HARDWARE-PART1

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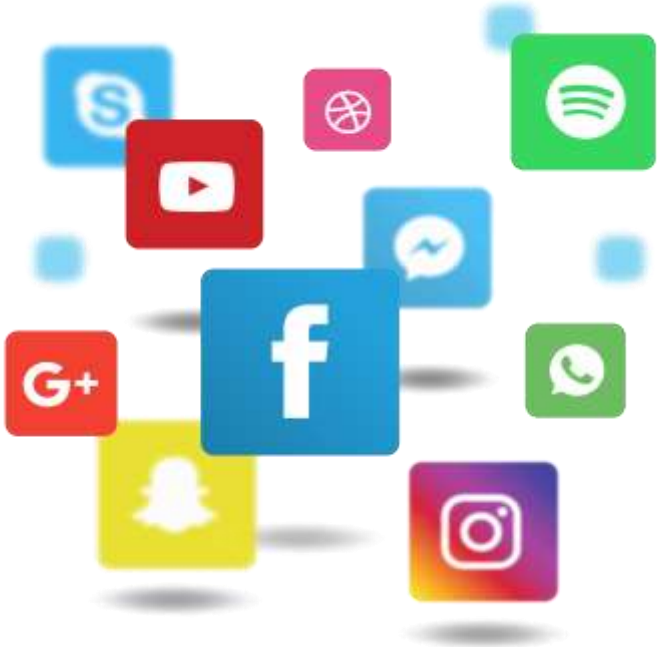
WHY SHOULD WE LEARN ABOUT COMPUTER HARDWARE ?

- purchasing a personal computer.
- getting your computer fixed up and upgraded.
- calling for help or support.

WHAT IS COMPUTER?

A computer is an electrical device used to process and store data for further use. It can save information, retrieve it, and process it.



SOFTWARE VS HARDWARE

HARDWARE VS SOFTWARE

Parameter	Hardware	Software
Definition	Hardware is a set of physical parts of computers which actually executes the instruction.	Software is a program or set of instructions which are to be executed by CPU to do the intended task.
Tangible	A hardware can be touched being a physical electronic device.	Software being digital can be seen but cannot be touched.
Categories	Hardware categories: Input Devices, Output Devices, Storage Devices, Internal components of CPU and motherboard.	Software categories: Programming Software, Application Software, Operating Systems.
Digital Transfer	A hardware can be only physically transferred.	Software can be transferred electronically.
Replacement	If hardware gets damaged, it is replaced with new one.	If Software get damaged, it is reinstalled.
Programming language	Hardware understands only machine language (or binary language).	Software can be developed in machine language or assembly language or high-level language.

BINARY SYSTEM

Unit	Size	What it means
Bit (b)	1 or 0	Short for "binary digit", after the binary code (1 or 0) computers use to store and process data
Byte (B)	8 bits	Enough information to create an English letter or number in computer code. It is the basic unit of computing
Kilobyte (KB)	1,000, or 2^{10}, bytes	From "thousand" in Greek. One page of typed text is 2KB
Megabyte (MB)	1,000KB; 2^{20} bytes	From "large" in Greek. The complete works of Shakespeare total 5MB. A typical pop song is about 4MB
Gigabyte (GB)	1,000MB; 2^{30} bytes	From "giant" in Greek. A two-hour film can be compressed into 1-2GB
Terabyte (TB)	1,000GB; 2^{40} bytes	From "monster" in Greek. All the catalogued books in America's Library of Congress total 15TB
Petabyte (PB)	1,000TB; 2^{50} bytes	All letters delivered by America's postal service this year will amount to around 5PB. Google processes around 1PB every hour
Exabyte (EB)	1,000PB; 2^{60} bytes	Equivalent to 10 billion copies of *The Economist*
Zettabyte (ZB)	1,000EB; 2^{70} bytes	The total amount of information in existence this year is forecast to be around 1.2ZB
Yottabyte (YB)	1,000ZB; 2^{80} bytes	Currently too big to imagine

Source: *The Economist*

The prefixes are set by an intergovernmental group, the International Bureau of Weights and Measures. Yotta and Zetta were added in 1991; terms for larger amounts have yet to be established.

PC VS MAC

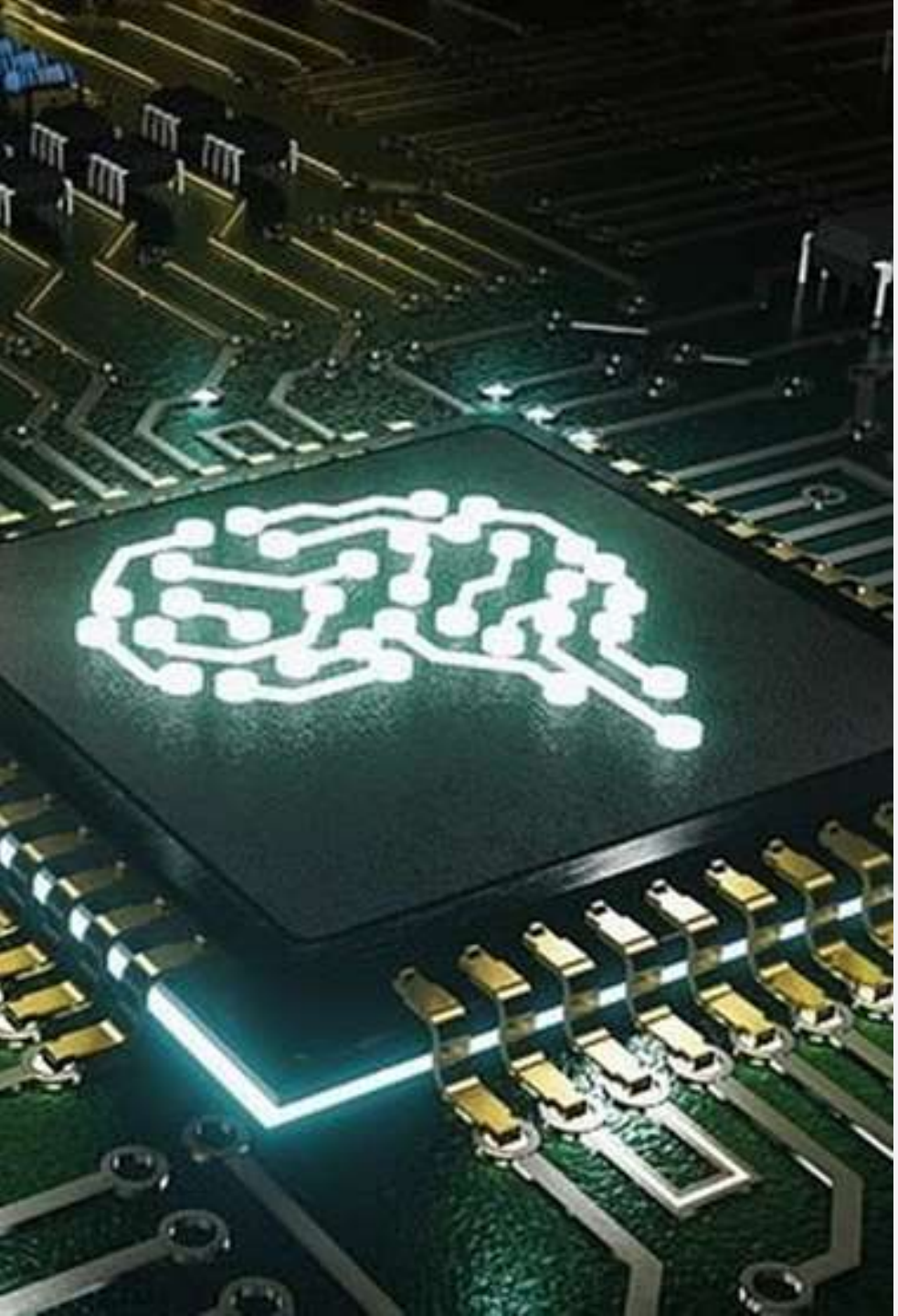
- PC is a computer that uses the Windows running system. It is also known as a computer that works with IBM software.
- Macintosh, which most people simply refer to as "Mac," is a brand name for several types of personal computers that Apple makes, develops, and sells.

PROS AND CONS (MAC)

Pros	Cons
Stability and reliability	High upfront price
Aesthetic appeal	Software is less readily available
User-friendly design	Harder to fix
Potential long-term savings	
Less prone to malware	
Strong resale value	
Seamless integration with other Apple devices	

PROS AND CONS (PCS)

Pros	Cons
Affordability	Lower resale value
Hardware flexibility	Common target of malware
Customizability	Some configurations are less stable and/or reliable
Widely available support and software	
More options for compatible accessories	
Easier to repair	
More common	

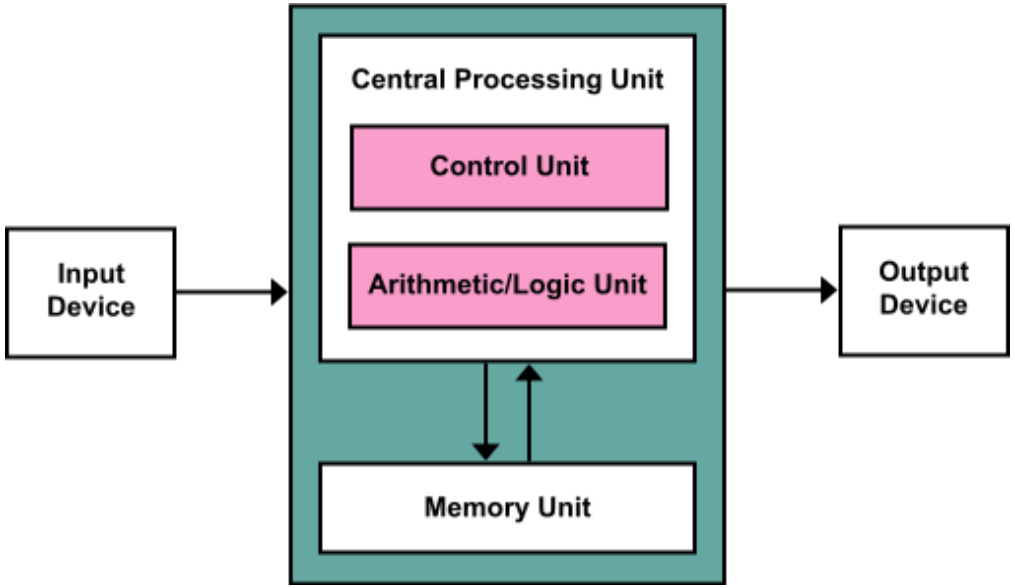


CENTRAL PROCESSING UNIT (CPU)

- (CPU) is the primary component of a computer that acts as its “control center.” The CPU, also referred to as the “central” or “main” processor.

CPU ARCHITECTURE

- If you're buying a new computer, there are two main CPU architectures to choose between. Windows PCs are normally built on the x86 platform, used by Intel and AMD, while Apple's computers use the company's own M1 and M2 processors, based on the ARM architecture.
- CPU architecture is the design and implementation of the core components of a computer processor, such as the instruction set, the registers, the pipelines, the caches, and the microcode. It determines how fast, efficient, and powerful a CPU can be, and how well it can run different types of software and applications.



FEATURES OF CPU

Cache Memory	**Cores**	**Speed**
Multithreading	**Compatibility**	**Bandwidth**

TYPES OF CPU

Single-core

Dual-core

Quad-core

Hexa core

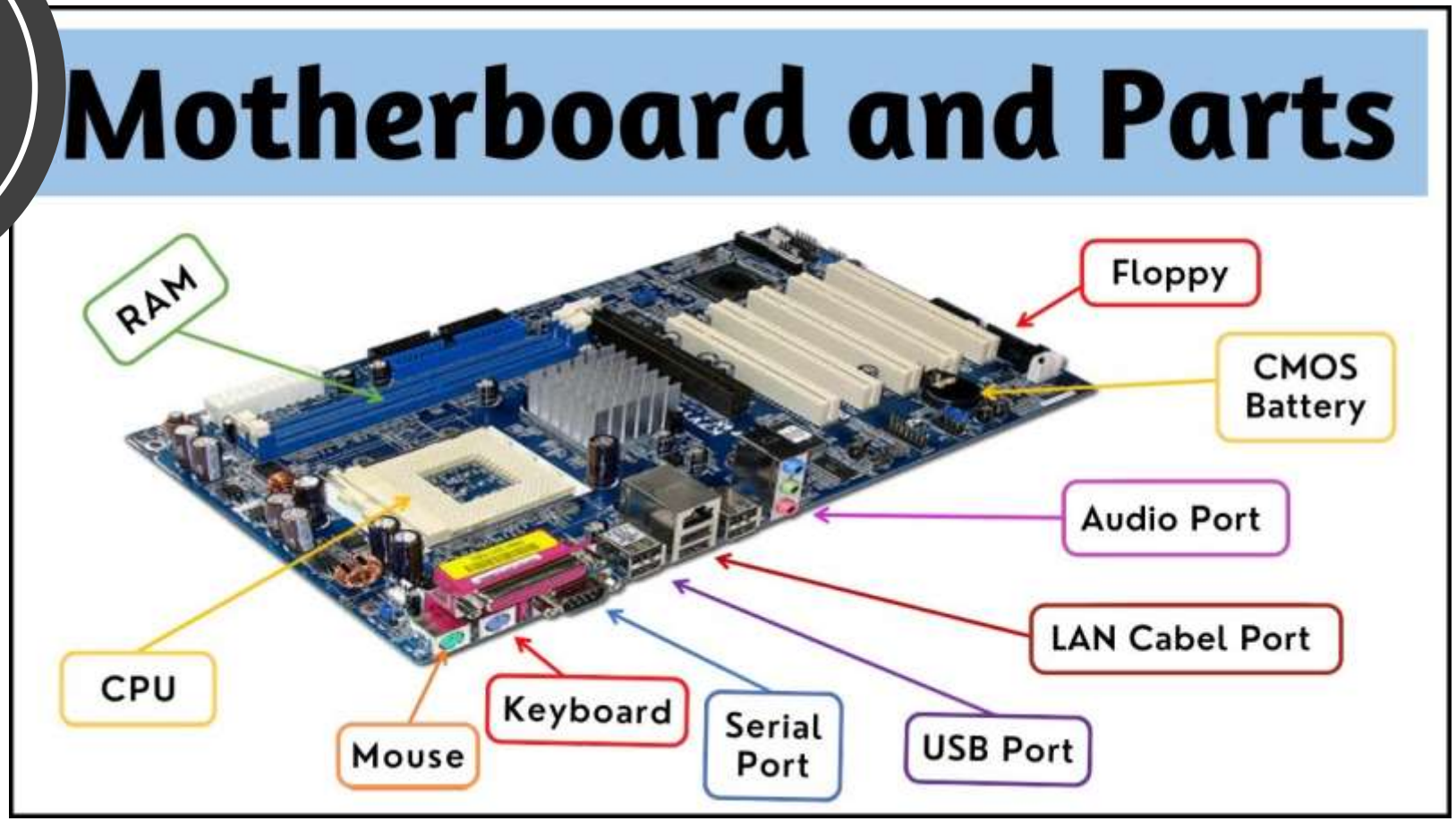
Octa-core

Deca-core

WHAT IS A MOTHERBOARD?

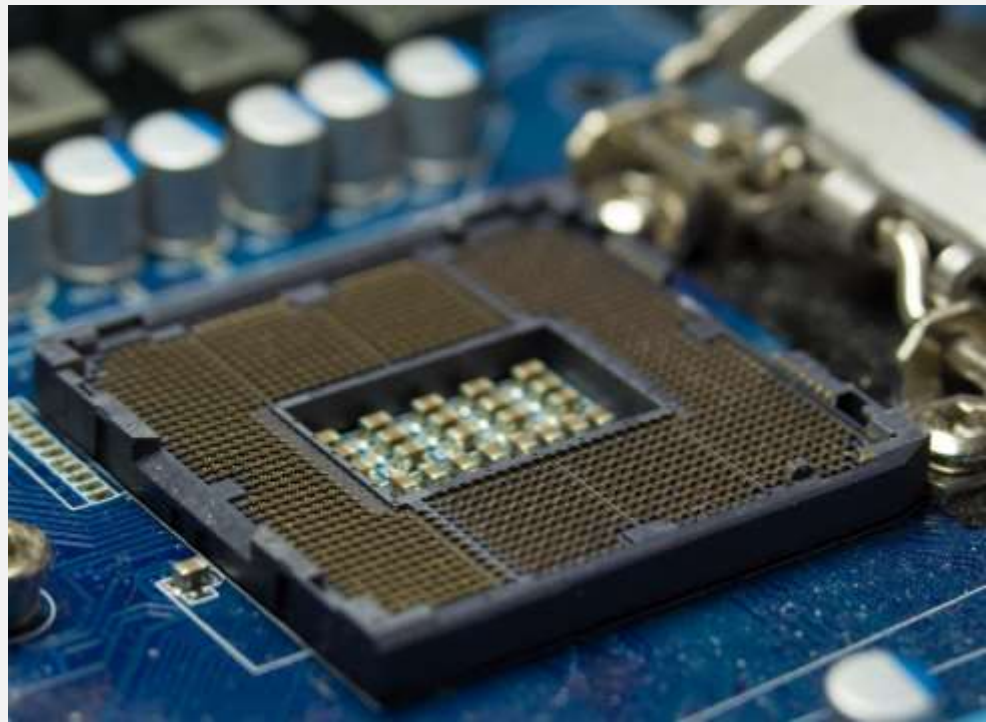
- A computer's motherboard is typically the largest printed circuit board in a machine's chassis. It distributes electricity and facilitates communication between and to the central processing unit (CPU), random access memory (RAM), and any other component of the computer's hardware.

COMPONENTS OF A MOTHER BOARD



CPU SOCKET – WHAT IS IT?

- A socket is a spot on the computer's motherboard where the processor goes. It works as an adapter to link the central processing unit (CPU) to the motherboard and make mechanical and electrical connections between the two.



4 TYPES OF CPU SOCKETS

LGA Sockets

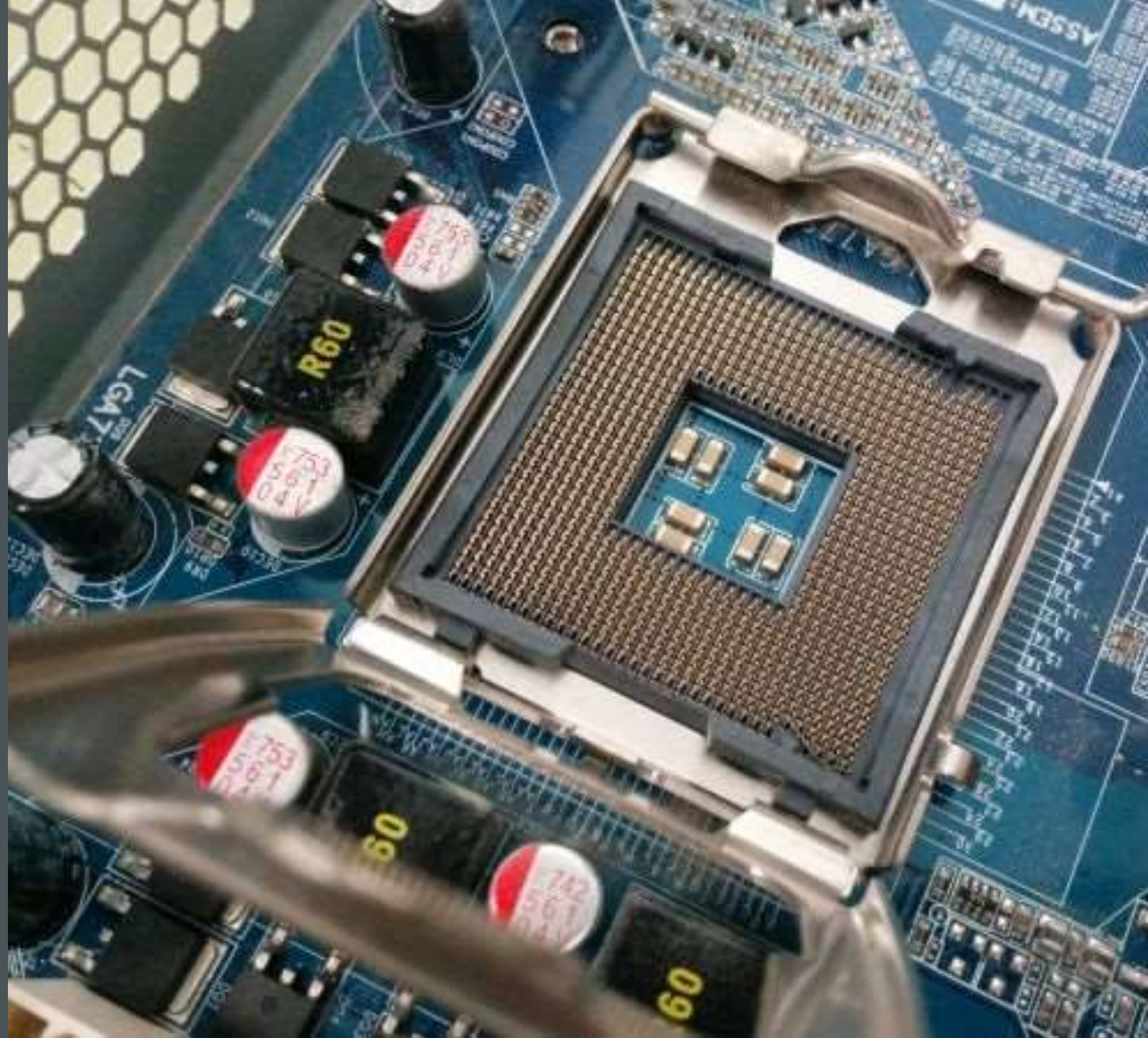
PGA Sockets

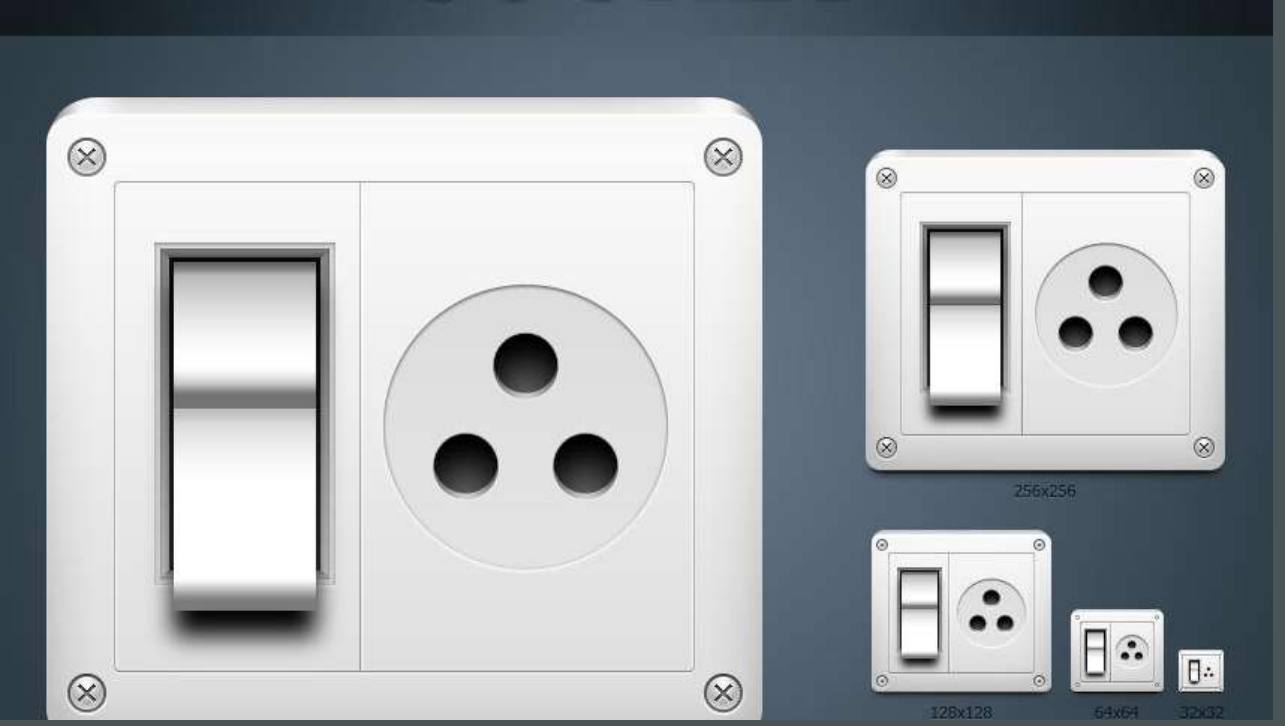
ZIF sockets

BGA Sockets

LGA SOCKETS

- Integrated circuits are often assembled using a socket called an LGA, or Land Grid Array. These sockets have metal contact points on the underside of the CPU, where the pins are located. Both ports and attaching the board itself may be used to connect the LGA to a motherboard.





PGA SOCKETS

- Rectangular or square integrated circuit packaging with pins arranged in a grid pattern is known as a PGA (Pin Grid Array). Standard pin spacing in this case is 2.54mm, therefore the pins may create gaps rather than cover the full surface.

LGA	PGA
Reduced manufacturing costs for the CPU.	The lower cost of the socket allows for a lower cost of the motherboard.
Reduced electrical leakage.	The processor feet are more durable and may be fixed if they get damaged, unlike the LGA socket feet. Legs are easily damaged in the LGA socket, and it's a pain to straighten them out.
Production capabilities for very large sockets, such as Intel's LGA 3647 and AMD's TR4.	Mobile devices may benefit from the PGA socket's smaller size and portability.
Safer than PGA sockets at keeping CPUs in place.	

LGA VS PGA SOCKETS(ADVANTAGES)

ZIF SOCKETS

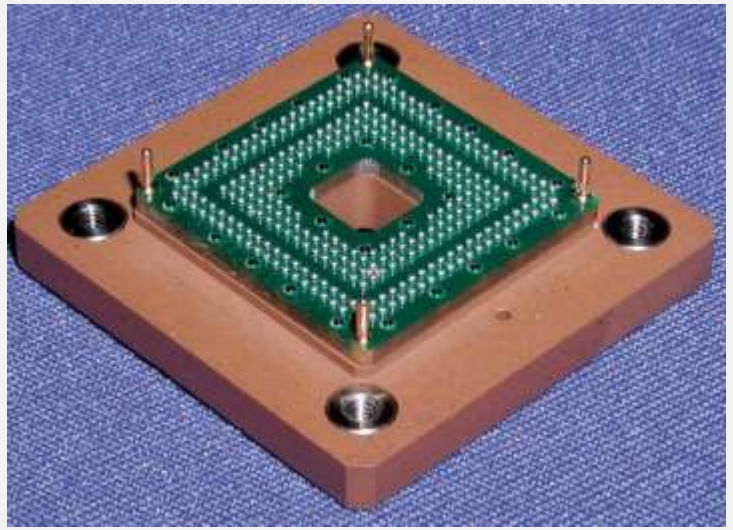
- ZIF (Zero Insertion Force): This is a development of the PGA in which the microprocessor inserts the pins into the socket connections without the need of any external tools. The term "Zero Insertion Force" (ZIF) refers to the lack of force required to insert or remove the CPU from its socket.

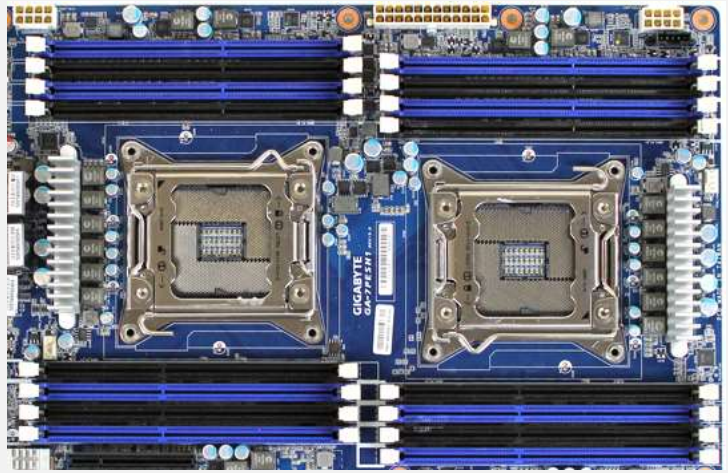
- ZIF sockets are commonplace in computer memory and other components that allow for the change of data in a computer system.

BGA SOCKETS

- The BGA (Ball Grid Array) socket is not technically a socket, since the microprocessors are permanently installed in this socket, and hence is not as well-known as other kinds of sockets.

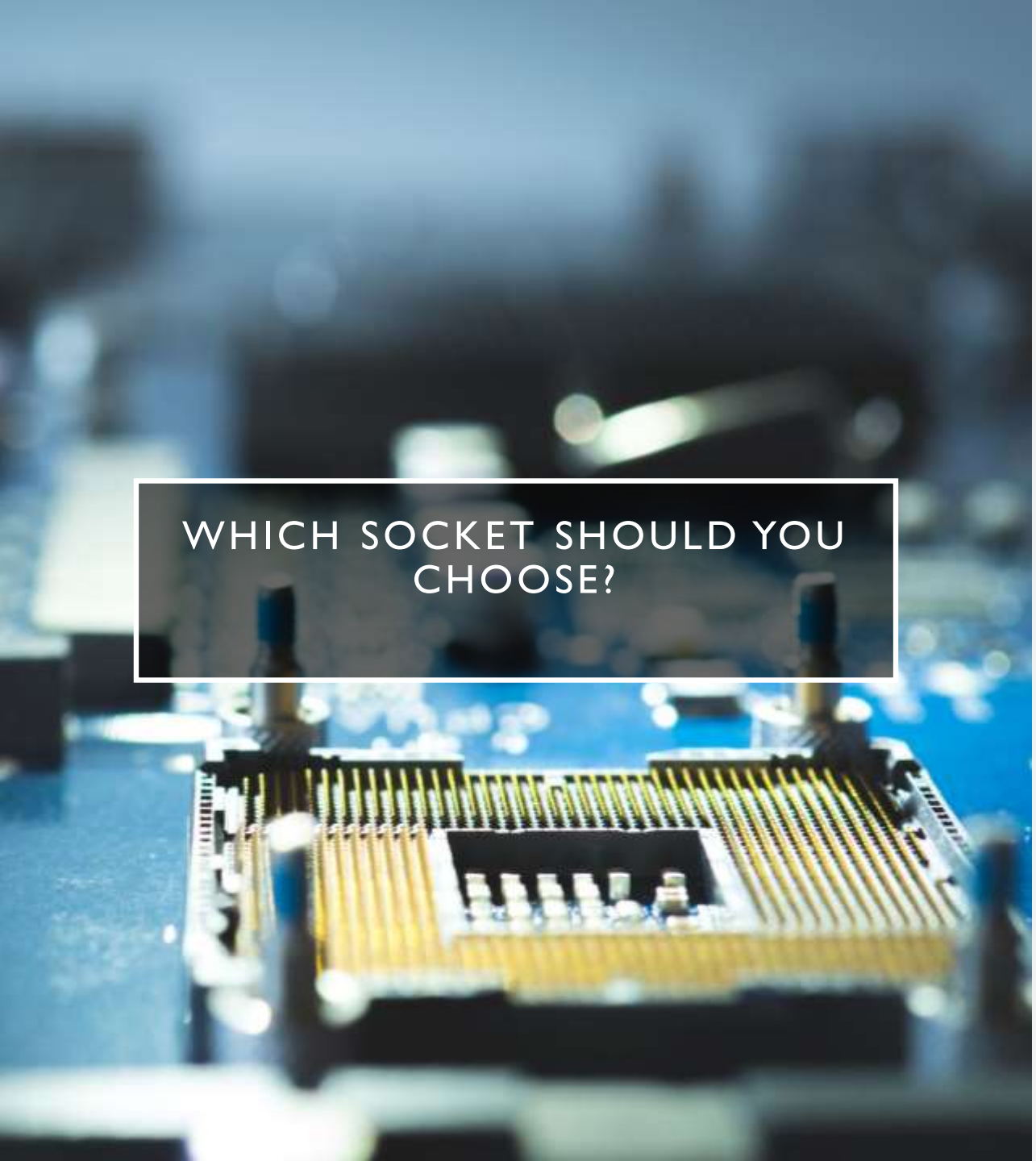
- There are less counterparts between consumer BGA, LGA, and PGA products, therefore the BGA connection and motherboard might be cheaper. So, tell me, where do you locate this plug in? Wherever a compact electronic board is required, such in computers, mobile phones, memory chips, etc.





INTEL VS AMD CPU SOCKETS

- If you're using a modern Intel processor, you'll find the CPU socket near the VRM area of the motherboard (see image below, right), while if you're using an AMD processor, you'll find the CPU socket near the VRM area of the motherboard, but the pins for the AMD processor are soldered directly to the processor and the socket has slots into which these pins are inserted.



WHICH SOCKET SHOULD YOU CHOOSE?

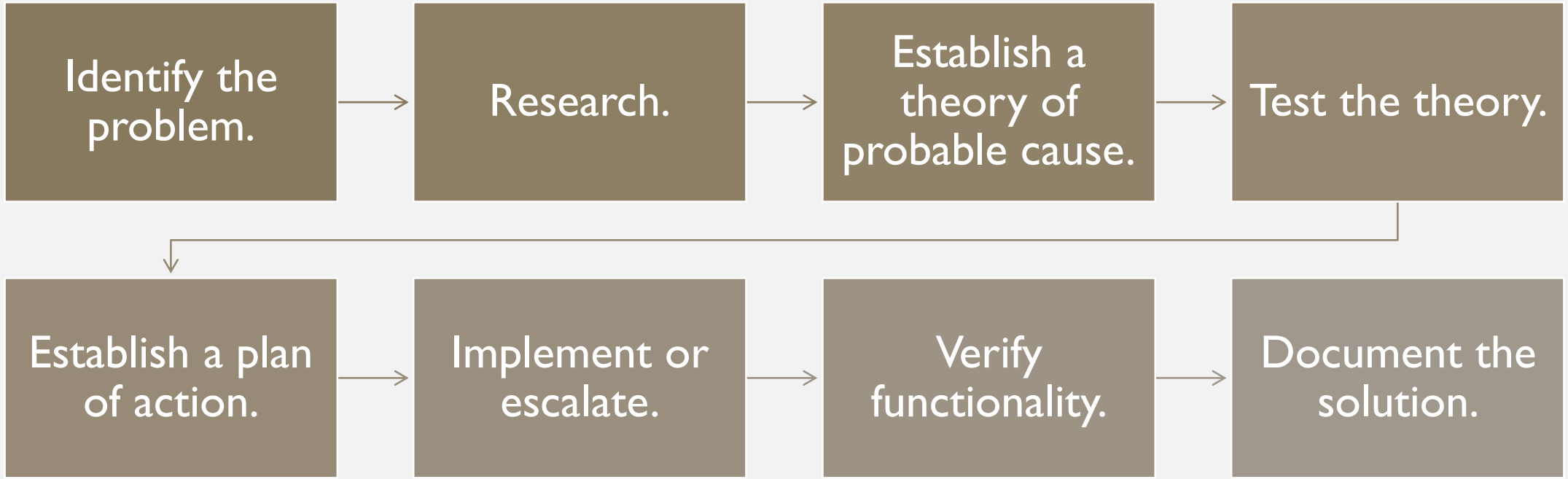
- No one ever choose the Socket by itself while putting up a PC. To ensure compatibility with the motherboard, the kind of socket you have will determine which cooler you may use.

- If you plan on purchasing an AMD CPU in the future, then this is the best choice of Socket for your needs. However, if you're using an Intel CPU, you don't have to choose a socket since the socket version changes whenever a new processor is released, necessitating a new motherboard.

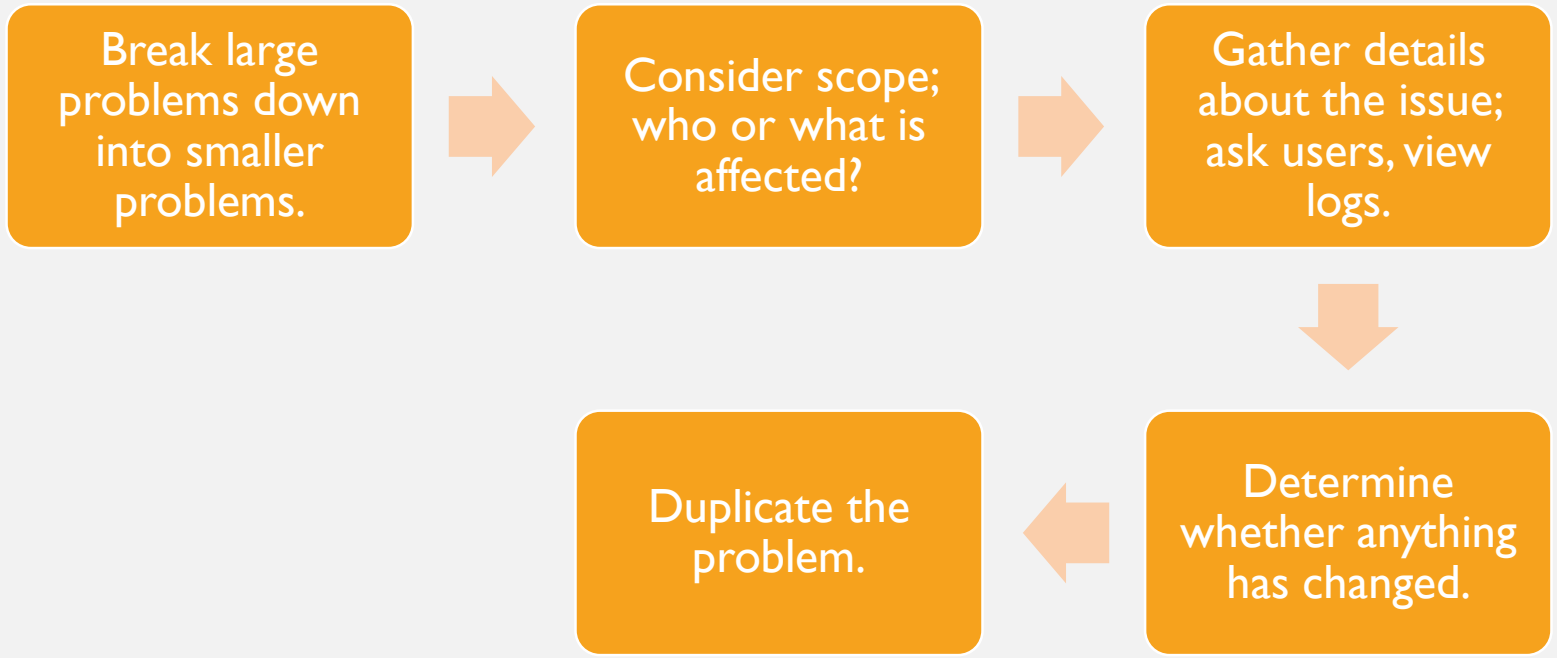
TROUBLESHOOTING METHODOLOGIES

- Troubleshooting methodologies usually try to isolate a problem so that it can be examined. The initial goal is to diagnose the problem and try obvious solutions, such as performing a system reboot, powering down and up, and checking that the power cord is connected.

8 PHASES IN THE TROUBLESHOOTING METHODOLOGY



STEP 1. IDENTIFY THE PROBLEM



STEP 2. RESEARCH

Refer to past help desk tickets.

Search through private or public knowledge bases.

Ask friends or colleagues.

Internet search.

STEP 3. ESTABLISH A THEORY OF PROBABLE CAUSE

Eliminate the simple and obvious possible causes.

Consider factors that can indirectly cause problems.

STEP 4. TEST THE THEORY

1. Change and test only one potential solution at a time.
2. Determine the root cause of the issue.
3. Escalate the issue to a professional if necessary.

STEP 5. ESTABLISH A PLAN OF ACTION

1. Prepare a specific method to implement the solution.
2. Test the plan in an isolated sandboxed environment.
3. Notify other users if the solution could possibly affect them.
4. Escalate the issue to a professional if necessary.

STEP 6. IMPLEMENT OR ESCALATE

BACK UP CONFIGURATIONS AND DATA FIRST.

IF THE PROBLEM IS COMPLEX, MONITOR IMPLEMENTATION PROGRESS.

STEP 7. VERIFY FUNCTIONALITY

Ensure the solution has solved the original problem.

Ensure new problems have not been introduced.

Consult a subject-matter expert if needed.

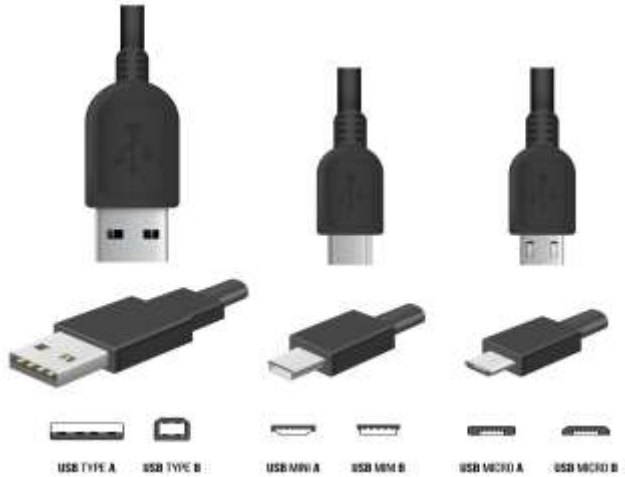
Configure preventative measure if appropriate.

STEP 8. DOCUMENT THE SOLUTION

Document the problem and steps taken in the solution.

Update old documentation with new knowledge.

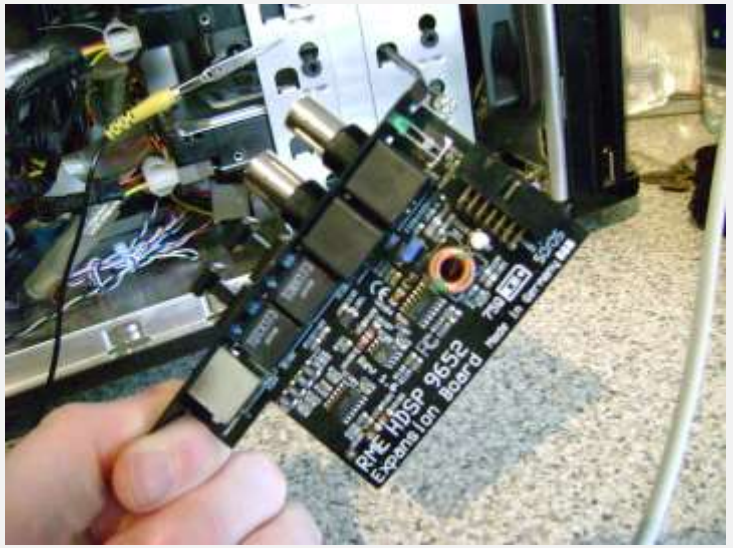
TYPES OF COMPUTER CABLES



EXPANSION CARDS

A type of add-on that goes into a location on the motherboard is called an expansion card. With these cards, you can make your computer system more powerful. You can use them to add more memory, add more ports, or even connect items from the outside.

For example, you could add an extra computer or printer to your laptop to make it do more. There are two kinds of expansion cards: PCI, which stands for "Peripheral Component Interconnect," and AGP, which stands for "Accelerated Graphics Port."



TYPES OF EXPANSION CARD

- **Video Card**
- **Sound Card**
- **Network Interface Card (NIC)**
- **TV Tuner Card**
- **Modem card**

PART I END