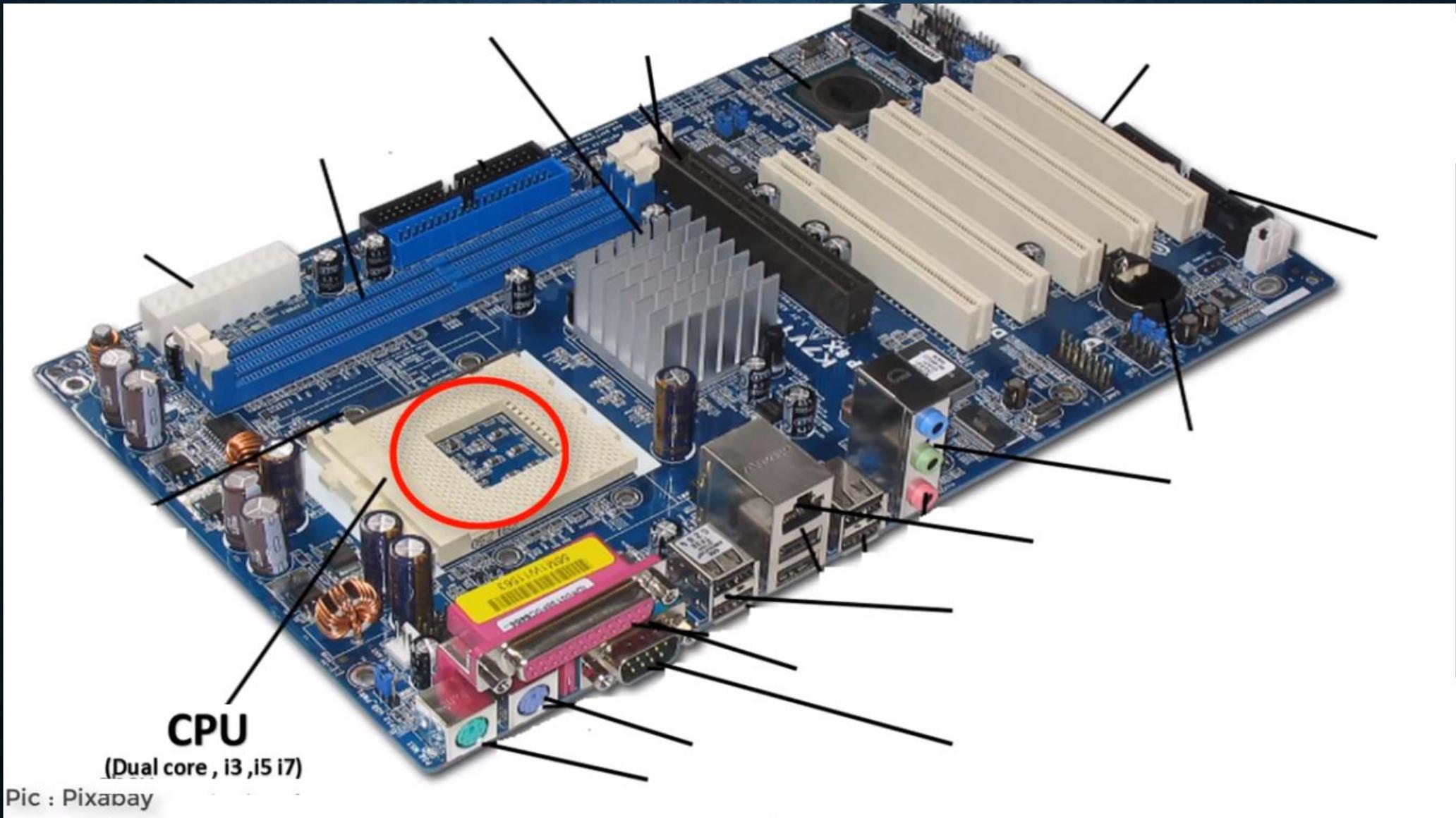
MOTHERBOARD



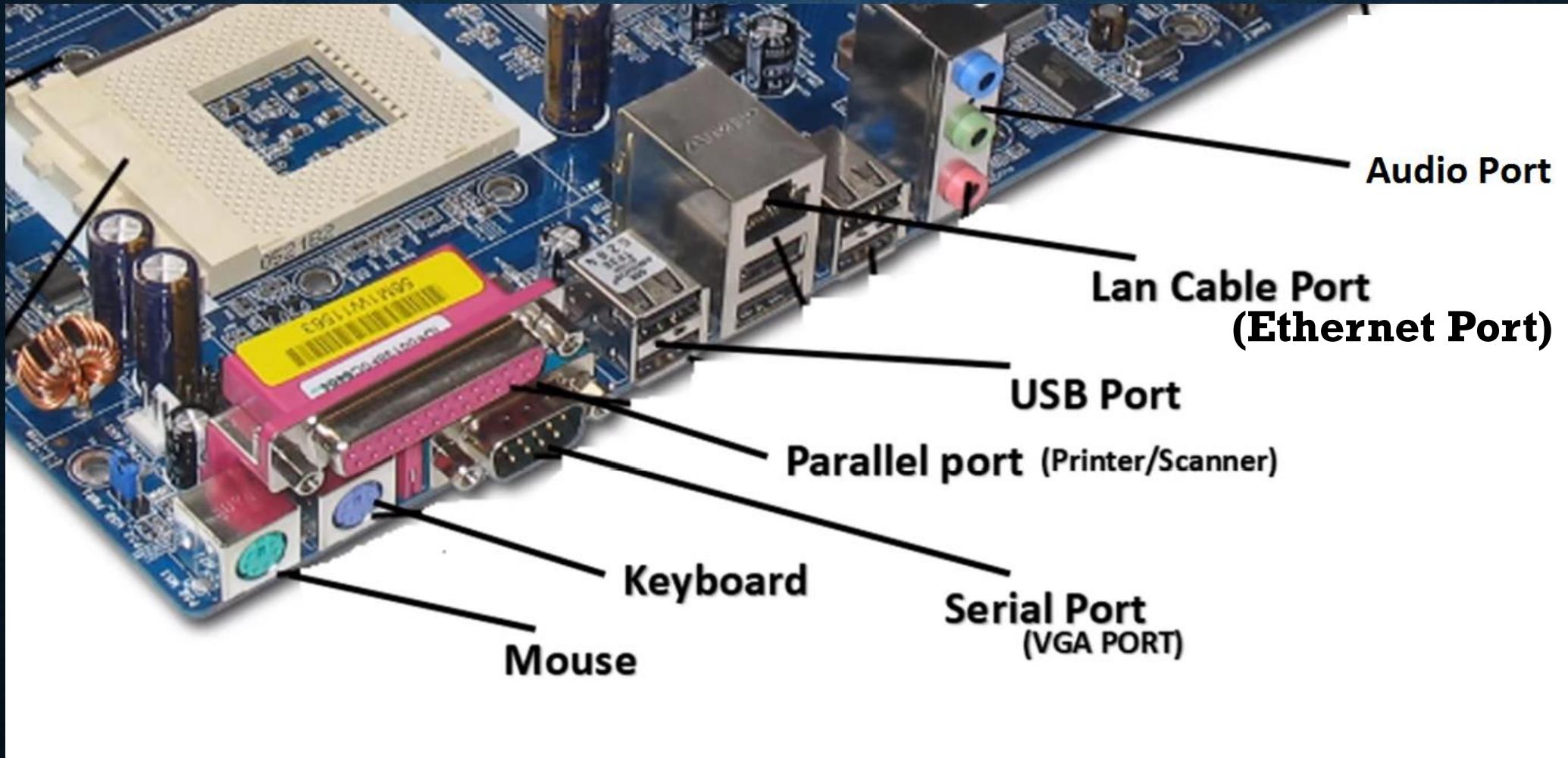
MOTHERBOARD

- A motherboard is one of the most essential parts of a computer system. It holds together many of the crucial components of a computer, including the central processing unit (CPU), memory and connectors for input and output devices.
- The base of a motherboard consists of a very firm sheet of non-conductive material, typically some sort of rigid plastic.
- The motherboard is a printed circuit board and foundation of a computer that is the biggest board in a computer chassis.
- Motherboard is also known as mb, mainboard, mboard, mobo, mobd, backplane board, base board, main circuit board, planar board, system board, or a logic board on Apple computers.

COMPONENTS OF MOTHERBOARD



COMPONENTS OF MOTHERBOARD



COMPONENTS OF MOTHERBOARD

1) **Mouse Port**: It's also known as PS/2 port is a light green color 6-pin mini-DIN connector used for connecting mouse to a PC compatible computer system.



2) **Key board Port**: It's also known as PS/2 port is a violet color 6-pin mini-DIN connector used for connecting Key board to a PC compatible computer system.



3) **VGA / Serial Port**: VGA (Video Graphics Array) is a graphics interface which uses RGB analog signals as video output.



COMPONENTS OF MOTHERBOARD

4) **Parallel port**: The parallel port uses a 25-pin connector (type DB-25) and is used to connect printers, computers and other devices that need relatively high bandwidth.



5) **USB Port**: USB (Universal Serial Bus port) is a standard cable connection interface for personal computers and consumer electronics devices. USB is an industry standard for short-distance digital data communications.



Speed of data transfer

version

USB 1.0 4 MBps

USB 2.0 40 MBps

USB 3.0 5 GBps

USB 3.1 10 GBps

Mini USB port

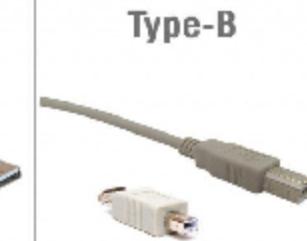
Micro USB port



USB Type A



USB Type B



USB Type C

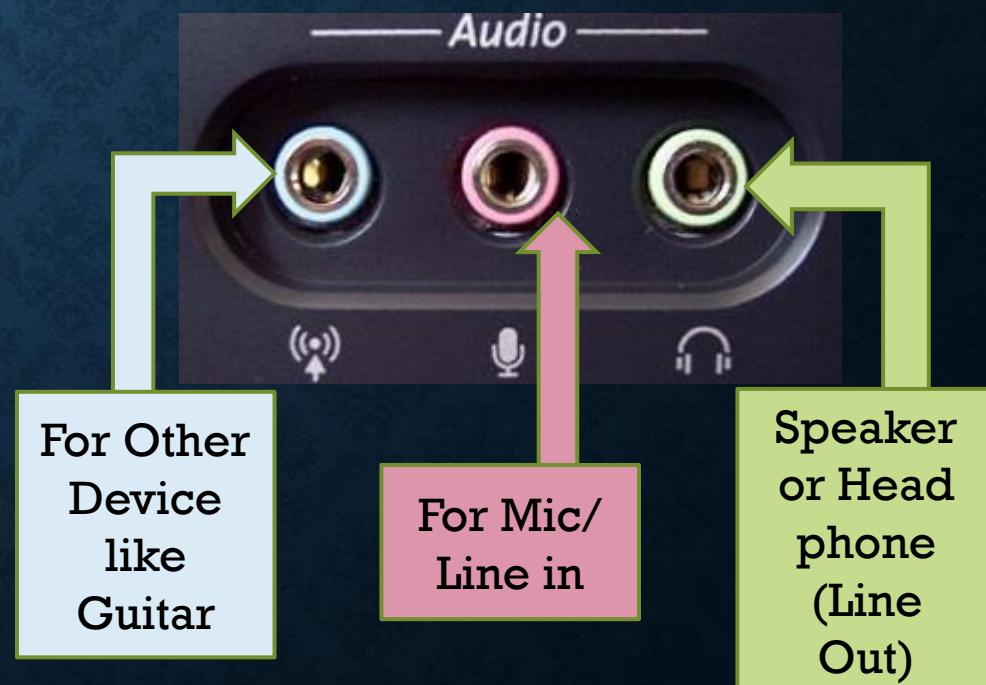


COMPONENTS OF MOTHERBOARD

6) **LAN Cable Port**: LAN also known as Ethernet port, network connection, and network port. The LAN port allows a computer to connect to a network using a wired connection.



7) **Audio Port**: An audio port on a computer is any receptacle or jack to which an audio device such as speakers, headphones or a microphone can be connected.



COMPONENTS OF MOTHERBOARD

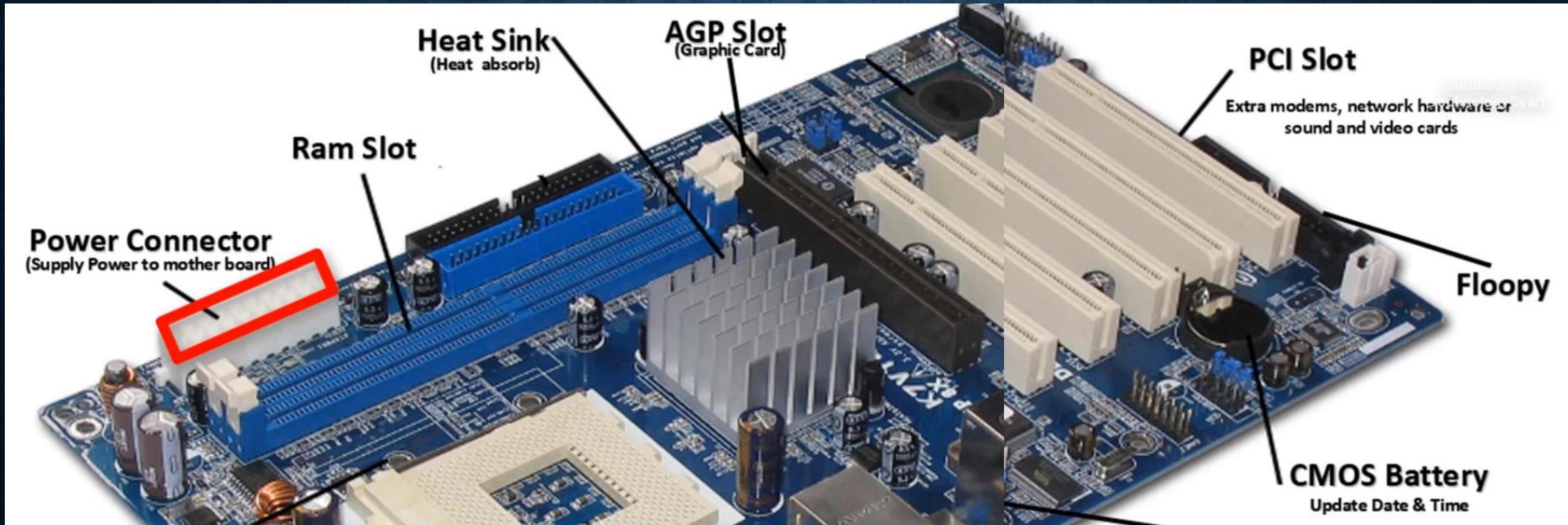
8) **HDMI Port**: HDMI (High Definition Multimedia Interface) is a connector and cable capable of transmitting high-quality and high-bandwidth streams of audio and video between devices. The HDMI technology is used with devices such as an HDTV, Projector, Blu-ray player etc.



9) **USB Type C Port**: An audio port on a computer is any receptacle or jack to which an audio device such as speakers, headphones or a microphone can be connected.

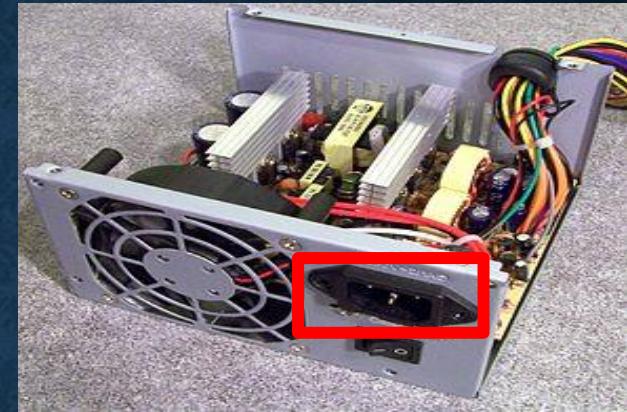


COMPONENTS OF MOTHERBOARD

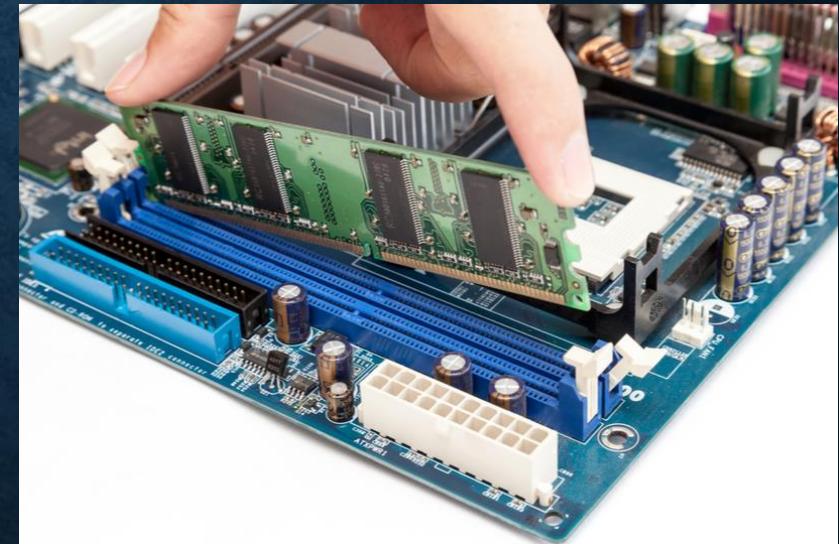


COMPONENTS OF MOTHERBOARD

10)**Power Connector**: A power supply unit (or PSU) converts mains AC to low-voltage regulated DC power for the internal components of a computer.

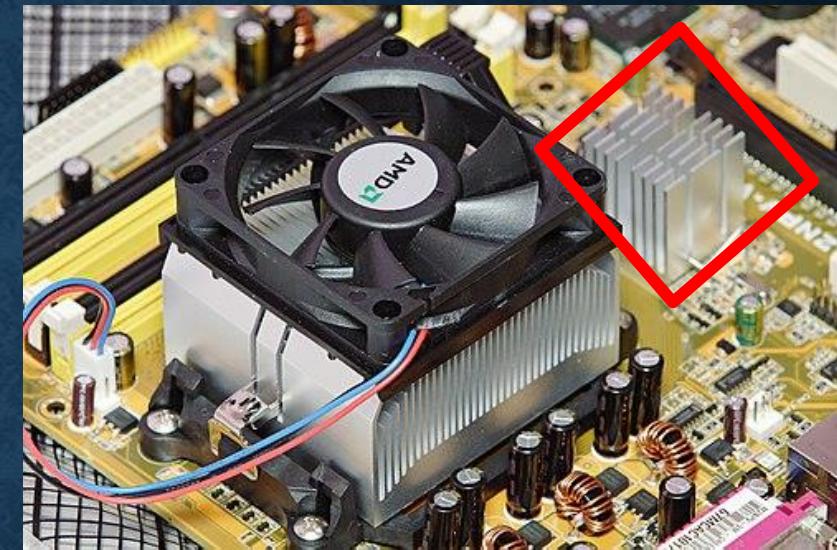


11)**RAM Slot**: A memory slot, memory socket, or RAM slot is what allows RAM (computer memory) to be inserted into the computer. Most motherboards have two to four memory slots, which determine the type of RAM used with the computer.

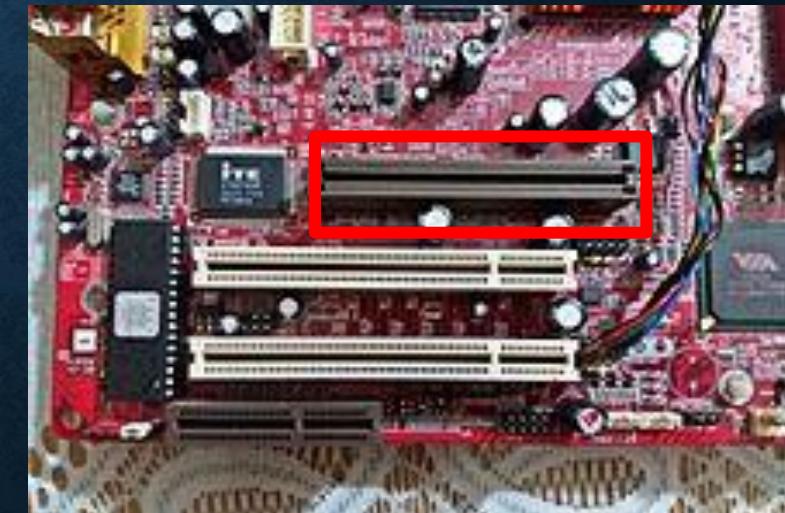


COMPONENTS OF MOTHERBOARD

12) **Heat Sink**: A heat sink is a passive heat exchanger that transfers the heat generated by an electronic or a allowing regulation of the device's temperature. In computers, heat sinks are used to cool CPUs, GPUs, and some chipsets and RAM modules. It is usually made out of aluminum or copper.

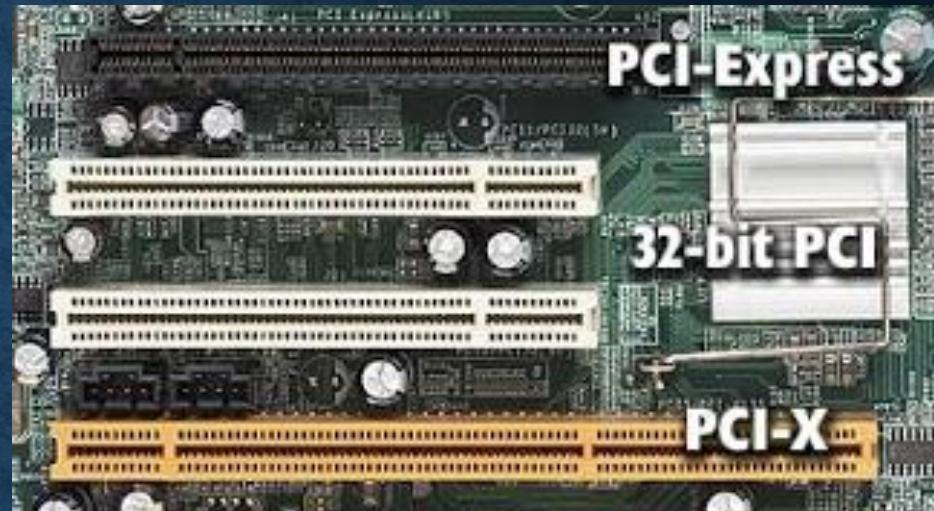


13) **AGP slot**: The Accelerated Graphics Port was designed as a high-speed point-to-point channel for attaching a video card to a computer system, primarily to assist in the acceleration of 3D computer graphics.

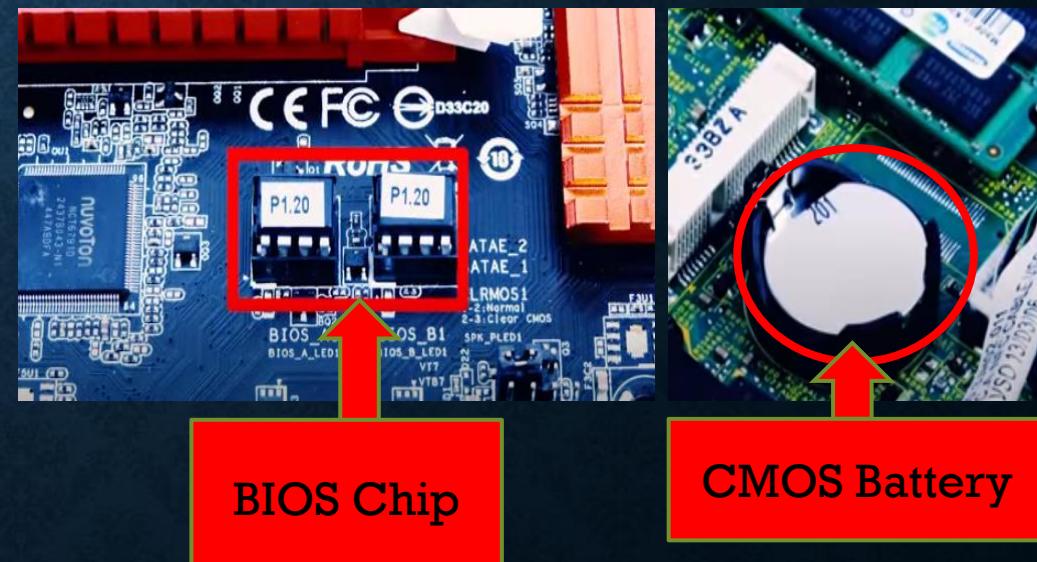


COMPONENTS OF MOTHERBOARD

14) **PCI Slot**: A PCI (Peripheral Component Interconnect) slot is a built-in slot on a device that allows for the attachment of various hardware components such as network cards, modems, sound cards, disk controllers and other peripherals.



15) **CMOS Battery**: It is a power supply component to CMOS (Complementary metal-oxide-semiconductor) which hold basic programming called BIOS. Which is primary program to start booting process.



PROCESSOR



PROCESSOR

- A central processing unit (CPU), also called a central processor or main processor, is the electronic circuitry within a computer that executes instructions that make up a computer program.
- The CPU performs basic arithmetic, logic, controlling, and input/output (I/O) operations specified by the instructions in the program.
- A processor (CPU) is the logic circuitry that responds to and processes the basic instructions that drive a computer. The CPU is seen as the main and most crucial integrated circuitry (IC) chip in a computer, as it is responsible for interpreting most of computers commands.

PROCESSOR

Codename	i7 x86 gen	Official Gen	Lead chip	Process	Intro	Graphics
Skylake	7th	6th	Core i7-6700K	14nm	2015	HD 530
Broadwell	6th	5th	Core i7-5775C	14nm	2015	Iris Pro 5200
Haswell	5th	4th	Core i7-4770K	22nm	2013	HD 4600
Ivy Bridge	4th	3rd	Core i7-3770K	22nm	2012	HD 4000
Sandy Bridge	3rd	2nd	Core i7-2600K	32nm	2011	HD 3000
Clarkdale	2nd	1st	Core i5-655K	32nm	2010	HD
Westmere	2nd		Core i7-980X	32nm	2010	None
Lynnfield	1st		Core i7-870	45nm	2009	None
Bloomfield	1st		Core i7-965XE	45nm	2008	None
Yorkfield			Core 2 Extreme QX6850	45nm	2007	None
Conroe			Core 2 X6800	65nm	2006	None

PROCESSOR

Processor	Physical Cores	Cache Size	Hyper-Threading	Turbo Boost	Graphics	Price
Core i3	2	3MB	Yes	No	Low	Low
Core i5	2-4	3MB-6MB	No	Yes	Mid-range	Mid-range
Core i7	2-4	4MB-8MB	Yes	Yes	Best	Expensive

Clock Speed

CPU clock speed, or clock rate, is measured in Hertz — generally in gigahertz, or GHz. A CPU's clock speed rate is a measure of how many clock cycles a CPU can perform per second. For example, a CPU with a clock rate of 1.8 GHz can perform 1,800,000,000 clock cycles per second.

32 bit
vs
64 bit
vs
128 bit

MEMORY COMPONENT



ComputerHope.com

MEMORY COMPONENT

- Computer memory is any physical device capable of storing information temporarily, like **RAM (Random Access Memory)**, or permanently, like **ROM (Read Only Memory)**.
- In computing, memory refers to a device that is used to store information for immediate use in a computer or related computer hardware device.
- Memory can be categorized into to types:
 1. RAM (Random Access Memory)
 2. ROM (Read Only Memory)

MEMORY COMPONENT

➤ Basic units of memory

1. Bit (b)

- Most fundamental unit of memory is “bit”. (Smallest unit of memory)

Bit is a binary digit which consist of 0 and 1.

0 or 1

Bit are symbolized as “b” (small b)

Bit can be calculated as Kb, Gb, Tb etc.

2. Byte (B)

- Another basic unit of memory is “byte”.
- Consist by 8 bits.

0 0 0 0 0 0 0 0

- Byte are symbolized as “B”
- Byte can be calculated as KB, GB, TB etc.

MEMORY COMPONENT

➤ Basic units of memory

2. Byte

- By various combination of 8 bits using binary number 0 and 1. Byte can be expressed into 256 possible combinations.

$$2^8 = 256 \text{ combinations.}$$

- From 0 to 255 different combinations are used to express 1 Byte

0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---

3. Nibble

- It's made up of 4 bits using binary number of 0 and 1.

0	0	0	0
---	---	---	---

MEMORY COMPONENT

➤ Binary vs Decimal

1. Decimal

- Deci “Latin word” = Ten)
- Decimal means based on Decimal numbers (0,1,2,3,4,5,6,7,8,9).
- Human used this system in daily routine.
- Every box replaced by 0 to 9 number.



2. Binary

- Bi “Latin prefix” = Two)
- Binary means based on Binary numbers (0,1).
- Machines used this language system.
- Every box replaced by 0 or 1 number.



BINARY VS DECIMAL

1. Decimal

	10^3	10^2	10^1	10^0
• One:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1
• Two:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2
• Three:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3
• Four:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4
• Five:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5
• Six:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6
• Seven:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7

2. Binary

	2^3	2^2	2^1	2^0
• One:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1
• Two:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0
• Three:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1
• Four:	<input type="checkbox"/>	<input type="checkbox"/>	1	0
• Five:	<input type="checkbox"/>	<input type="checkbox"/>	1	1
• Six:	<input type="checkbox"/>	1	1	0
• Seven:	<input type="checkbox"/>	1	1	1

BINARY VS DECIMAL

1. Decimal

100 10 1

10^3 10^2 10^1 10^0

• 33:

		3	3
--	--	---	---

• 56:

			2
--	--	--	---

• 89:

			3
--	--	--	---

• 100:

			4
--	--	--	---

• 124:

			5
--	--	--	---

• 52:

			6
--	--	--	---

• 73:

			7
--	--	--	---

2. Binary

128 64 32 16 8 4 2 1

2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0

• 33:

		1	0	0	0	0	1
--	--	---	---	---	---	---	---

• 56:

		1	1	1	0	0	0
--	--	---	---	---	---	---	---

• 89:

	1	0	1	1	0	0	1
--	---	---	---	---	---	---	---

• 100:

	1	1	0	0	1	0	0
--	---	---	---	---	---	---	---

• 124:

	1	1	1	1	1	0	0
--	---	---	---	---	---	---	---

• 52:

		1	1	0	1	0	0
--	--	---	---	---	---	---	---

• 73:

--	--	--	--	--	--	--	--

MEMORY COMPONENT

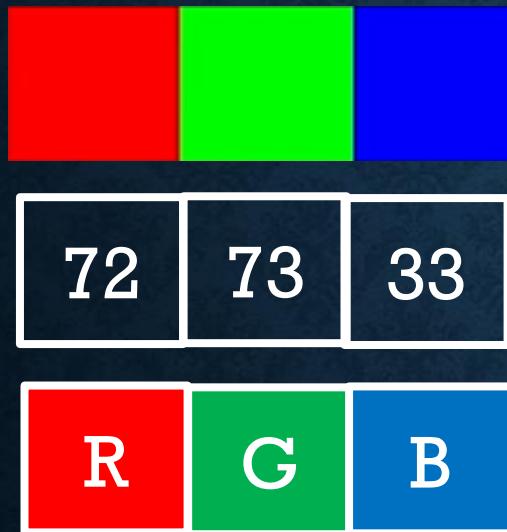
AASCII

Abbreviated from American Standard Code for Information Interchange

Dec	Hx	Oct	Char	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr
0	0	000	NUL (null)	32	20	040	 	Space	64	40	100	@	Ø	96	60	140	`	~
1	1	001	SOH (start of heading)	33	21	041	!	!	65	41	101	A	A	97	61	141	a	a
2	2	002	STX (start of text)	34	22	042	"	"	66	42	102	B	B	98	62	142	b	b
3	3	003	ETX (end of text)	35	23	043	#	#	67	43	103	C	C	99	63	143	c	c
4	4	004	EOT (end of transmission)	36	24	044	$	\$	68	44	104	D	D	100	64	144	d	d
5	5	005	ENQ (enquiry)	37	25	045	%	%	69	45	105	E	E	101	65	145	e	e
6	6	006	ACK (acknowledge)	38	26	046	&	&	70	46	106	F	F	102	66	146	f	f
7	7	007	BEL (bell)	39	27	047	'	'	71	47	107	G	G	103	67	147	g	g
8	8	010	BS (backspace)	40	28	050	((72	48	110	H	H	104	68	150	h	h
9	9	011	TAB (horizontal tab)	41	29	051))	73	49	111	I	I	105	69	151	i	i
10	A	012	LF (NL line feed, new line)	42	2A	052	*	*	74	4A	112	J	J	106	6A	152	j	j
11	B	013	VT (vertical tab)	43	2B	053	+	+	75	4B	113	K	K	107	6B	153	k	k
12	C	014	FF (NP form feed, new page)	44	2C	054	,	,	76	4C	114	L	L	108	6C	154	l	l
13	D	015	CR (carriage return)	45	2D	055	-	-	77	4D	115	M	M	109	6D	155	m	m
14	E	016	SO (shift out)	46	2E	056	.	.	78	4E	116	N	N	110	6E	156	n	n
15	F	017	SI (shift in)	47	2F	057	/	/	79	4F	117	O	O	111	6F	157	o	o
16	10	020	DLE (data link escape)	48	30	060	0	0	80	50	120	P	P	112	70	160	p	p
17	11	021	DC1 (device control 1)	49	31	061	1	1	81	51	121	Q	Q	113	71	161	q	q
18	12	022	DC2 (device control 2)	50	32	062	2	2	82	52	122	R	R	114	72	162	r	r
19	13	023	DC3 (device control 3)	51	33	063	3	3	83	53	123	S	S	115	73	163	s	s
20	14	024	DC4 (device control 4)	52	34	064	4	4	84	54	124	T	T	116	74	164	t	t
21	15	025	NAK (negative acknowledge)	53	35	065	5	5	85	55	125	U	U	117	75	165	u	u
22	16	026	SYN (synchronous idle)	54	36	066	6	6	86	56	126	V	V	118	76	166	v	v
23	17	027	ETB (end of trans. block)	55	37	067	7	7	87	57	127	W	W	119	77	167	w	w
24	18	030	CAN (cancel)	56	38	070	8	8	88	58	130	X	X	120	78	170	x	x
25	19	031	EM (end of medium)	57	39	071	9	9	89	59	131	Y	Y	121	79	171	y	y
26	1A	032	SUB (substitute)	58	3A	072	:	:	90	5A	132	Z	Z	122	7A	172	z	z
27	1B	033	ESC (escape)	59	3B	073	;	:	91	5B	133	[[123	7B	173	{	{
28	1C	034	FS (file separator)	60	3C	074	<	<	92	5C	134	\	\	124	7C	174	|	
29	1D	035	GS (group separator)	61	3D	075	=	=	93	5D	135]]	125	7D	175	}	}
30	1E	036	RS (record separator)	62	3E	076	>	>	94	5E	136	^	^	126	7E	176	~	~
31	1F	037	US (unit separator)	63	3F	077	?	?	95	5F	137	_	_	127	7F	177		DEL

MEMORY COMPONENT

COLORS IN BINARY



$$\begin{array}{c|c|c} 72 & 73 & 33 \end{array} = \boxed{\text{brown}}$$

<https://www.mathsisfun.com/hexadecimal-decimal-colors.html>

OTHER NUMBER SYSTEM

Decimal

- Decimal = Ten
- Denoted by $()_{10}$
- Base = “Ten”
- Base digits (0-9)
“0,1,2,3,4,5,6,7,8,9”
- Eg.
 1. 124
 2. 90
 3. 22

Binary

- Binary = Two
- Denoted by $()_2$
- Base = “Two”
- Base digits
“0,1”
- Eg.
 1. 1111100
 2. 1011010

Octal

- Octal = Eight
- Denoted by $()_8$
- Base = “Eight”
- Base digits
“0,1,2,3,4,5,6,7”
- Eg.
 1. 174
 2. 132

Hexadecimal

- Hexa + decimal
= Ten + Six
= Sixteen
- Denoted by $()_{16}$
- Base = “Sixteen”
- Base digits
“0,1,2,3,4,5,6,7,8,9
A, B, C, D, E, F”
- Eg.
 1. 7C
 2. 5A

Decimal



356

$$10^0 = 6 \times 1 = 6$$

$$10^1 = 5 \times 10 = 50$$

$$10^2 = 3 \times 100 = 300$$

$$2^0 = 1 \times 0 = 000$$

$$2^1 = 2 \times 0 = 000$$

$$2^2 = 4 \times 1 = 004$$

$$2^3 = 8 \times 0 = 000$$

$$356 \quad 2^4 = 16 \times 0 = 000$$

$$2^5 = 32 \times 1 = 032$$

$$2^6 = 64 \times 1 = 064$$

$$2^7 = 128 \times 0 = 000$$

$$2^8 = 256 \times 1 = 256$$

101100100



Octal



544

$$\text{Octal} = 2^0 \times 2^1 \times 2^2$$

For 356 binary

101100100

<u>101</u>	<u>100</u>	<u>100</u>
c	b	a

a -> 1 0 0

$$2^2 + 2^1 + 2^0 = 4$$

b -> 1 0 0

$$2^2 + 2^1 + 2^0 = 4$$

c -> 1 0 1

$$2^2 + 2^1 + 2^0 = 5$$

Hexa-decimal



164

Hexa-Decimal = Sixteen

$$16 = 2^3 \times 2^2 \times 2^1 \times 2^0$$

101100100

0001 0110 0100

c b a

a -> 0 1 0 0

$$2^3 + 2^2 + 2^1 + 2^0 = 4$$

b -> 0 1 1 0

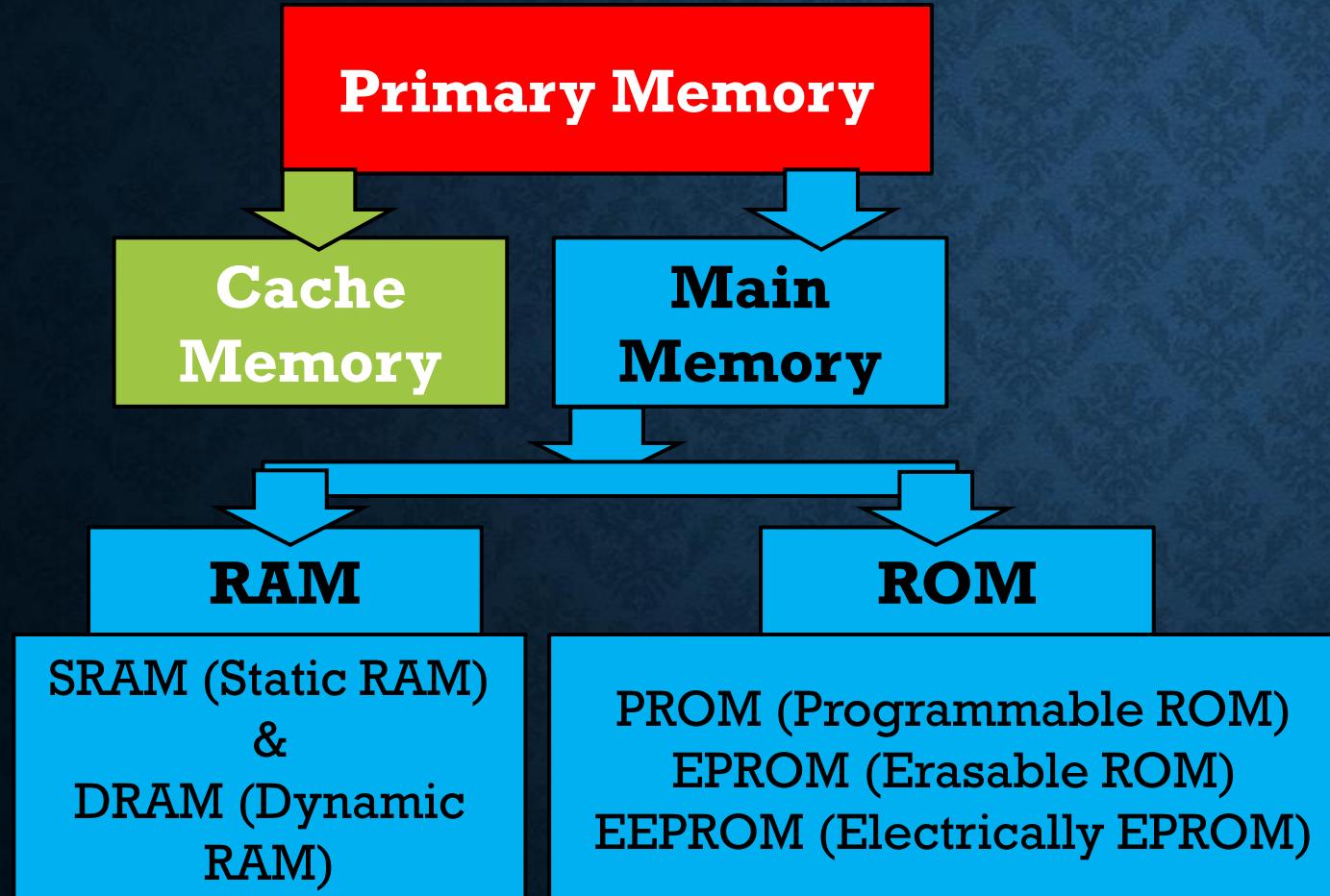
$$2^3 + 2^2 + 2^1 + 2^0 = 6$$

c -> 0 0 0 1

$$2^3 + 2^2 + 2^1 + 2^0 = 1$$

1st	0
2nd	1
3rd	2
4th	3
5th	4
6th	5
7th	6
8th	7
9th	8
10th	9
11th	A
12th	B
13th	C
14th	D
15th	E
16th	F

COMPUTER MEMORY



- Magnetic Tape (S.A)
- Magnetic Disc
 - HDD (Hard Disk Drive)
 - FDD (Floppy Disk Drive)
- Optical Disc
 - CD (Compact disc)
 - DVD (Digital Versatile Disc)
 - BRD (Blu Ray disc)
 - HVD (Holographic Versatile Disc)
- Flesh Memory
 - Pen drive
 - Memory Card

MEMORY COMPONENT

1. Primary Memory

- A primary storage device is a medium that holds memory for short periods of time while a computer is running. Although it has a much lower access time and faster performance.
- RAM (random access memory) and cache are both examples of a primary storage device.
- Primary Storage is directly accessible by CPU. It is non-volatile or volatile but non removable.
- A primary storage device may also be referred to as internal memory, main memory, main storage, and primary memory.

MEMORY COMPONENT

➤ Cache Memory

- Cache memory is a high-speed access area that's a reserved section of main memory or an area on the storage device. The two main types of cache are memory cache and disk cache.
- It is the fastest memory in computer.
- Cache memory store data which continuously used by Main Memory, which reduce to reduce the average cost to access data from the main memory.
- A cache is a smaller, faster memory, located closer to a processor core, which stores copies of the data from frequently used main memory locations.

MEMORY COMPONENT

1. RAM (Random Access Memory)

- Random-access memory is a form of computer memory that can be read and changed in any order, typically used to store working data and machine code.
- A random-access memory device allows data items to be read or written in almost the same amount of time irrespective of the physical location of data inside the memory.
- There are two types of RAM.
 - a) SRAM
 - b) DRAM

MEMORY COMPONENT

1. RAM (Random Access Memory)

a) SRAM: For memory storage: Flip flop mechanism

- SRAM (static RAM) is random access memory (RAM) that retains data bits in its memory as long as power is being supplied.
- Unlike dynamic RAM (DRAM), which stores bits in cells consisting of a capacitor and a transistor, SRAM does not have to be periodically refreshed.

b) DRAM: For memory storage: Capacitors and transistors used

- In Dynamic RAM chip, each memory cell holds one bit of information and is made up of two parts: a transistor and a capacitor.
- These are extremely small transistors and capacitors so that millions of them can fit on a single memory chip.

MEMORY COMPONENT

1. RAM (Random Access Memory)

Parameter	SRAM	DRAM
Full Form	Static Random Access Memory	Dynamic Random Access Memory
Read & Write speed	Faster	Slower than SRAM
Storage component	Uses transistor to store single bit of information	Uses separate capacitor to store each bit of data
Price	Expensive than DRAM	Economical than SRAM
Power consumption	More	Less
Refresh	No need to refresh for maintaining data	Needs to be refreshed thousands of time every second
Used in	Cache memory	Main memory
Internal structure	Complex	Simpler than SRAM
Density	Less dense	Highly dense
Storage per bit	Can store many bits per chip	Cannot store many bits per chip

MEMORY COMPONENT

1. ROM (Read Only Memory)

- Read-only memory is a type of non-volatile memory used in computers and other electronic devices.
- Data stored in ROM cannot be electronically modified after the manufacture of the memory device.
- There are three types of ROM.
 1. PROM (Programmable ROM)
 2. EPROM (Erasable Programmable ROM)
 3. EEPROM (Electrically Erasable Programmable ROM)

MEMORY COMPONENT

1. PROM (Programmable ROM)

- A **programmable read-only memory** is a form of digital memory where the setting of each bit is locked by a fuse or antifuse. It is one type of ROM.
- PROM can be modified once by a user. PROM is a way of allowing a user to tailor a microcode program using a special machine called a PROM programmer.
- It's used to store low level programs such as firmware or microcode.



MEMORY COMPONENT

2. EPROM (Erasable Programmable ROM)

- EPROM (erasable programmable read-only memory) is programmable read-only memory (programmable ROM) that can be erased and re-used.
- Erasure is caused by shining an intense UV light through a window that is designed into the memory chip.

3. EEPROM (Electrically Erasable Programmable ROM)

- EEPROM (Electrically Erasable Programmable Read-Only Memory) electric signal is used to erase the EEPROM's contents.
- The main difference between EPROM and EEPROM is that, the content of EPROM is erased by using UV rays. On the other hand, the content of EEPROM is erased by using electric signals.

PROM VS EPROM VS EEPROM

PROM

A Read Only Memory (ROM) that can be modified only once by a user.

Stands for Programmable Read Only Memory

Developed by Wen Tsing Chow in 1956

Reprogrammable only once

EPROM

A programmable ROM that can be erased and reused

Stands for Erasable Programmable Read Only Memory

Developed by Dov Frohman in 1971

Can be reprogrammed using ultraviolet light

EFPROM

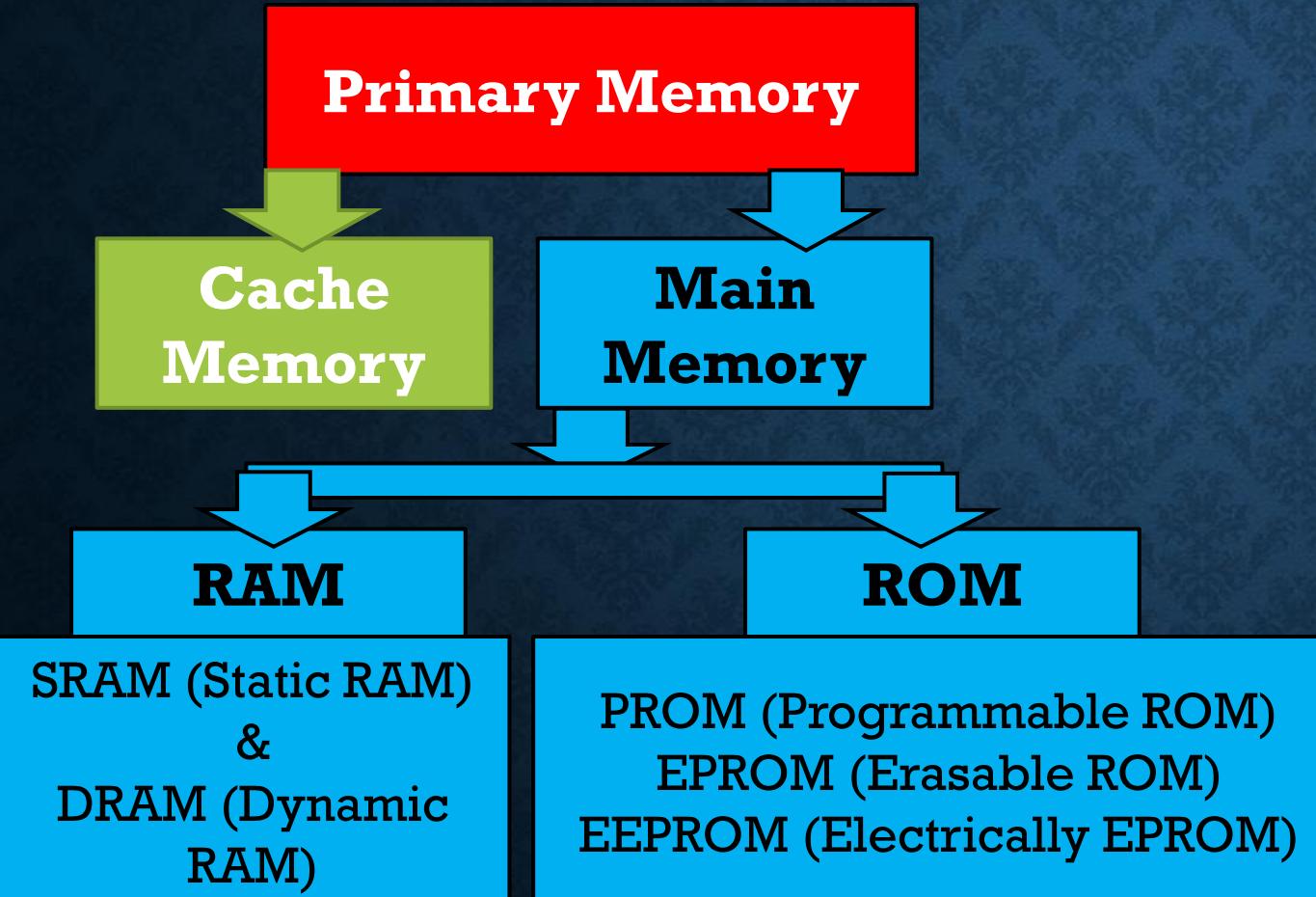
A user-modifiable ROM that can be erased and reprogrammed repeatedly through a normal electrical voltage

Stands for Electrically Erasable Programmable Read-Only Memory

Developed by George Perlegos in 1978

Can be reprogrammed using electrical charge

COMPUTER MEMORY



Secondary Memory

- Magnetic Tape (S.A)
- Magnetic Disc
 - HDD (Hard Disk Drive)
 - FDD (Floppy Disk Drive)
- Optical Disc
 - CD (Compact disc)
 - DVD (Digital Versatile Disc)
 - BRD (Blu Ray disc)
 - HVD (Holographic Versatile Disc)
- Flesh Memory
 - Pen drive
 - Memory Card

MEMORY COMPONENT

➤ Secondary Memory (Auxiliary Memory)

- Secondary memory, also known as auxiliary storage, secondary storage, Auxiliary memory or external memory, is a non-volatile memory that is not directly accessible by the CPU, because it is not accessed via the input/output channels (it is an external device).
- Secondary Memory have greater storage capacity and data stability.
- Auxiliary memory holds programs and data for future use, and, because it is nonvolatile (like ROM), it is used to store inactive programs and to archive data.

MEMORY COMPONENT

➤ Secondary Memory (Auxiliary Memory)

Secondary Memory

- Magnetic Tape
- Magnetic Disc
 - HDD (Hard Disk Drive)
 - FDD (Floppy Disk Drive)
- Optical Disc
 - CD (Compact disc)
 - DVD (Digital Versatile Disc)
 - BRD (Blu Ray disc)
 - HVD (Holographic Versatile Disc)
- Flesh Memory
 - Pen drive
 - Memory Card

MEMORY COMPONENT

➤ Magnetic Tape

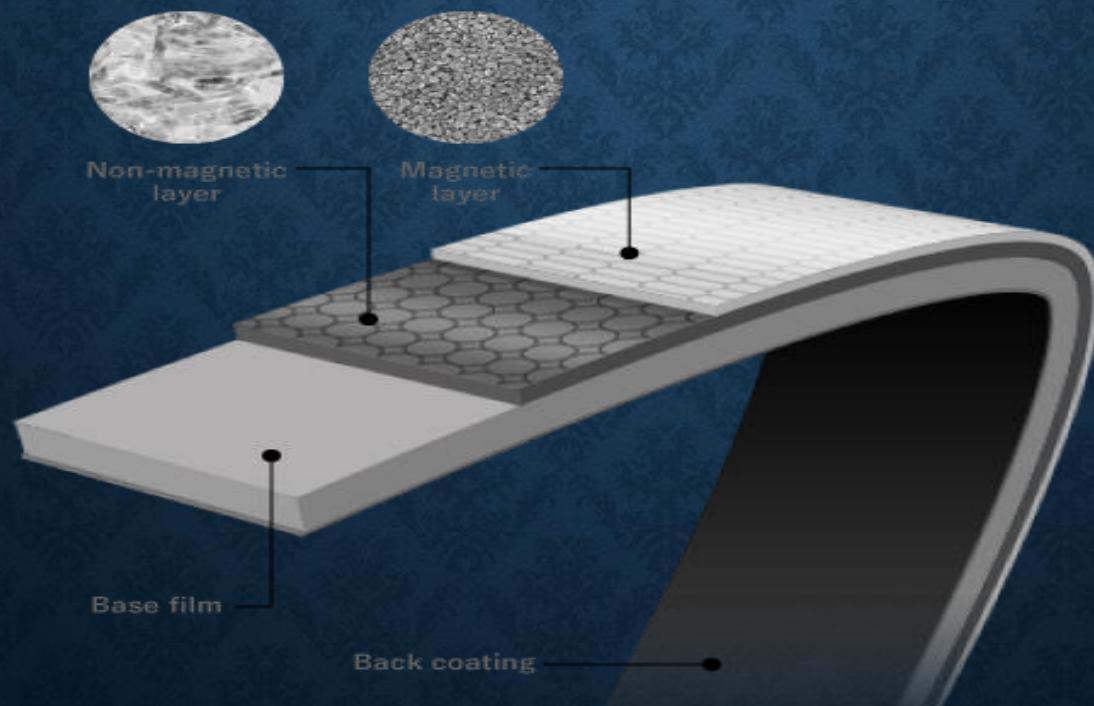
- Magnetic tape is a medium for magnetic recording, made of a thin, magnetizable coating on a long, narrow strip of plastic film.
- It was developed in Germany in 1928, based on magnetic wire recording.
- A device that stores computer data on magnetic tape is known as a tape drive.



MEMORY COMPONENT

➤ Magnetic Tape

- Devices that record and playback audio and video using magnetic tape are tape recorders and video tape recorders respectively.



MEMORY COMPONENT

➤ Magnetic Disk

- Magnetic storage or magnetic recording is the storage of data on a magnetized medium.
- Magnetic storage uses different patterns of magnetization in a magnetizable material to store data and is a form of non-volatile memory.
- There are two types:
 - a) HDD (Hard Disk Drive)
 - b) FDD (Floppy Disk Drive)



MEMORY COMPONENT

a) HDD (Hard Disk Drive)

- It is storage device that can store data up to terabytes.
- In normal cases, it is not removable. It is generally fitted inside the computer and is not visible.
- There can be one or more hard disk drive inside a computer. Before being known as the hard disks, they were called as “fitted disks” or “Winchesters”.



<https://www.youtube.com/watch?v=wteUW2sL7bc>

MEMORY COMPONENT

a) HDD (Hard Disk Drive)

- They have a hard platter that holds the magnetic medium.
- At the simplest level, a hard disk uses magnetic recording techniques to store the data.
- The magnetic recording techniques allow the data to be easily erased and rewritten.
- Most drives have multiple platters just so as to increase the capacity of data that can be stored on it.

MEMORY COMPONENT

b) FDD (Floppy Disk Drive)

- A floppy disk, also known as a floppy, diskette, or simply disk, is a type of disk storage composed of a disk of thin and flexible magnetic storage medium,
- FD sealed in a rectangular plastic enclosure lined with fabric that removes dust particles. Floppy disks are read and written by a floppy disk drive (FDD).
- Floppy disks, initially as 8-inch (203 mm) media and later in 5 1/4-inch (133 mm) and 3 1/2 inch (90 mm) sizes, were a ubiquitous form of data storage and exchange from the mid-1970s into the first years of the 21st century.



MEMORY COMPONENT

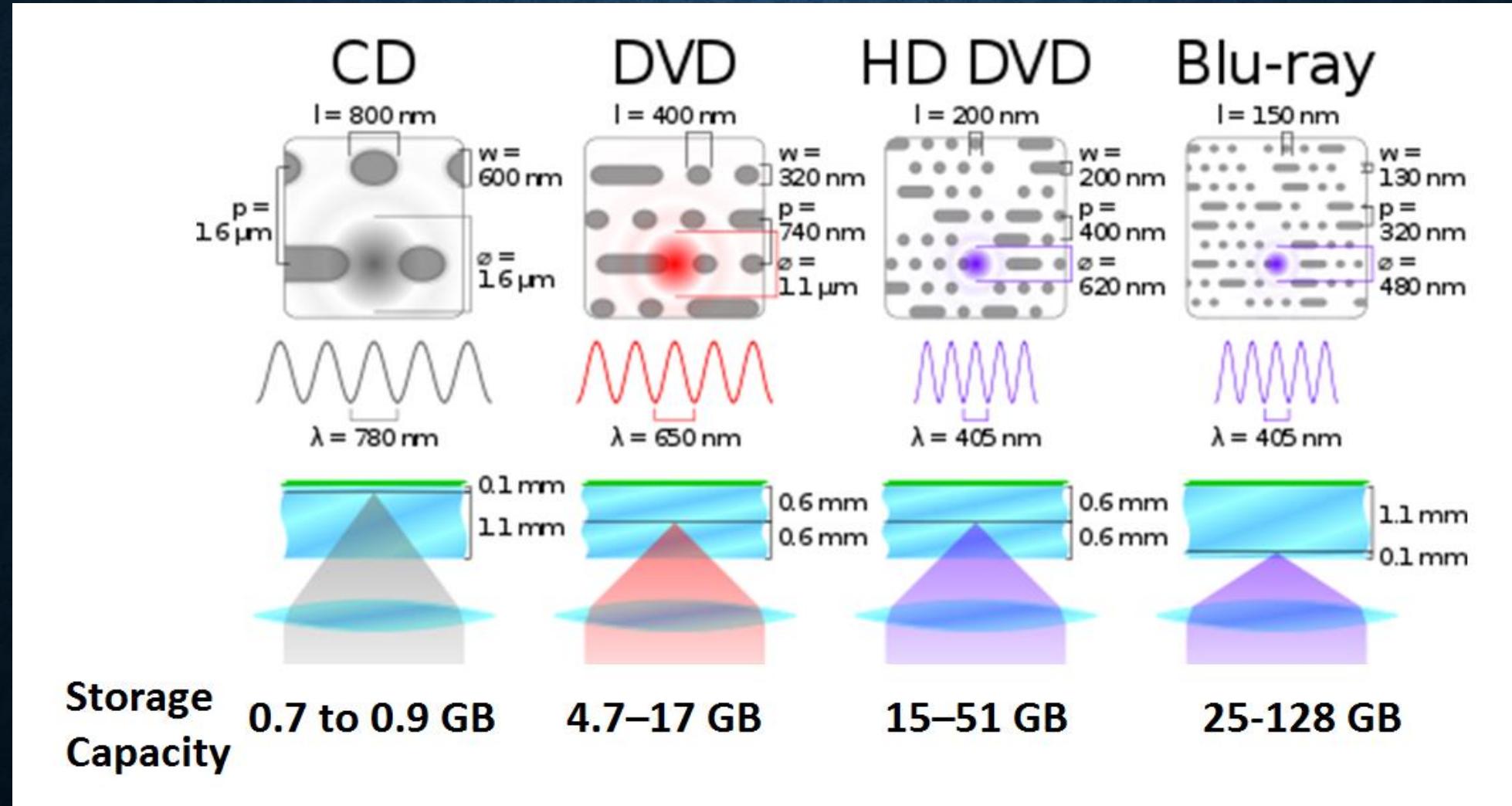
➤ Optical Disk

- In computing and optical disc recording technologies, an optical disc (OD) is a flat, usually circular disc that encodes binary data (bits) in the form of pits (binary value of 0 or off, due to lack of reflection when read) and lands (binary value of 1 or on, due to a reflection when read) on a special material often aluminum.
- There are many type of Optical Disk
 1. CD (Compact disc)
 2. DVD (Digital Versatile Disc)
 3. BRD (Blu Ray disc)
 4. HVD (Holographic Versatile Disc)



MEMORY COMPONENT

➤ Optical Disk



MEMORY COMPONENT

➤Flesh Memory

- Flash memory is a non-volatile memory chip used for storage and for transferring data between a personal computer (PC) and digital devices. It has the ability to be electronically reprogrammed and erased. It is often found in USB flash drives, MP3 players, digital cameras and solid-state drives.
- There are many type of Flesh Drive
 1. Pen or USB Drive
 2. Memory Card
 3. SSD (Solid State Drive)



MEMORY COMPONENT

1) USB flash drive

- A USB flash drive is a data storage device that includes flash memory with an integrated USB interface.
- It is typically removable, rewritable and much smaller than an optical disc. Most weigh less than 30 g (1 oz).
- Since first appearing on the market in late 2000, as with virtually all other computer memory devices, storage capacities have risen while prices have dropped.



MEMORY COMPONENT

1) USB flash drive

- As of March 2016, flash drives with anywhere from 8 to 256 gigabytes (GB) were frequently sold, while 512 GB and 1 terabyte (TB) units were less frequent.
- As of 2018, 2 TB flash drives were the largest available in terms of storage capacity. Some allow up to 100,000 write/erase cycles, depending on the exact type of memory chip used.
- Life span of USB flesh drive is between 10 and 100 years under normal circumstances

MEMORY COMPONENT

2) Memory Card and SD Card

- A memory card or memory cartridge is an electronic data storage device used for storing digital information, typically using flash memory.
- These are commonly used in portable electronic devices, such as digital cameras, mobile phones, computers, tablets, PDAs, portable media players, video game consoles, synthesizers, electronic keyboards and digital pianos.
- Types of SD Cards:
 1. SDSC
 2. SDHC
 3. SDXE:



MEMORY COMPONENT

2) Memory Card and SD Card

➤ Types of Memory Card

1. SDSC (Secure Digital Standard Capacity)

- Storage capacity: 128 MB to 4 GB

2. SDHC (Secure Digital High Capacity)

- Storage capacity: 4 GB to 32 GB

3. SDXC (Secure Digital Extended Capacity)

- Storage capacity: 64 GB to 2 TB



MEMORY COMPONENT

2) Memory Card and SD Card

➤ **Class of Memory Card:** It describe speed of memory card

1. **Class 2:** 2 mbps
2. **Class 4:** 4 mbps
3. **Class 6:** 6 mbps
4. **Class 10:** 10 mbps
5. **Class UHS 1 (Ultra High Speed):** 50 MBps to 104 MBps
6. **Class UHS 2:** 156 MBps



MEMORY COMPONENT

3) SSD (Solid State Drive)

- Short for solid-state drive, an SSD is a storage medium that uses non-volatile memory as a means of holding and accessing data.
- Unlike a hard disk drive, an SSD has no moving parts, which gives it advantages, such as faster access time, noiseless operation, higher reliability, and lower power consumption.
- As the costs have come down, SSDs have become suitable replacements for a standard hard drive in both desktop and laptop computers.



MEMORY COMPONENT

3) SSD (Solid State Drive)

- A solid state drive is made of all semiconductor components, so shock & vibration resistance is significantly better than the hard disk drive.
- Other superior attributes of SSD are lower power usage and better performance – especially small blocks of data.
- A Solid State Drive is used to provide better performance and/or lower power usage than a hard disk drive in an existing computer system.
- It is also used for new computer or embedded system designs which require smaller physical size, removability, lower power, higher performance and/or a lower absolute price if low capacity needed.



SSD vs HDD

Usually 10 000 or 15 000 rpm SAS drives

0.1 ms

SSDs deliver at least
6000 io/s

SSDs have a failure
rate of less than
0.5 %

SSDs consume between
2 & 5 watts

SSDs have an average
I/O wait of
1 %

the average service time for
an I/O request while running
a backup remains below
20 ms

SSD backups take about
6 hours

Access times

SSDs exhibit virtually no access time

5.5 ~ 8.0 ms

Random I/O Performance

SSDs are at least 15 times faster than HDDs

HDDs reach up to
400 io/s

Reliability

This makes SSDs 4 - 10 times more reliable

HDD's failure rate
fluctuates between
2 ~ 5 %

Energy savings

This means that on a large server like ours,
approximately 100 watts are saved

HDDs consume between
6 & 15 watts

CPU Power

You will have an extra 6%
of CPU power for other operations

HDDs' average I/O wait
is about
7 %

Input/Output request times

SSDs allow for much
faster data access

the I/O request time with
HDDs during backup rises up
to

400 ~ 500 ms

Backup Rates

SSDs allows for 3 - 5 times faster
backups for your data

HDD backups take up to

20 ~ 24 hours

THANK YOU KEEP LEARNING

