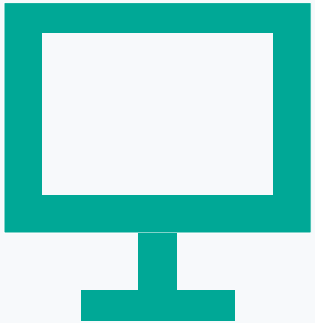
COMPUTER BASICS

What is a Computer?

An Introduction to Computing Technology

What is a Computer?

A computer is an electronic device that manipulates information or data.



Key Capabilities:

- Store data and information
- Retrieve information when needed
- Process and manipulate data

Common Uses:

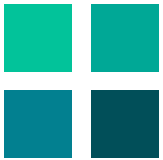
- Type documents and send an email
- Play games and browse the web
- Create spreadsheets, presentations, and videos

Hardware vs. Software

Hardware

Physical components you can touch

- Keyboard and mouse
- Monitor and screen
- Computer case
- Internal parts (CPU, RAM, etc.)



Software

Instructions that tell hardware what to do

- Web browsers
- Games and apps
- Word processors
- Operating systems

Types of Computers

Computers come in many shapes and sizes, each designed for different purposes.

1. **Desktop Computers**
   Designed for desk use with separate components
2. **Laptop Computers**
   Portable, battery-powered computers
3. **Tablet Computers**
   Handheld devices with touch screens
4. **Servers**
   Provide information to other computers on a network

Other Computing Devices

Many everyday electronics are specialized computers:

Smartphones

Cell phones that can browse the internet and run apps

Wearables

Fitness trackers and smartwatches are worn throughout the day

Game Consoles

Specialized computers for playing video games on TV

Smart TVs

TVs with apps that access online content and streaming services

PCs and Macs

Personal computers come in two main styles:

PC (Personal Computer)

- Origin: IBM PC (1981)
- Compatible systems became known as PCs
- Most common type of personal computer
- Typically runs Microsoft Windows

Mac (Macintosh)

- Introduced in 1984
- First widely sold PC with a GUI
- All made by Apple
- Runs Mac OS X operating system

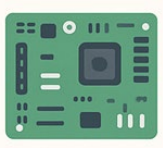
Basic Parts of a Computer

Essential components every desktop computer needs:

- **Computer Case**
  Houses internal components
- **Monitor**
  Displays information and graphics
- **Keyboard**
  Input device for typing
- **Mouse**
  Pointing device for navigation
- **Power Cord**
  Supplies electrical power

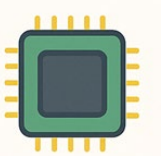
Each part plays an important role whenever you use a computer

Inside a Computer



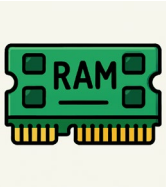
Motherboard

The main circuit board connecting all components



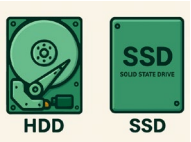
CPU - Central Processing Unit

The 'brain' that processes instructions



RAM

Short-term memory for current tasks

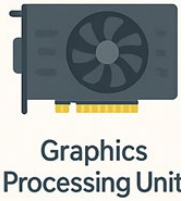


HDD & SSD

Long-term storage for files and programs

Power Supply

Converts electricity and distributes power



Expansion Cards

Video cards, sound cards, and network cards

Motherboard

Motherboards are the backbone of a computer system, housing essential components such as the CPU, RAM, and expansion cards.

Standard-ATX

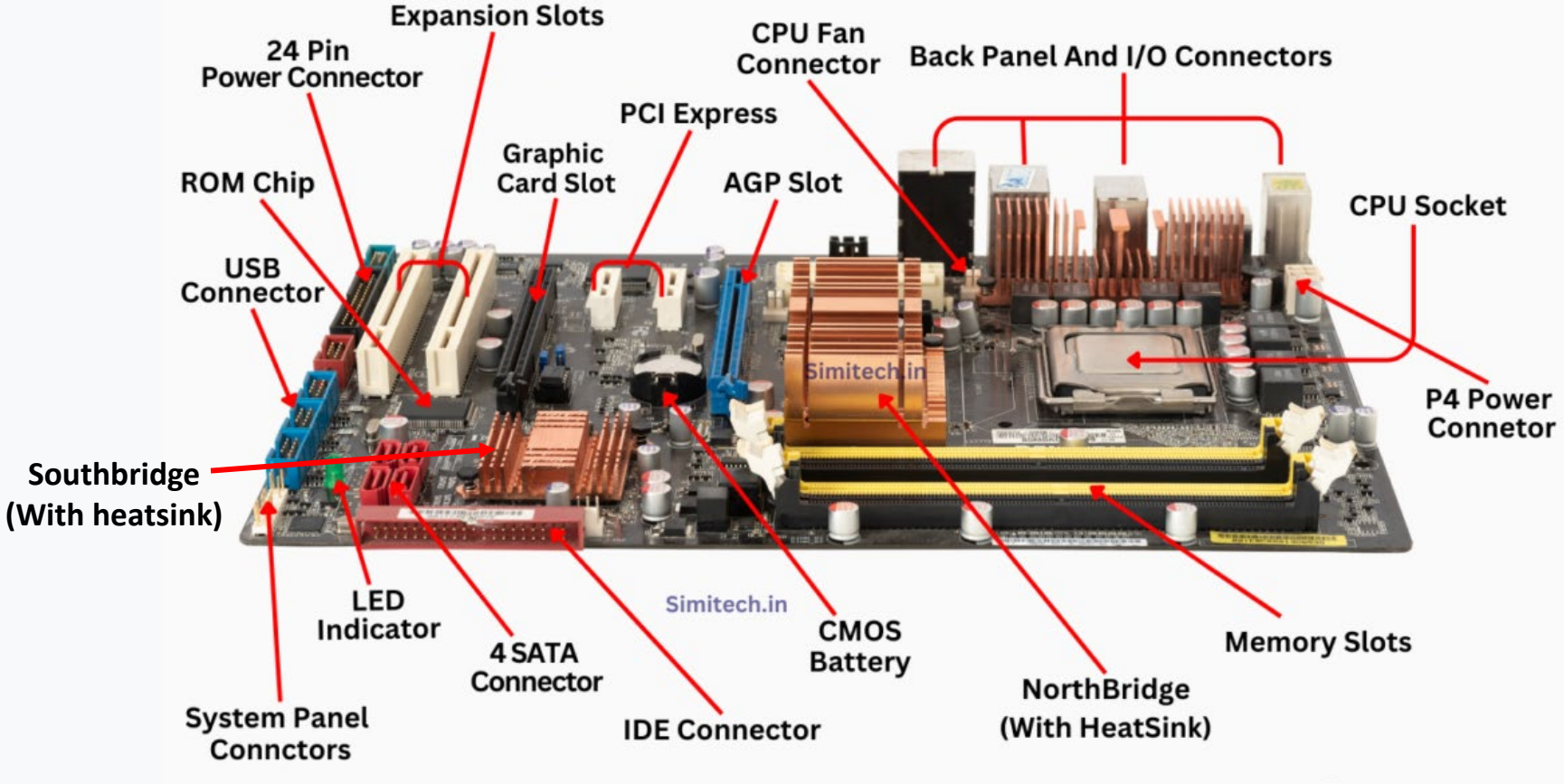
Micro-ATX

Mini-ITX

Nano-ITX

Pico-ITX

Parts of a Motherboard



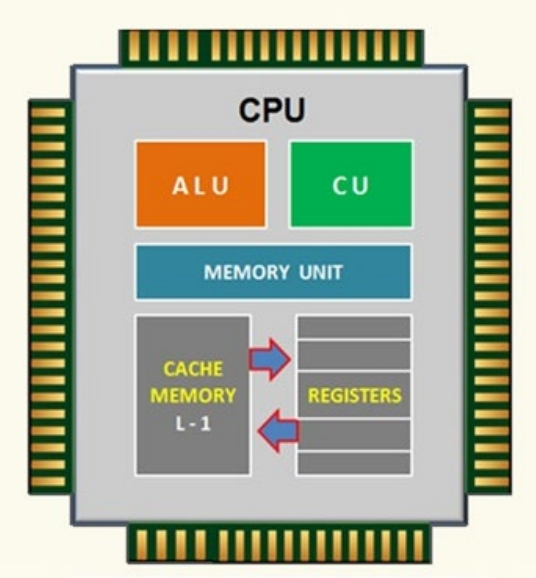
Northbridge vs. Southbridge

In traditional computer architectures (late 1990s to early 2010s), the motherboard chipset was divided into two separate chips.

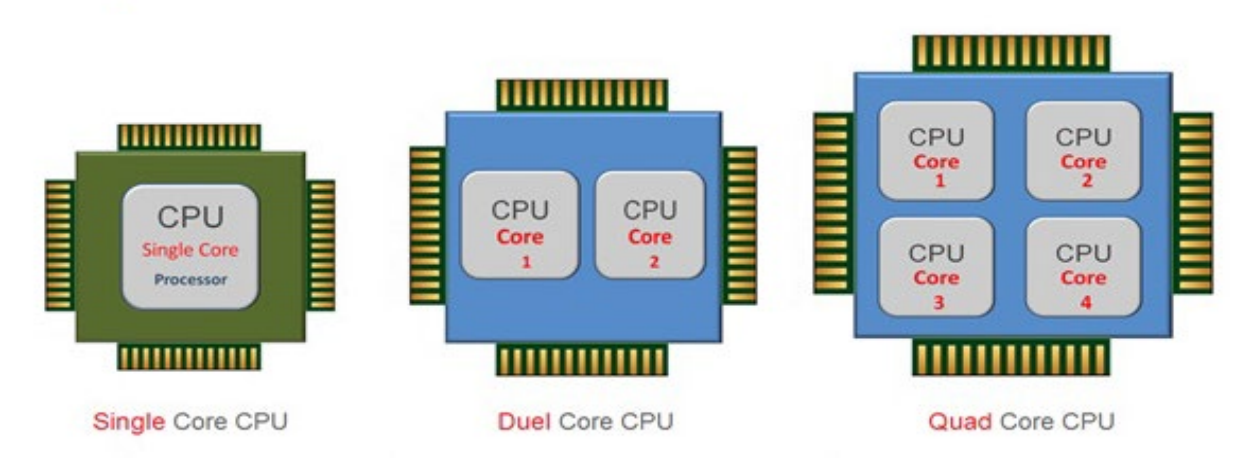
Feature	Northbridge	Southbridge
Also Known As	Memory Controller Hub (MCH)	I/O Controller Hub (ICH)
Physical Location	Near the CPU	Lower part of the motherboard
Connection	Connects directly to the CPU	Connects to the Northbridge
Speed	High-speed	Lower-speed
Components Controlled	RAM, Graphics Card (AGP/PCIe), CPU	Hard Drives (SATA/IDE), USB ports, Audio, Network, PCI slots, BIOS
Primary Role	Manages performance-critical tasks	Manages peripherals and slower I/O devices
Heat Output	Runs hot (often requires a heatsink)	Runs cool (usually no heatsink needed)

CPU - Central Processing Unit

A central processing unit (CPU) is the primary functional component of a computer.



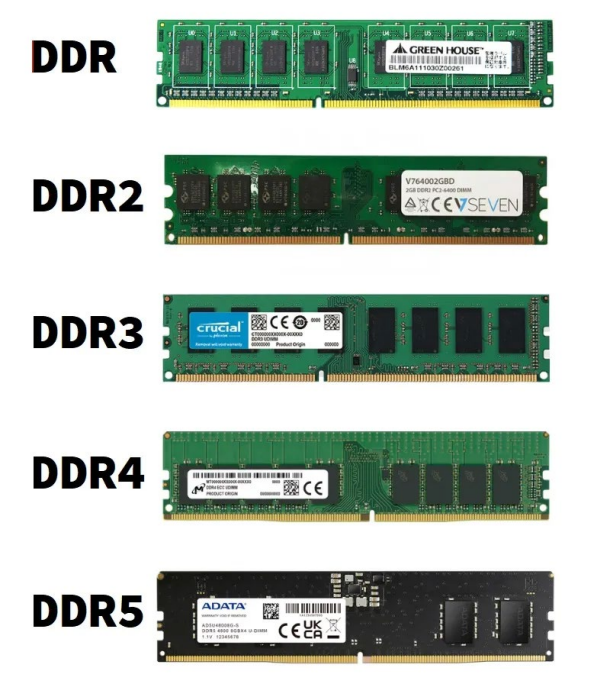
Inside the CPU

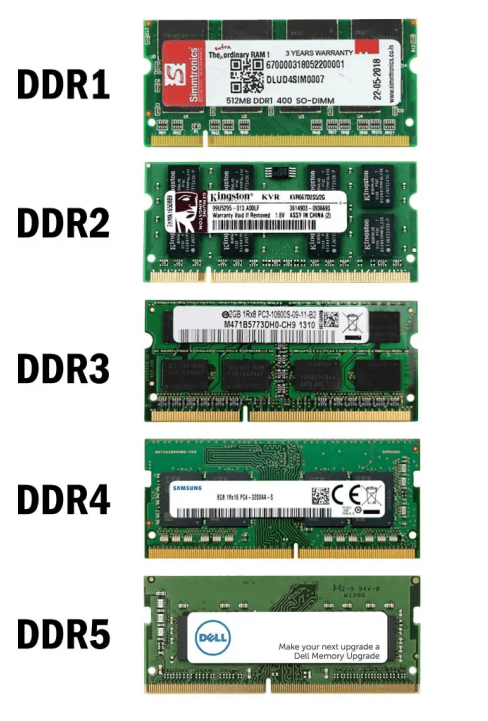


Types of CPUs

RAM - Random Access Memory

RAM is a hardware device that allows information to be stored and retrieved on a computer.





Expansion Cards

Expansion cards are circuit boards that plug into expansion slots on the motherboard to add new capabilities or enhance existing features of a computer.

Key Points:

- Installed in expansion slots (PCI, PCIe)
- Add functionality not built into the motherboard
- Can be upgraded or replaced independently
- Require proper drivers for operation
- Range from basic to high-performance

Graphics Card (GPU)

Processes and renders graphics

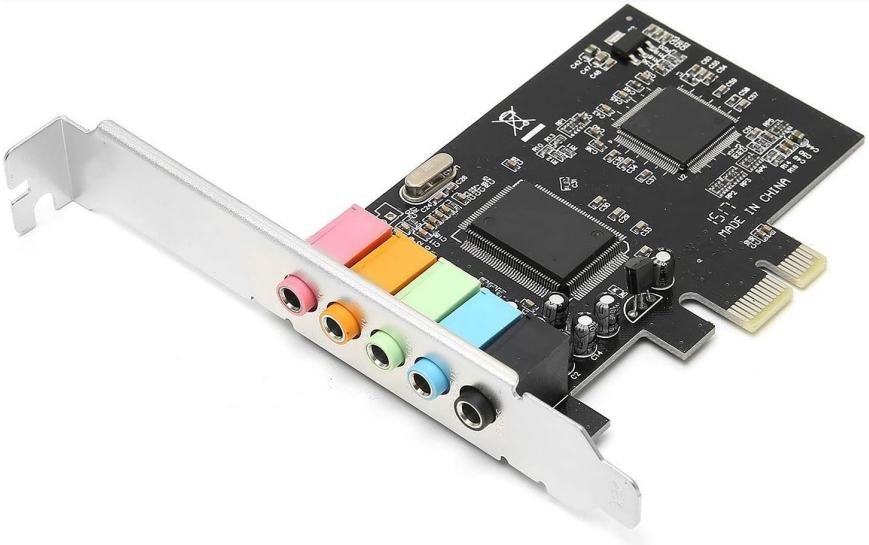
Purpose:

- Accelerates 3D graphics rendering
- Powers gaming at high resolutions
- Supports multiple monitors
- Handles video editing and encoding

Popular Manufacturers:

- NVIDIA (GeForce RTX, GTX series)
- AMD (Radeon RX series)
- Intel (Arc series)

Sound Card (Audio Card)



Processes audio input and output

Functions:

- Converts digital audio to analog signals
- Provides superior sound quality
- Supports surround sound (5.1, 7.1)
- Reduces CPU load for audio processing

Common Uses:

- Music production and recording
- Gaming with immersive audio
- Home theater systems

Network Interface Card (NIC)

Enables network connectivity

Types:

- Ethernet (Wired): 1 Gbps to 10 Gbps
- Wi-Fi (Wireless): 802.11ac, 802.11ax (Wi-Fi 6)
- Fiber Optic: High-speed enterprise

Features:

- Connects computer to LAN/Internet
- Supports network protocols (TCP/IP)
- Often includes Bluetooth capability
- Reduces latency for online gaming

TV Tuner Card

Watch and record TV on computer

Functions:

- Receives TV signals (antenna/cable)
- Converts signals to digital format
- Records TV shows to hard drive
- Time-shifting and pause live TV

Types:

- Analog TV tuners
- Digital TV tuners (ATSC, DVB)
- Hybrid (analog and digital)

USB Expansion Card

Adds additional USB ports

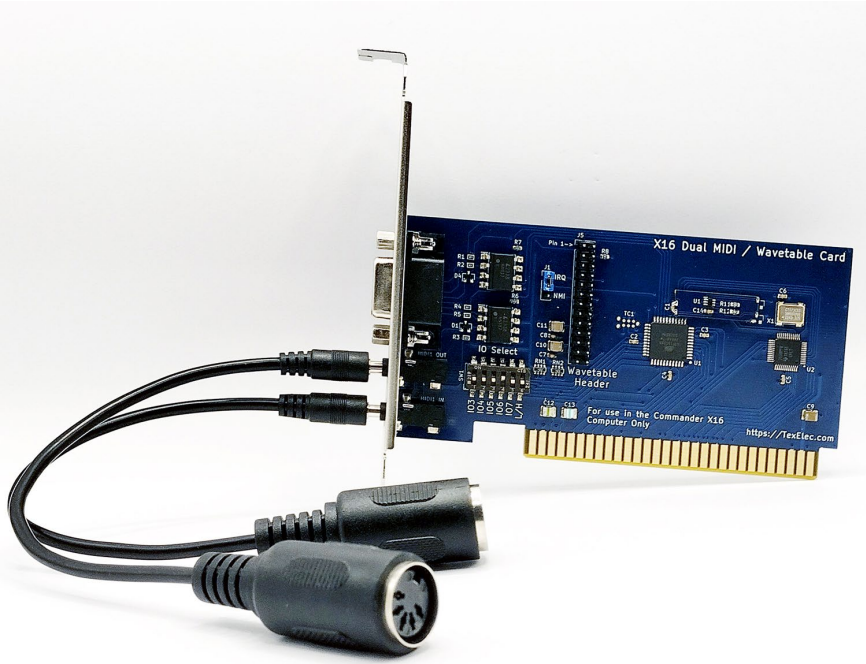
Purpose:

- Expands number of available USB ports
- Provides faster USB standards (3.0, 3.1, 3.2)
- Adds USB-C ports to older systems
- Internal headers for front panel ports

Benefits:

- Connect multiple peripherals simultaneously
- Faster data transfer speeds
- Better power delivery for devices

MIDI Interface Card



Musical Instrument Digital Interface

Purpose:

- Connects musical instruments to a computer
- Transmits musical performance data
- Records and plays back MIDI sequences
- Synchronises multiple devices

Applications:

- Music production and composition
- Live performance setups
- Connecting keyboards and synthesisers

Other Expansion Cards

RAID Controller Card

Manages multiple hard drives for performance and redundancy

RAID 0, 1, 5, 10 configurations, hot-swapping support

Capture Card

Records video from external sources like game consoles

HDMI/SDI input, real-time encoding, streaming support

I/O Controller Card

Adds serial, parallel, or other legacy ports

RS-232 serial ports, parallel printer ports, PS/2

Modem Card

Enables dial-up internet or fax capabilities (legacy)

56K dial-up, fax send/receive, voice capabilities

SSD/NVMe Adapter Card

Adds high-speed SSD storage via PCIe slots

M.2 NVMe support, PCIe 3.0/4.0, multiple drive slots

Video Capture Card

Professional video editing and broadcasting

4K/8K support, multiple inputs, low latency

Expansion Slots & Standards

Understanding where expansion cards connect:

PCI Express (PCIe) *PCIe 3.0, 4.0, 5.0*	Lanes: x1, x4, x8, x16 **Speed: Up to 32 GB/s per direction (PCIe 4.0 x16)**	Uses: Graphics cards, SSDs, network cards, all modern expansion
PCI (Legacy) *PCI 2.2, 2.3*	Lanes: 32-bit, 64-bit **Speed: 133-533 MB/s**	Uses: Older sound cards, modems, network cards (obsolete)
AGP (Legacy) *AGP 1x, 2x, 4x, 8x*	Lanes: Dedicated graphics slot **Speed: 266 MB/s to 2.1 GB/s**	Uses: Legacy graphics cards only (replaced by PCIe)
M.2 Socket *M.2 2280, 2260, 2242*	Lanes: PCIe or SATA **Speed: Up to 8 GB/s (PCIe 4.0 x4)**	Uses: NVMe SSDs, Wi-Fi cards, Bluetooth adapters

Key Takeaways

- Computers manipulate and store information
- Hardware and software work together
- Many types exist: desktops, laptops, tablets, servers
- Basic parts include case, monitor, keyboard, mouse
- Peripherals expand computer capabilities