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كلية العلوم
قسم الفيزياء الطبية



computer science

Lecture Three

Subject: Motherboard, Expansion Slots, and System Interfaces

Class: First stage

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This unit aims to:

- Provide a clear understanding of the structure and functions of the motherboard
- Explain the role and types of expansion slots in enhancing system capabilities
- Identify and describe integrated components within modern motherboards
- Illustrate the purpose of external connectors and their practical uses
- Examine the power supply system and its connection to motherboard components
- Differentiate between ports and interfaces and their respective functions
- Analyze how these components interact to ensure efficient computer performance
- Develop the ability to select appropriate hardware components for system design and upgrades
- Enhance troubleshooting skills related to motherboard and hardware issues
- Build foundational knowledge for advanced studies in computer architecture and hardware systems



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Introduction to the Motherboard

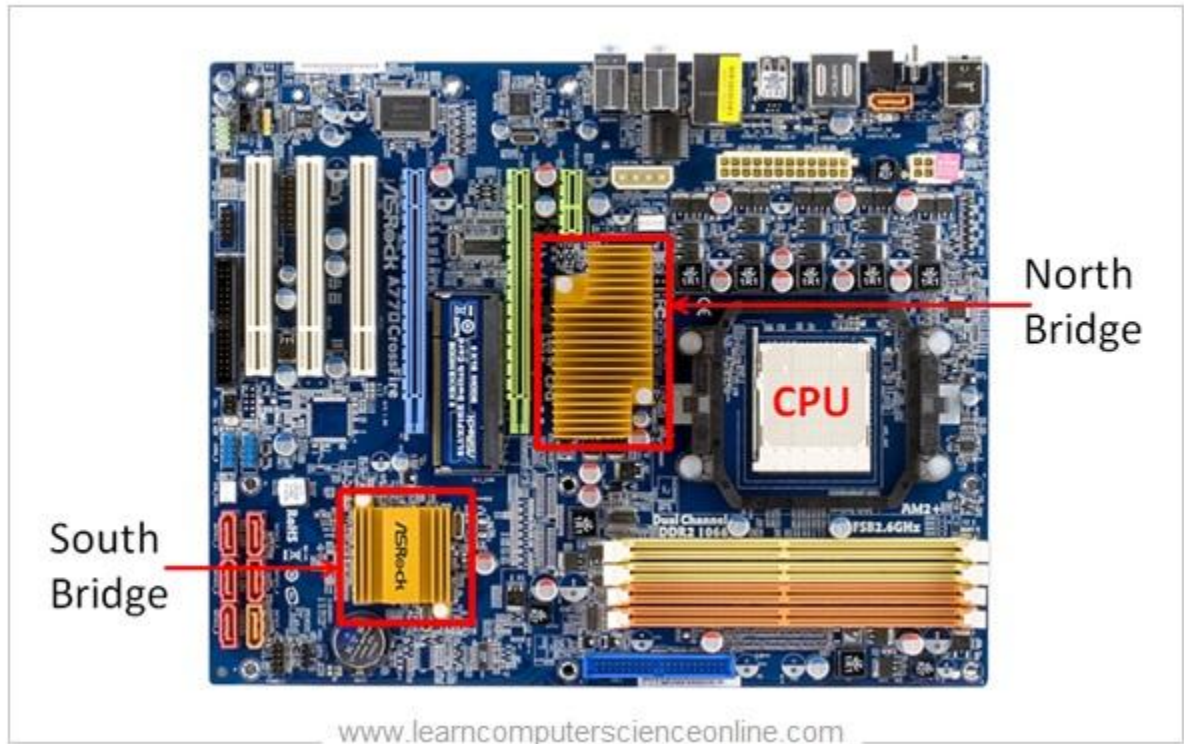
The motherboard is the central printed circuit board (PCB) of a computer system. It connects all essential components such as the CPU, RAM, storage devices, and peripherals.

Main functions:

- Acts as a communication hub between components
- Distributes power to hardware parts
- Supports system coordination and data flow
- Ensures compatibility among devices



Computer Motherboard - Chipset



Core Components of the Motherboard

The motherboard includes several fundamental components:

1. CPU Socket – holds the processor
2. RAM Slots – accommodate memory modules
3. Chipset – manages communication between CPU and peripherals



4. Expansion Slots – allow adding extra hardware
5. I/O Ports – connect external devices
6. Power Connectors – supply electrical power



Expansion Slots

Expansion slots enable users to enhance system functionality by installing expansion cards.

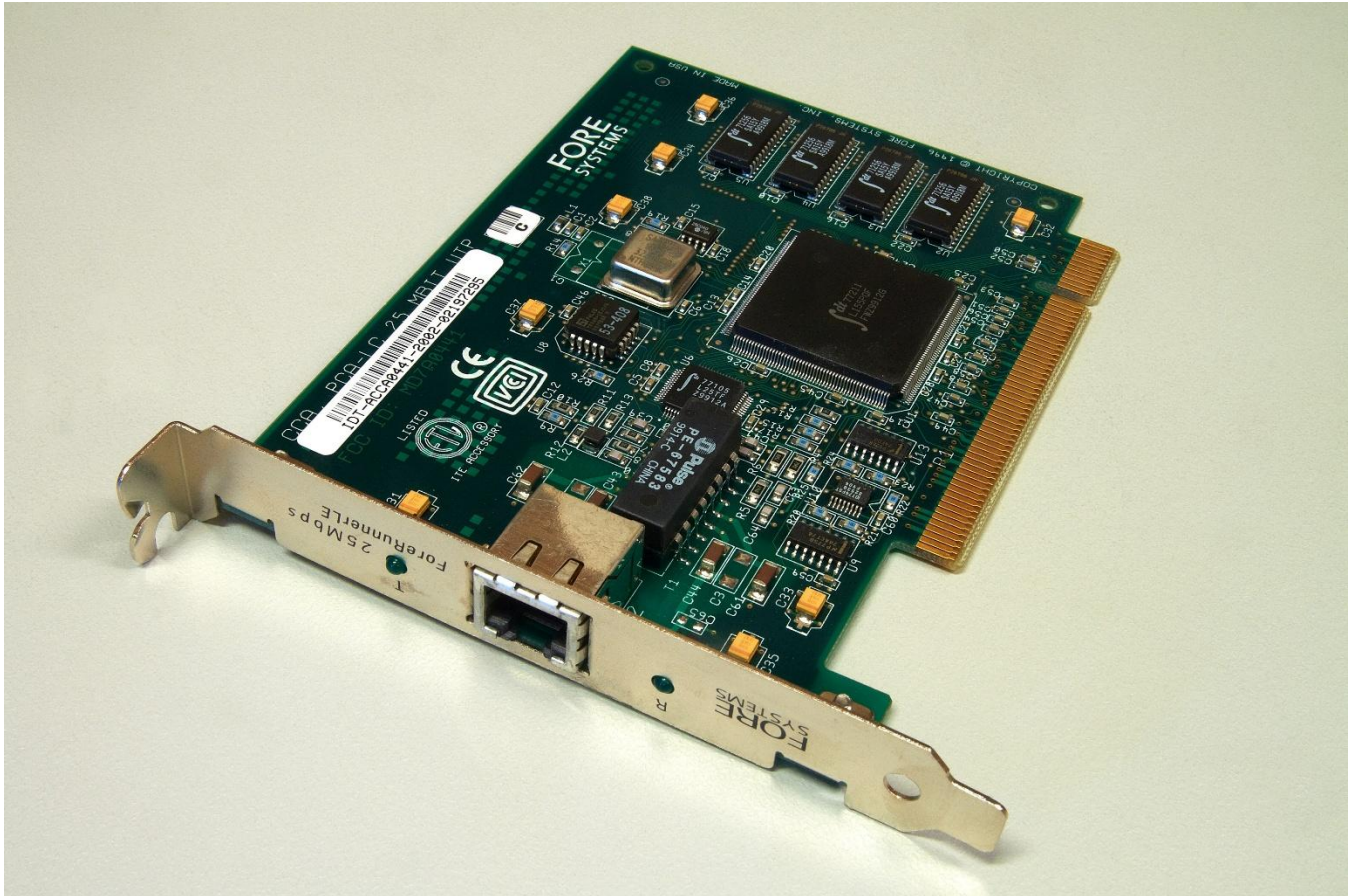
Types:



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- PCI
- PCI Express (PCIe)
- AGP (obsolete)



Applications:

- Graphics processing units (GPU)
- Sound cards



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- Network interface cards
- Storage controllers

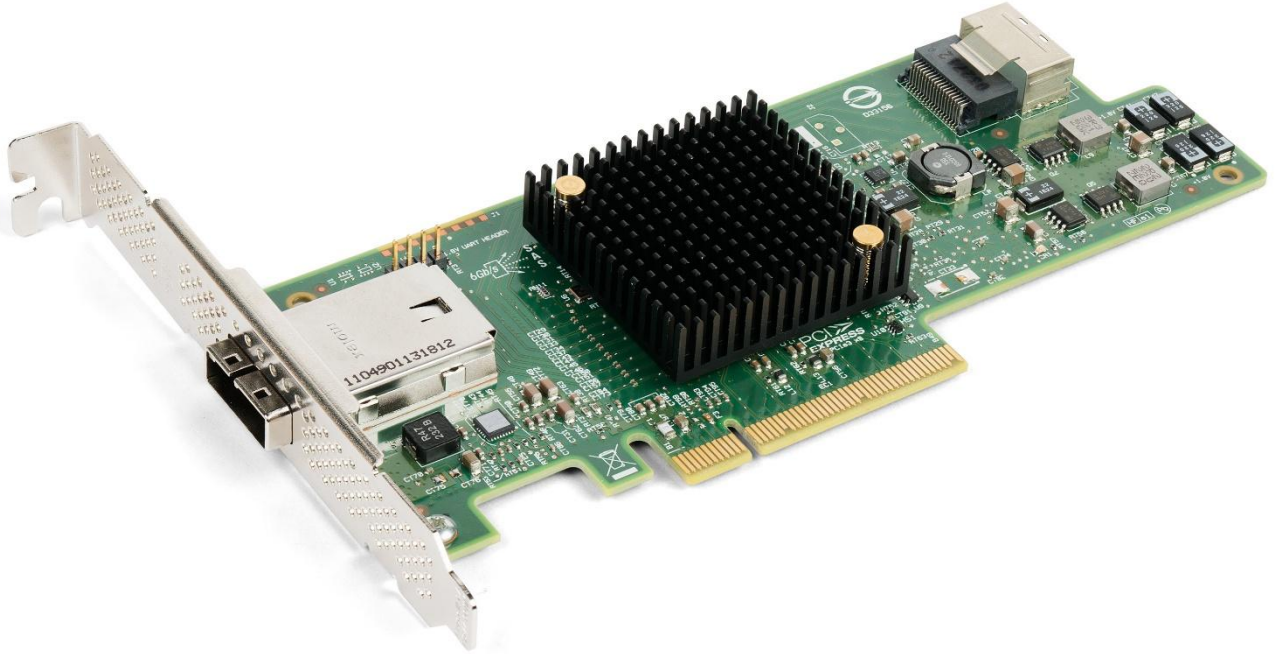


PCI Express Technology

PCI Express (PCIe) is the most advanced expansion slot standard.



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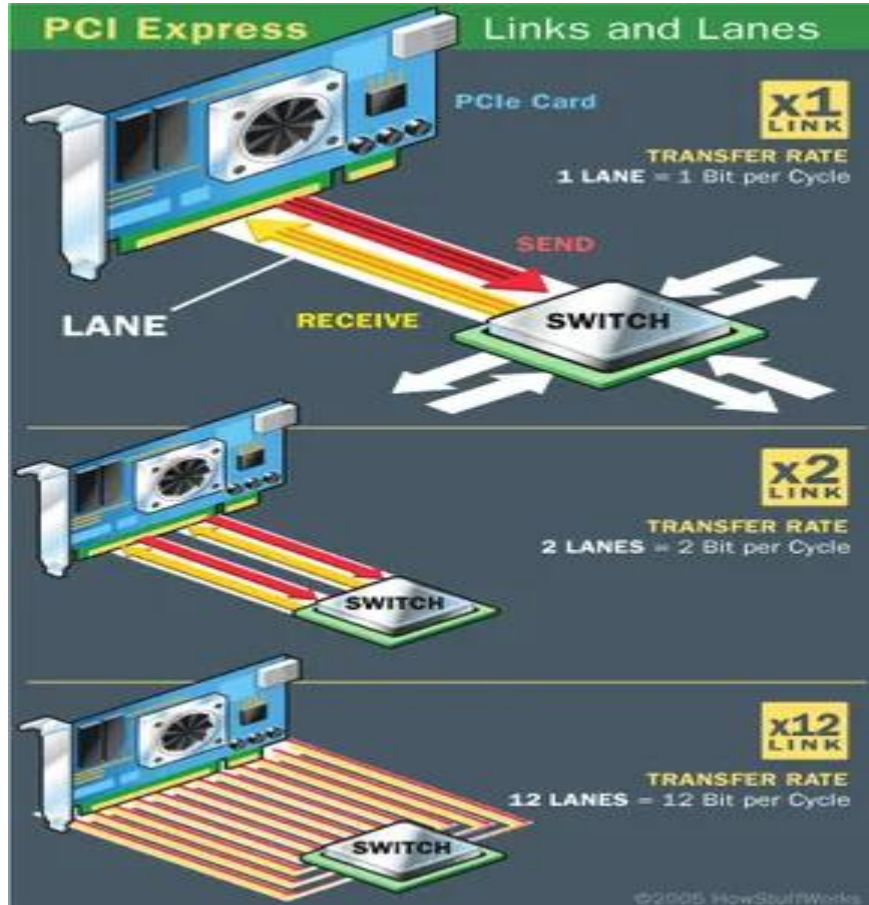


Features:

- High bandwidth and speed
- Scalable lane configurations (x1, x4, x8, x16)
- Efficient power usage
- Reliable high-performance communication



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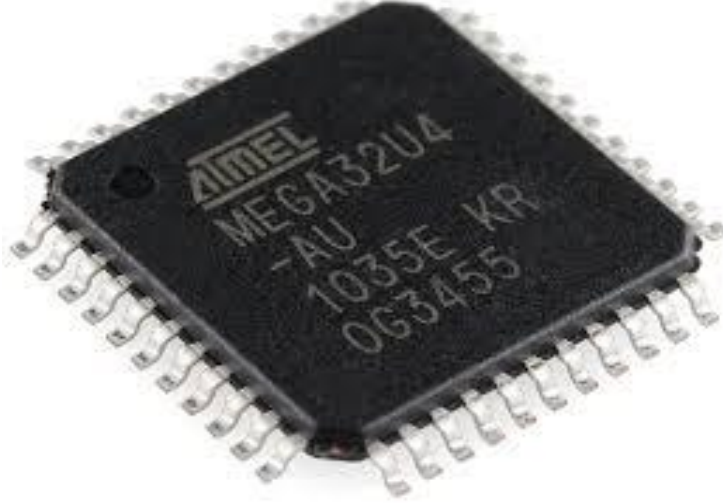


Integrated Components

Modern motherboards include built-in components:



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Examples:

- Integrated audio system
- LAN (network interface)
- Integrated graphics processor
- Wireless communication modules

Advantages:

- Reduced cost
- Simplified system design
- Lower energy consumption



External Connectors

External connectors provide interfaces for peripheral devices.

Common connectors:

- USB
- HDMI / DisplayPort
- Ethernet
- Audio ports

They support communication, multimedia output, and device interaction.

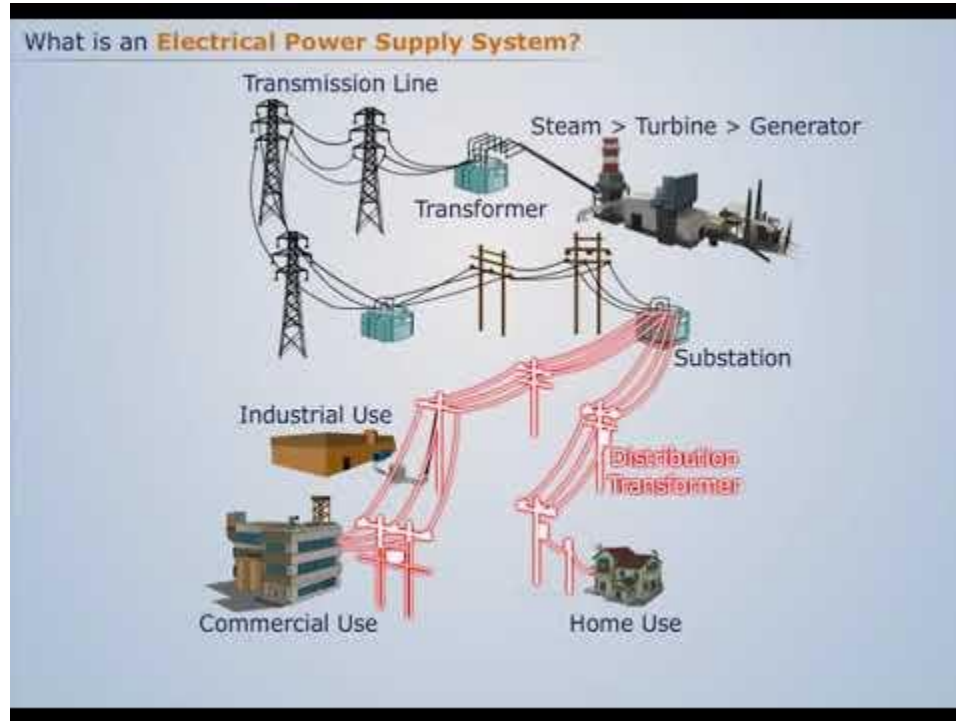


Power Supply System

The motherboard relies on the Power Supply Unit (PSU) for energy.



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Main connectors:

- 24-pin ATX connector
- CPU power connector (4/8-pin)
- SATA power connectors

These ensure stable operation of all components.

Ports

Ports are physical connection points on the motherboard.



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Types:

USB ports

- Display ports (HDMI, VGA)
- PS/2 ports (legacy)
- Network ports (Ethernet)

They differ in speed, functionality, and compatibility.

Interfaces

Interfaces define communication standards within the system.

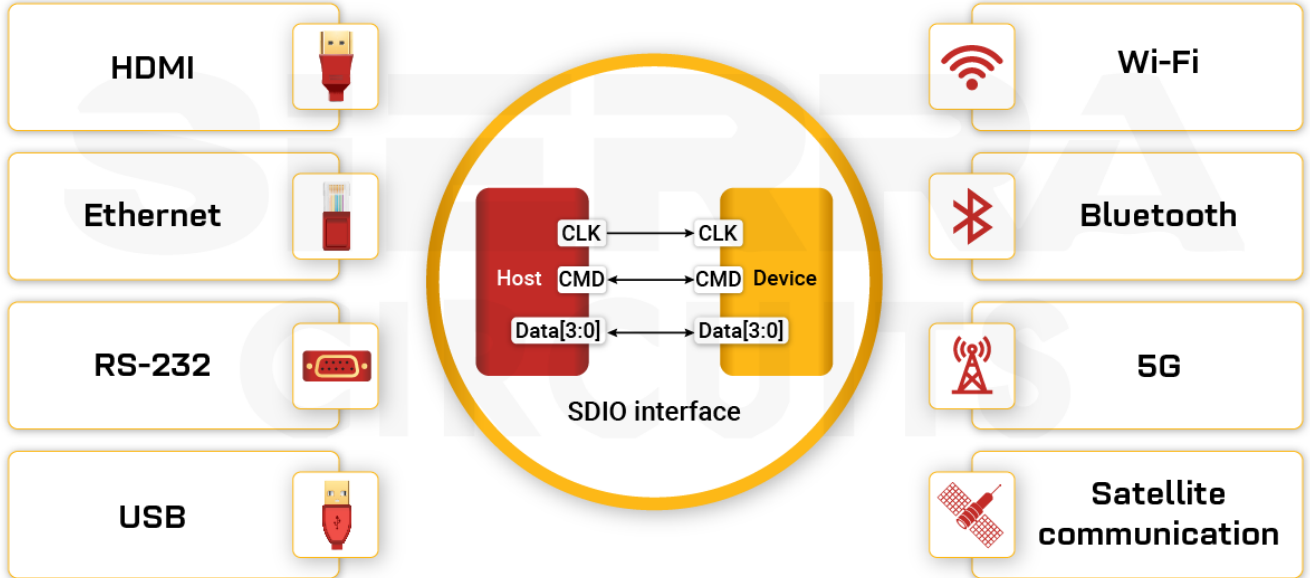


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SIERRA
CIRCUITS

Essential PCB interfaces every designer should know



Categories:

- Storage: SATA, NVMe
- Input/Output: USB, Thunderbolt
- Networking: Ethernet, Wi-Fi

They play a key role in system performance and efficiency.



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Conclusion

The motherboard is the backbone of a computer system. It integrates hardware components and ensures efficient communication.

Understanding its structure and related technologies enables:

- Better system design
- Hardware troubleshooting
- Performance optimization
- Efficient upgrades