Computer Hardware

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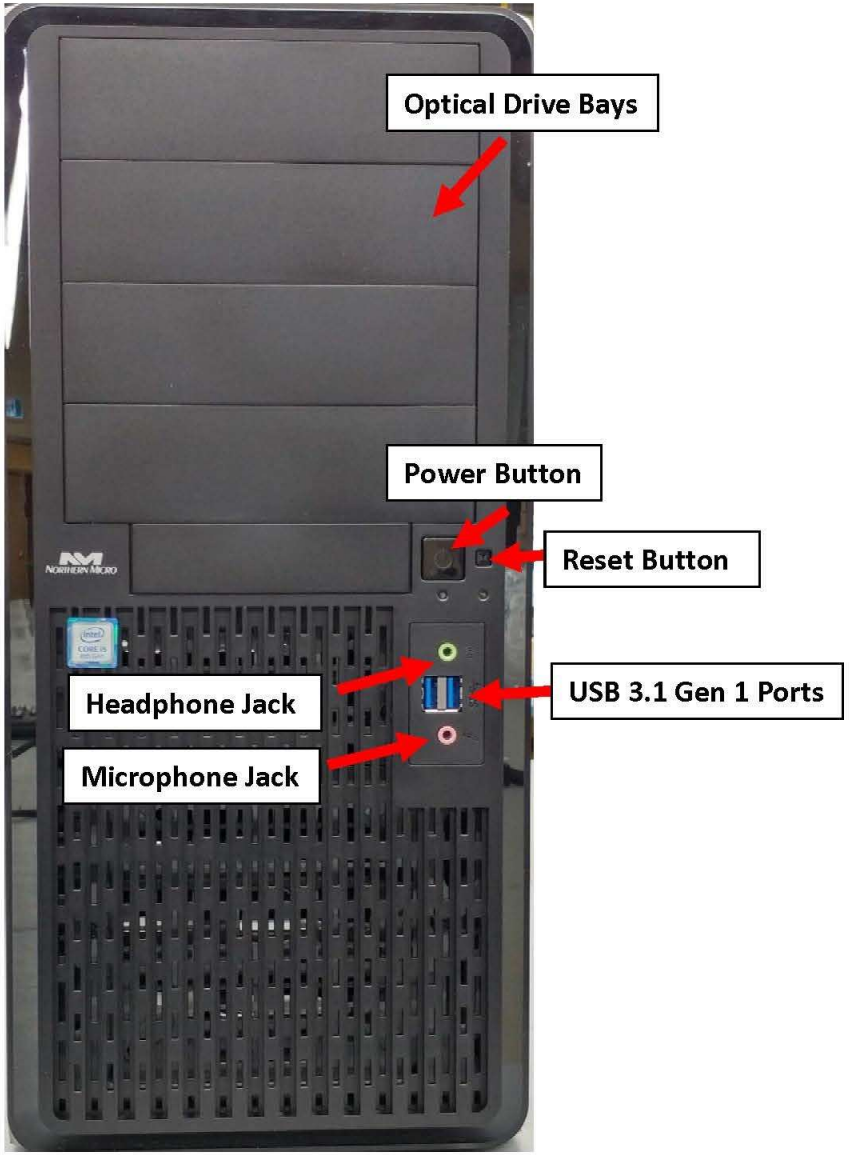
Contents

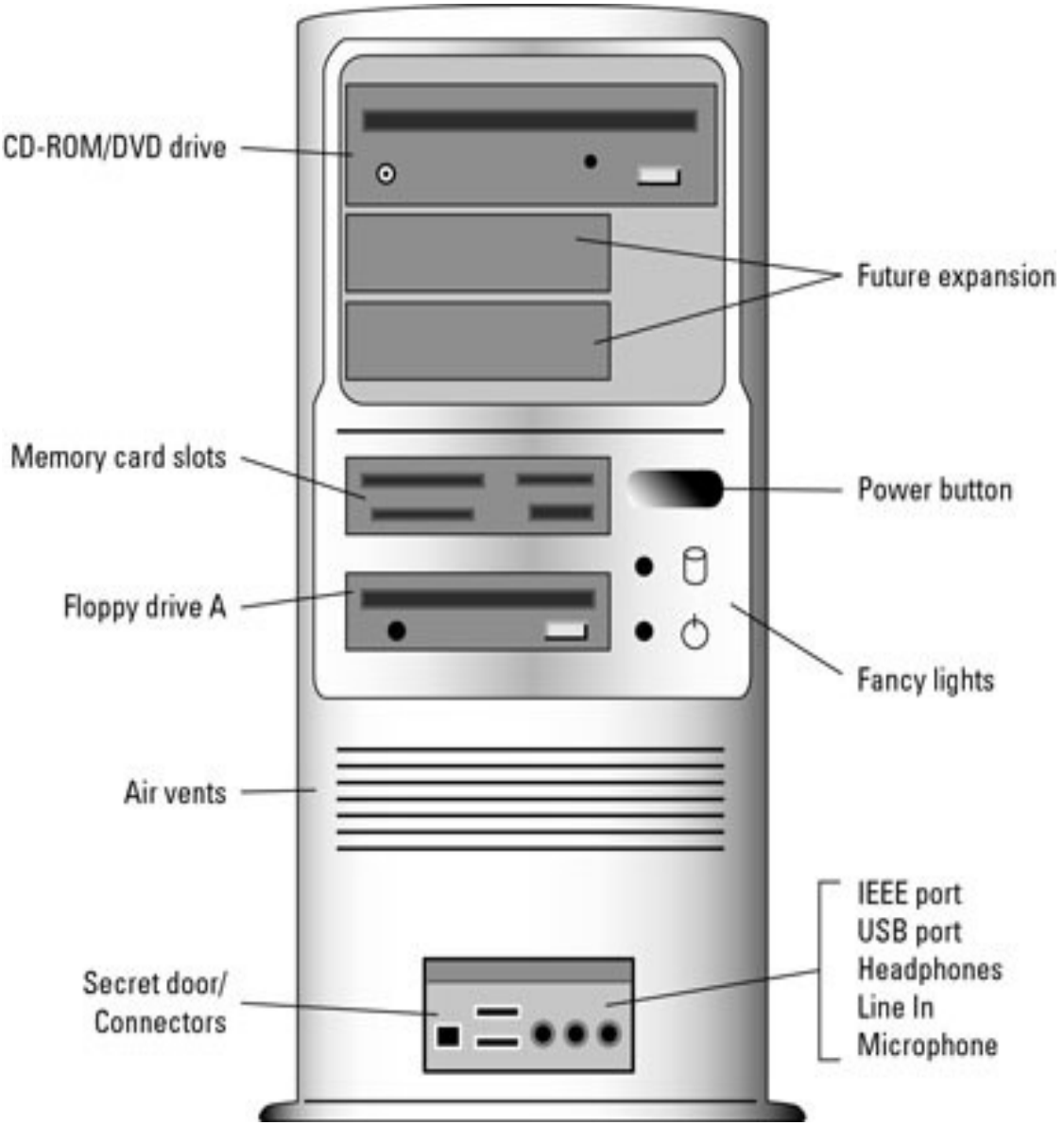
- Introduction to Computer
- Front Panel, Back Panel
- Microprocessor / CPU
- Motherboard
- BIOS
- Basic Organization of Computer (Functional Block diagram)
- Input Devices, CPU & Output Devices.
- Computer Memory and Classification of Memory

Introduction to Computer

- **Definition**: Computer is an electronic data processing device which is used to read and write, compute and compare, store and process, large amount of data with high speed, accuracy and reliability.

Front Panel


Optical Drive Bays
Power Button
Reset Button
Headphone Jack
USB 3.1 Gen 1 Ports
Microphone Jack


CD-ROM/DVD drive
Future expansion
Memory card slots
Power button
Floppy drive A
Fancy lights
Air vents
IEEE port
USB port
Headphones
Line In
Microphone
Secret door/
Connectors

Back Panel

Power Supply Cooling Fan
Power Connector
PS/2 Mouse Connector
PS/2 Keyboard Connector
Thumb Screw
Parallel Port
Serial COM Port
VGA Port
Case Cooling Fan
USB Ports
10/100Mbps RJ-45 Ethernet LAN Port
Microphone Jack
Security Lock Port
Audio Out Jack
Line In Jack
Expansion Slots
Thumb Screw
56Kbps RJ-11 Modem Ports

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Microprocessor / CPU

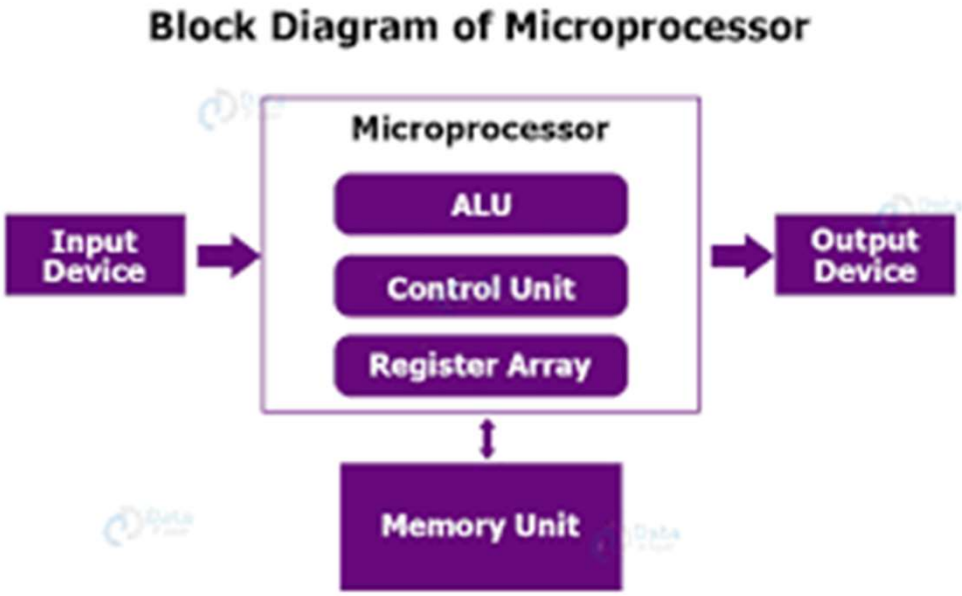
- It is an electronic device capable of handling repetitive task and control.
- In 1971 American Engineer Ted Hoff first invented Microprocessor. (INTEL4004)
- INTEL is the first manufacturer who lunched microprocessor.
- Microprocessor is recognized by its frequency and cache memory.
- INTEL – Integrated Electronics.
- XEON, CELERON, PENTIUM

Microprocessor / CPU

- CELERON & PENTIUM – Desktop system
- XEON – Server System
- CENTRINO – Laptop Processor
- AMD – Advanced Micro Device (K, DURON, ATHLON, PHENOM)
- CYRIX, IBM (International Business Machine)

Anatomy of Microprocessor

- A microprocessor's structure includes an arithmetic logic unit (ALU), control unit, registers, and input/output interfaces.
- It is a programmable device that performs arithmetic and logical operations on data, and provides output.



Units

- Control Unit
- Protection Test Unit
- Bus Interface Unit
- Prefetch Unit
- Resistors
- ALU
- Numerical Data Processing Unit
- Memory Management Unit (MMU)

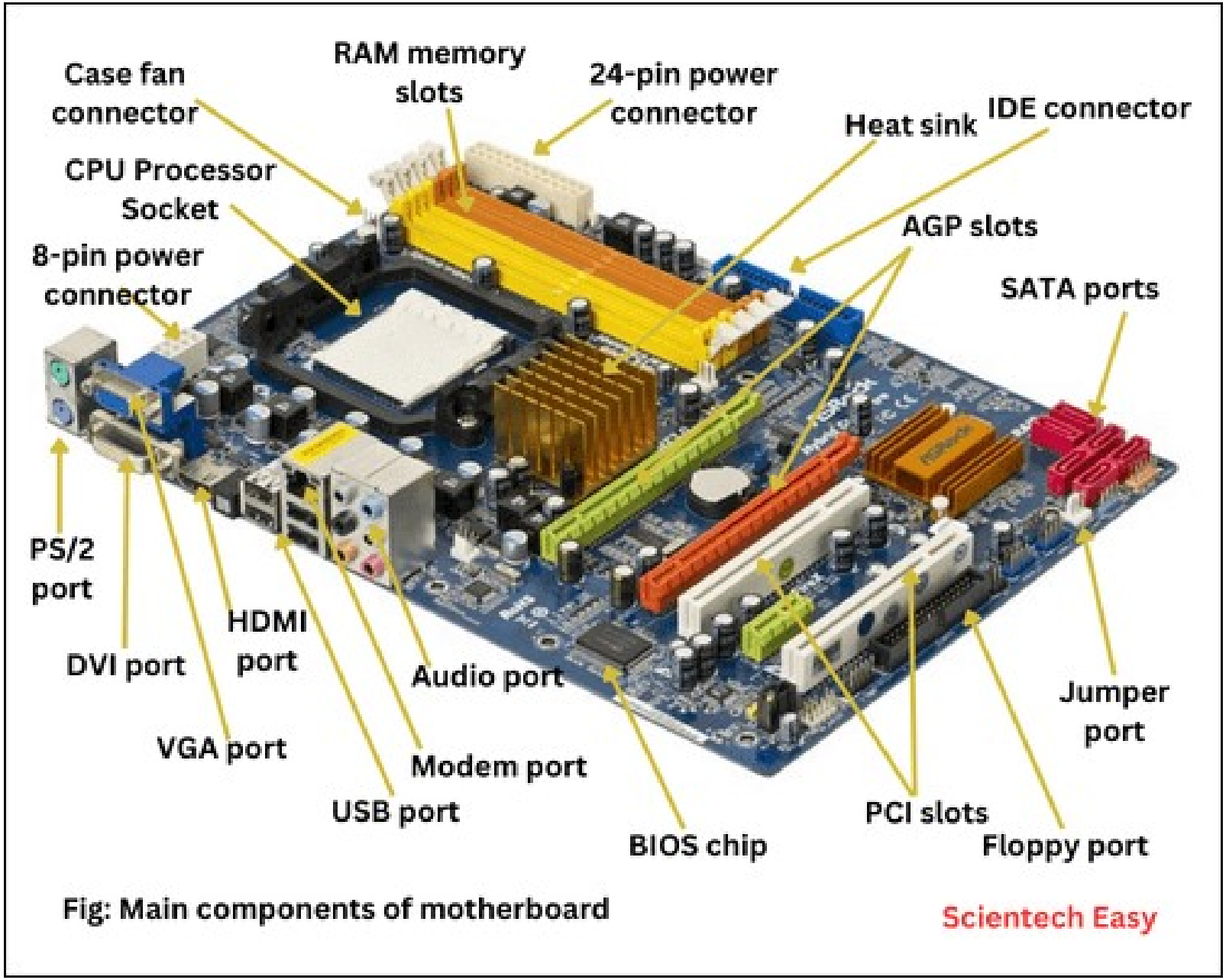
Instruction set

- The set of machine-level instructions that a microprocessor executes is the instruction set
- It is also known as an instruction set architecture (ISA)

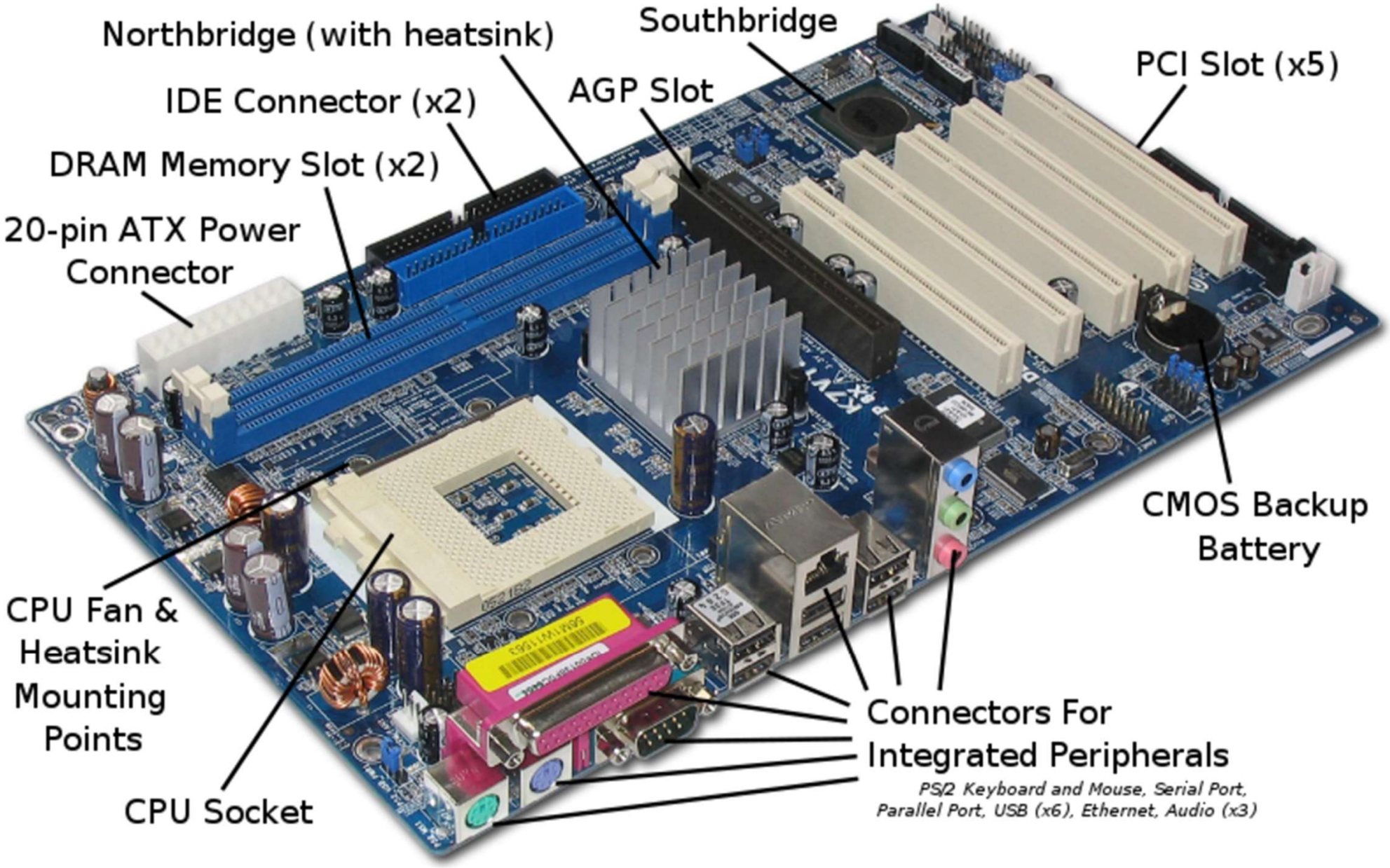
Buses

- Address
- Data
- Control

Motherboard



Motherboard



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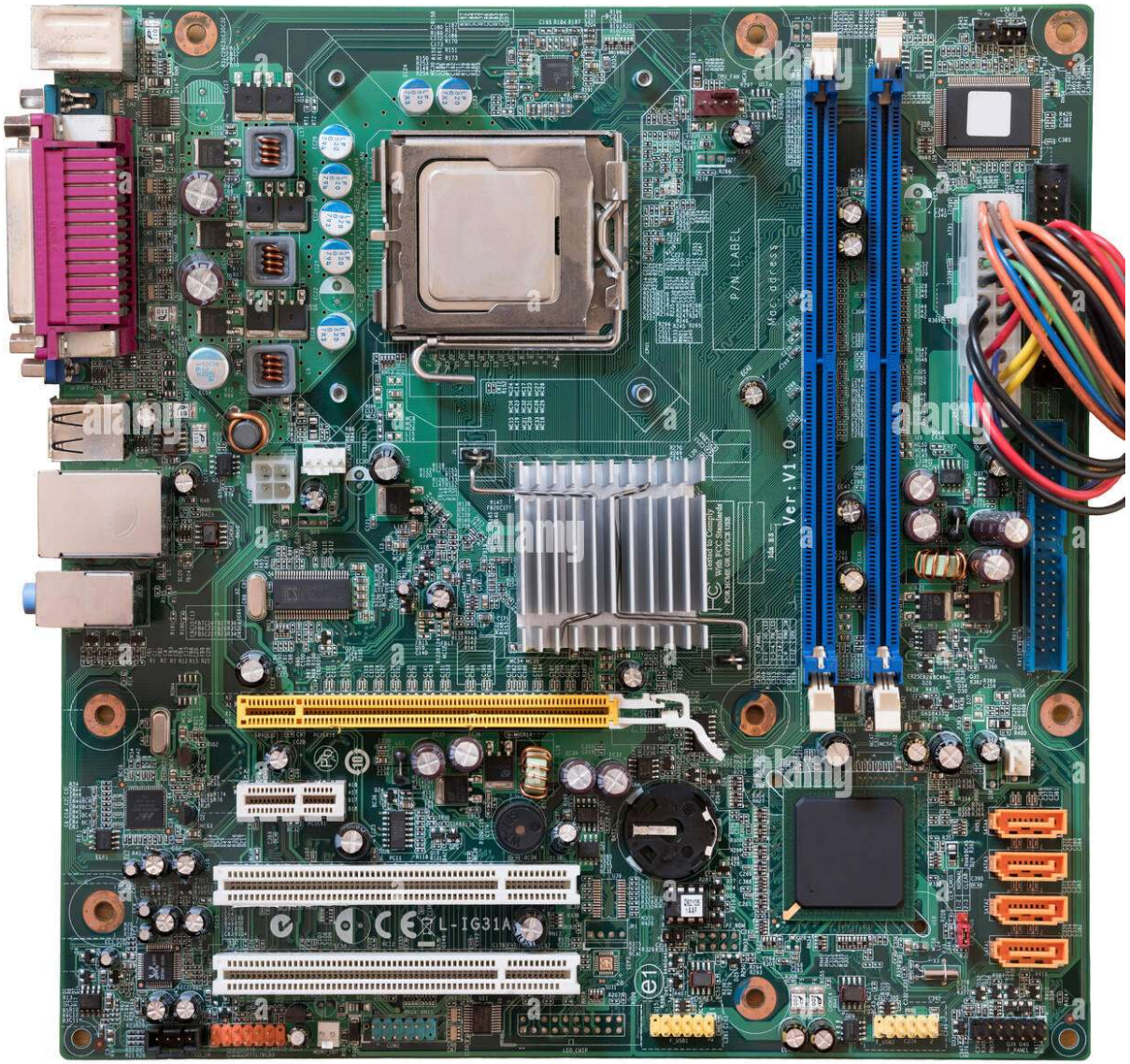

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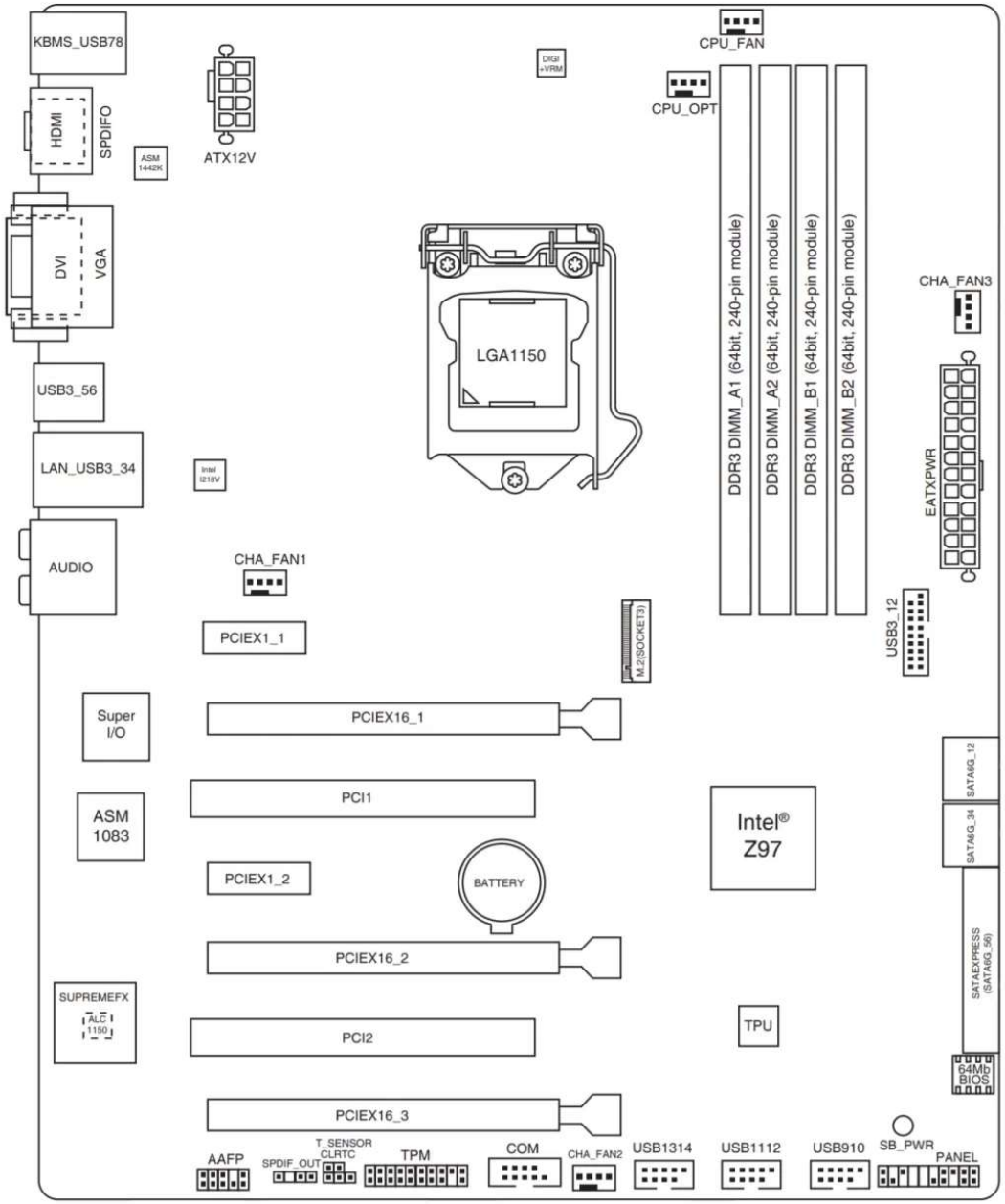
Motherboard



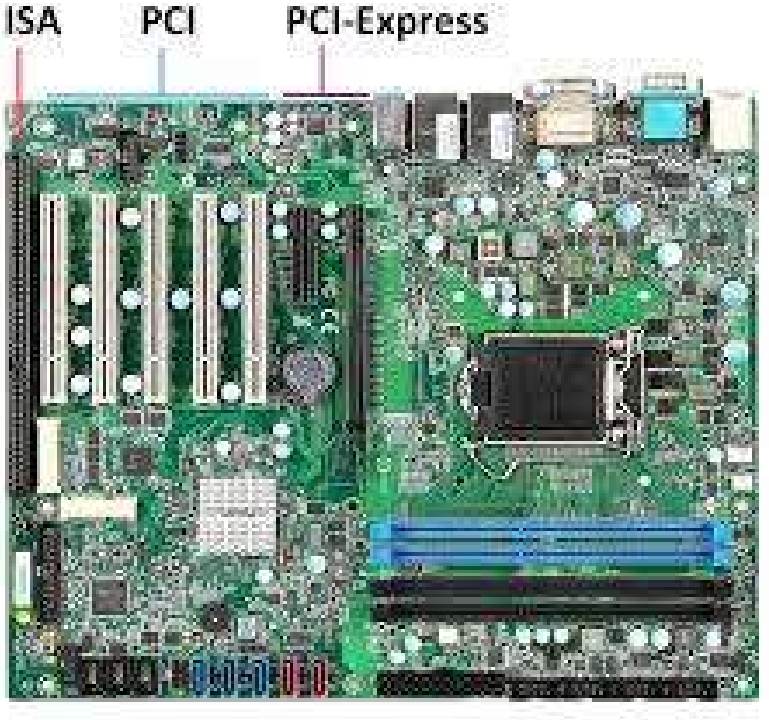
Slots

- ISA (Industrial Standard Architecture)
- PCI (Peripheral Component Interface)
- AGP (Accelerated Graphics Port)
- AMR (Audio Modem Riser)
- CNR (Common Network Riser)
- VESA (Video Extended Standard Architecture)

Or (Video Electronics Standard Association)

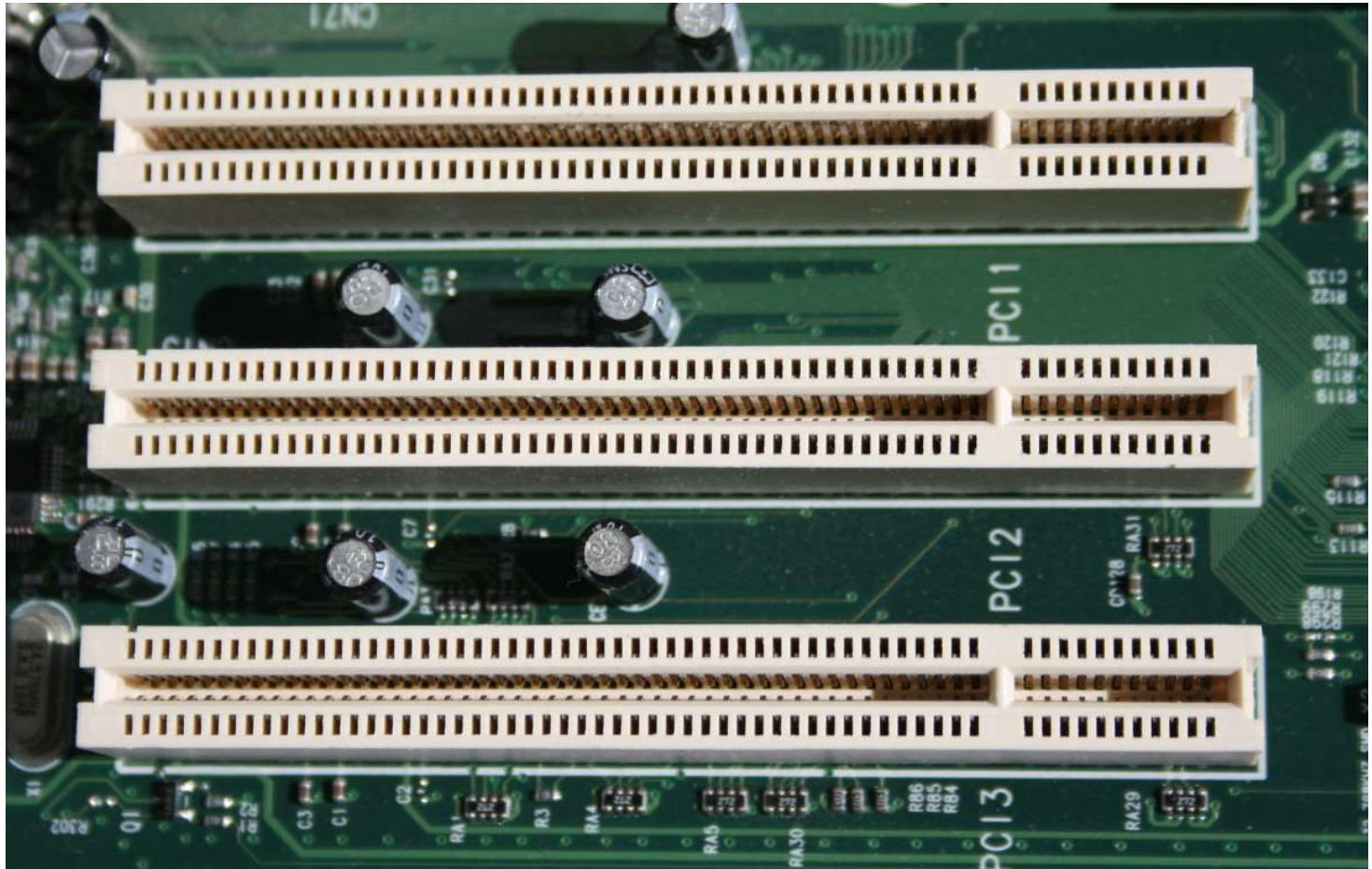
ISA (Industrial Standard Architecture)

- Industry-standard architecture (ISA) defines a standard architecture for expansion buses. The ISA slot serves as a connection point for input devices and modems.



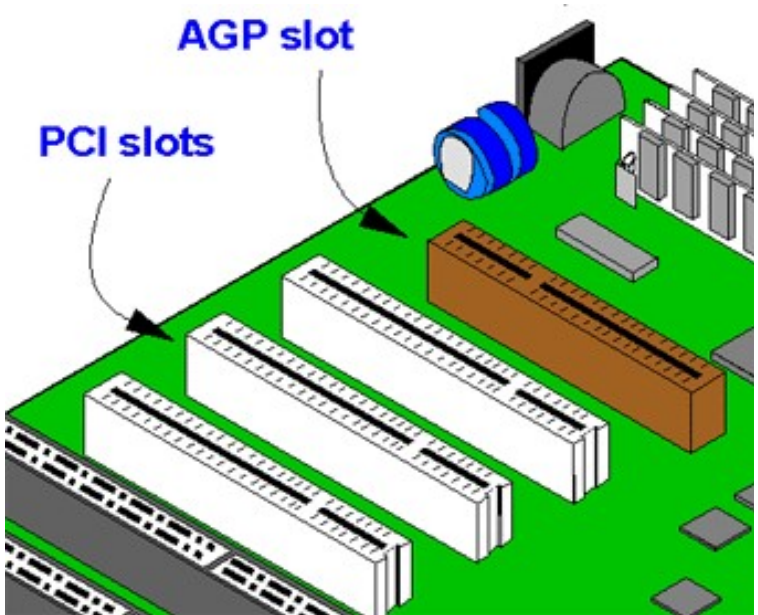
PCI (Peripheral Component Interface)

- Insertion point for a computer's expansion cards.
- Sound cards, network cards, video cards, modems, and other peripherals.
- Obsolete.



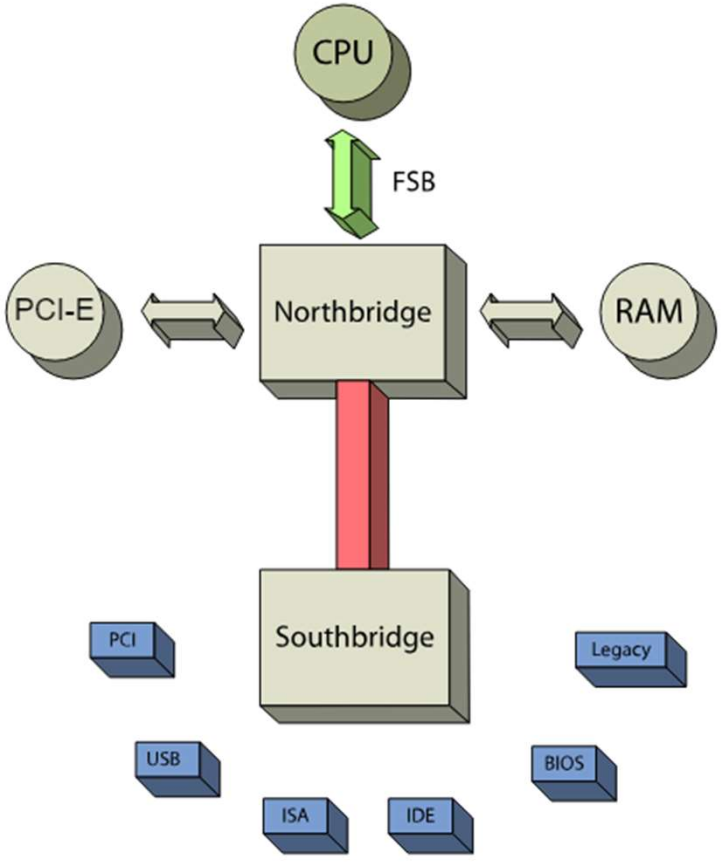
AGP (Accelerated Graphics Port)

- The AGP (Accelerated Graphics slot) is a type of computer slot used to attach the video card to the system. This slot facilitates high-speed data transfer.
- AGP slots were used to improve graphics performance and visuals in gaming and other graphical applications.



Northbridge and Southbridge

- The Northbridge and Southbridge are chipsets on a motherboard. The Northbridge handles high-speed connections like RAM and graphics, while the Southbridge manages slower I/O functions like USB and SATA.



BIOS/UEFI Chip

- The BIOS or UEFI chip stores firmware and settings for the motherboard. It initializes hardware during the boot process and manages system settings.

Ports

- DIN Port (Deutsches Institute for Normung)
  - For keu board
  - Usually violet color
  - Big DIN – 5 Pin – 486, P1, P2, P3
  - Min DIN – 6 Pin – P3, P4
- PS/2 Port (Personal System 2)
  - For mouse
  - 6 Pin
  - Usually green color

Ports (cont…)

- USB Port
- LPT Port)
- IDE
- COM Port
- Game or MIDI Port (Musical Instrument & Digital Interface)
- VGA Port
- Floppy Drive Port

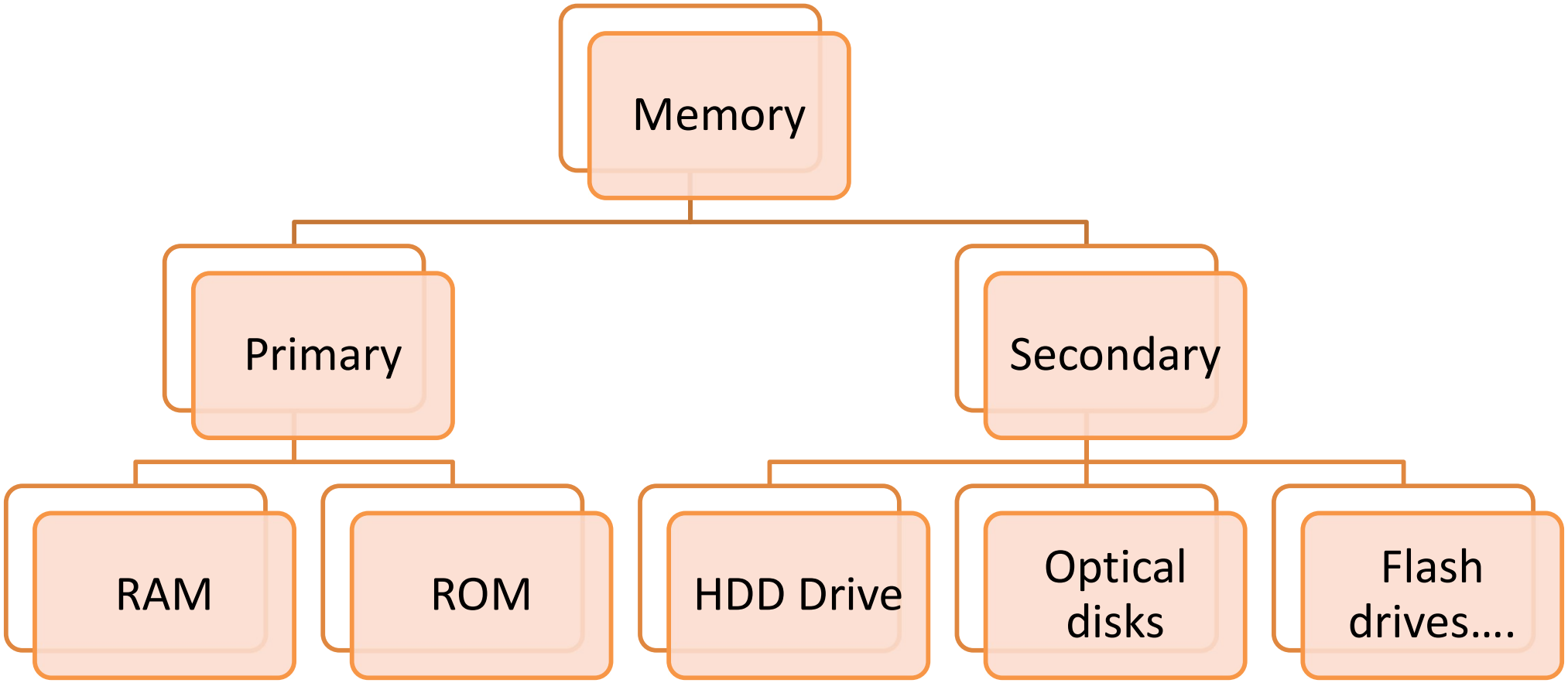
Cards

- VGA Card
- Sound Card
- LAN Card
- MODEM
- TV-tuner Card
- Video Editing Card

Types of Connectors

- DIN
- PS/2
- USB
- LPT
- VGA
- FLOPPY
- IDE
- COM
- MIDI

Memory

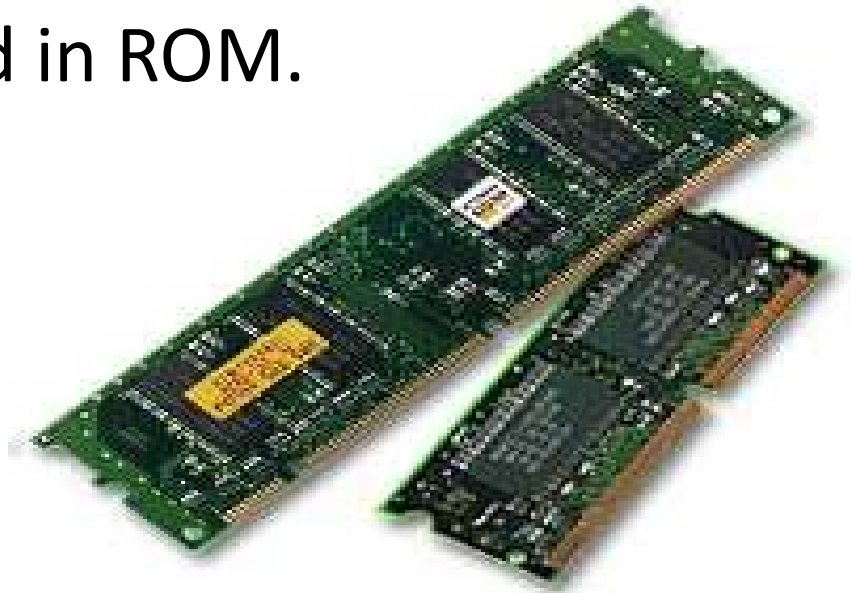

Memory
Primary
Secondary
RAM
ROM
HDD Drive
Optical disks
Flash drives….

Two types of Memory

- Primary
  - Used to hold running program instructions
  - Used to hold data, intermediate results, and
  - results of ongoing processing of job(s)
  - Fast in operation
  - Small Capacity
  - Expensive
  - Volatile (looses data on power dissipation)
- Secondary
  - Used to hold stored program instructions
  - Used to hold data and information of stored jobs
  - Slower than primary storage
  - Large Capacity
  - Lot cheaper that primary storage
  - Retains data even without power

Primary Memory

- RAM (Random Access Memory)
  - Volatile Memory
  - Contents will be erased when the power is OFF.
- ROM (Read Only Memory)
  - Not a Volatile Memory
  - The System start-up programs and System date and time information will be stored in ROM.



ROM

- This chip is inbuilt on Motherboard
- The ROM contains a permanently stored program which is activated by the 3V CMOS Battery.
- Types
  - PROM
  - EPROM
    - EEPROM
    - UVPROM

ROM (Cont…)

- Flash Bios : With the help of software we can reprogram the flash bios.

RAM

- This is used inside PC for several purpose but the most important cause is that RAM can transfer data to and from the CPU much faster than Secondary Storage.
- Without RAM all data could be read from the disk drive like HDD, CDD, FDD slowing the computer.
- RAM is used due to its high data access speed which operate the entire system much more speed.

RAM (Cont…)

- SRAM
  - Higher frequency than DRAM
  - High Cost
  - Auto refresh circuit.
  - Generally used as cache memory in Microprocessor and it is used in high cost medical equipments.
- DRAM
  - Types:
    - EDO RAM - Small EDO, Big EDO
    - SD RAM
    - DDRSD RAM - DDR1, DDR2, DDR3 etc.

RAM failure

- Symptom
  - 3 long continuous beep.
  - 3 long beep.
  - Long continuous beep and stop
- Cause
  - Dust particles deposition in RAM Slot
  - Small metallic object deposition in RAM Slot which causes short circuit.
  - If RAM is fitted in reverse direction by force. (rare)

Hard Disk

SMPS

BIOS (Basic Input Output System)

- Firmware = Software + Hardware
- Changing the standard setting.
- Changing advanced setting (BIOS and Chipset features)

Installation of CDD

- Install CDD
- Configure CDD
  - Change drive letter
  - Diagnose CDD

Using Pen drive

- Insert Pen drive
- Copy data from Pen drive to HDD
- Copy data from HDD to Pen drive
- Enable/disable Pen drive
- Format Pen drive

HDD Installation

- Connect/disconnect HDD to/from the system.
- Configure boot device in BIOS.

Formatting

- Formatting :
  - Low Level
  - High Level
    - Normal Formatting : File Allocation Table is created
    - Quick Formatting : Address from the File Allocation Table is erased.
- FAT (File Allocation Table)
  - FAT-16
  - FAT-32
- NTFS (New Technology File System)

Partitioning

- Partition : Primary Partition, Extended Partition, Logical Partition
- Steps for partitioning
  - Go to manage → disk management
  - Right click on unallocated space → new partition

Printer Installation and troubleshooting

- Install a printer
- Troubleshoot the printer

Scanner Installation and troubleshooting

- Install a scanner
- Configure the scanner using driver program.
- Scan a page using the scanner

Also see…

- Scandisk
- Antivirus software
- PC diagnostic softwares.
  - Process explorer
  - SysinternalsSuit
  - SystemExplorerSetup
  - HWinfo
  - Speccy
  - CPU-Z

Collecting system info using cmd

- Systeminfo
- Wmic (in run) (or run cmd as admin then write)
  - memorychip list full
  - Memorychip get speed
- Tasklist
- Taskkill
- SC : SC is a command line program used for communicating with the Service Control Manager and services.

Collecting system info using GUI

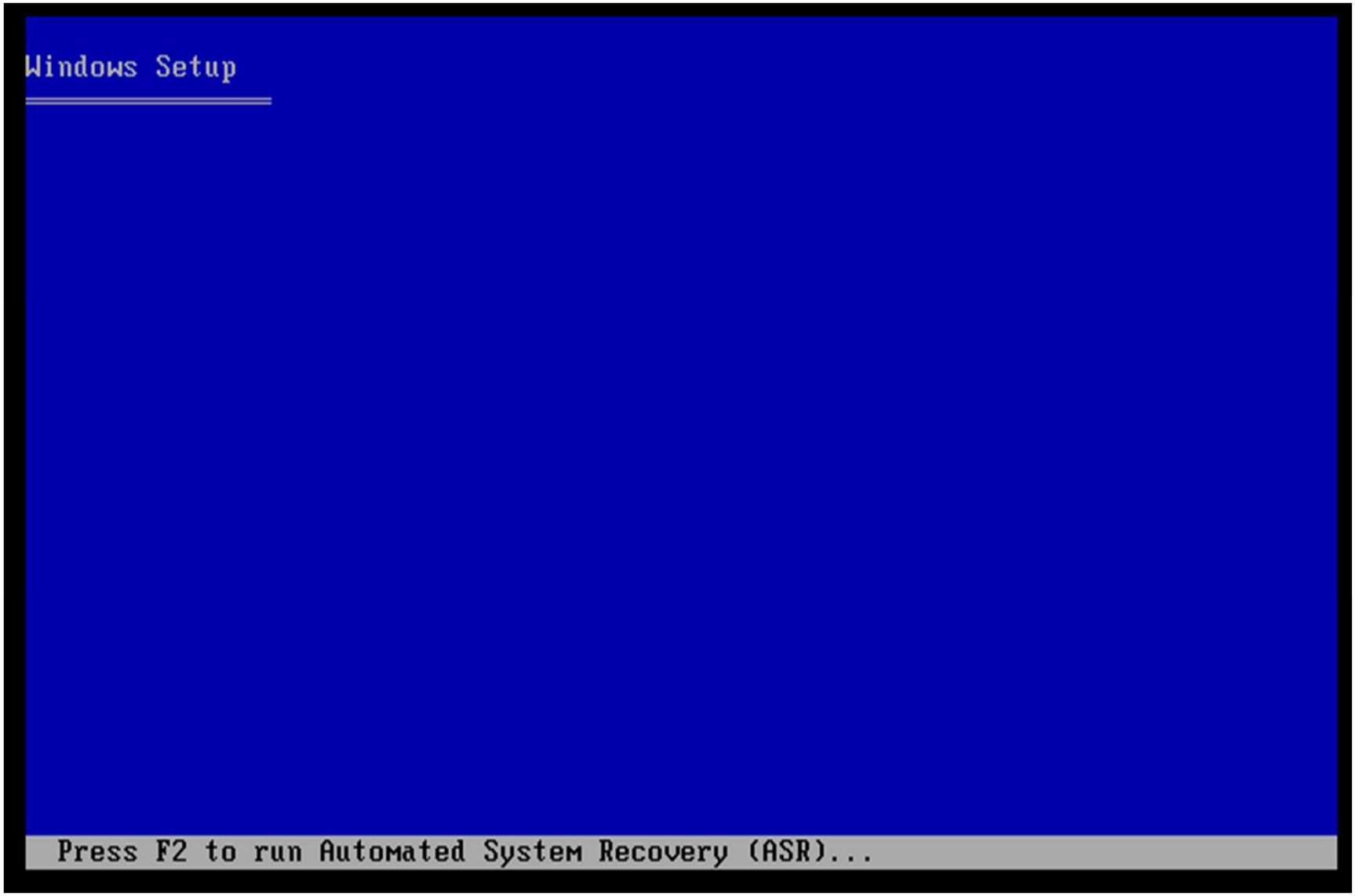
- Msinfo32
- MdSched : Windows memory diagnostics
- Msconfig
- Regedit : registry editor

Troubleshooting in CMD

- Chkdsk

- msdt.exe -id devicediagnostic → run

Windows XP installation



Windows XP installation

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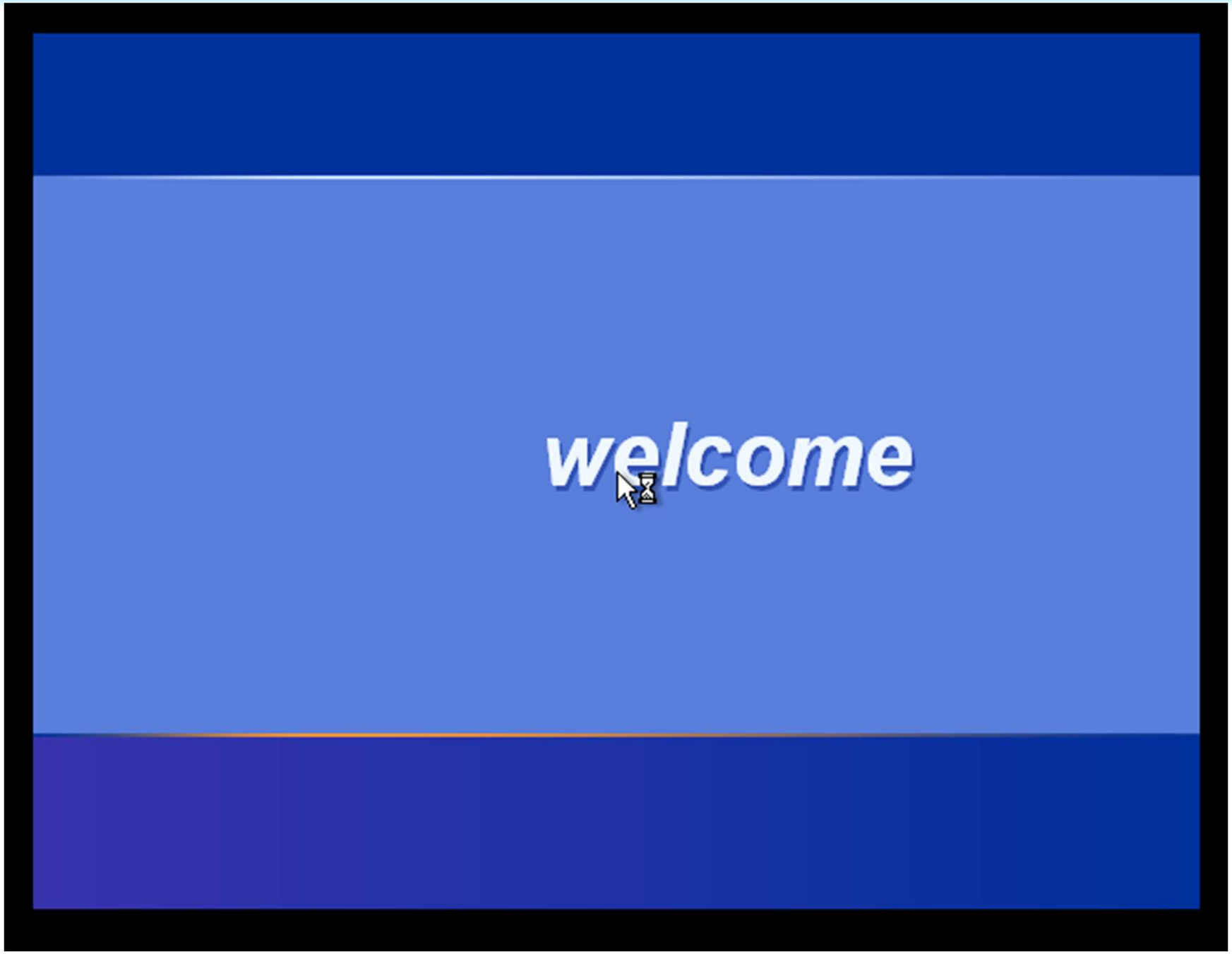

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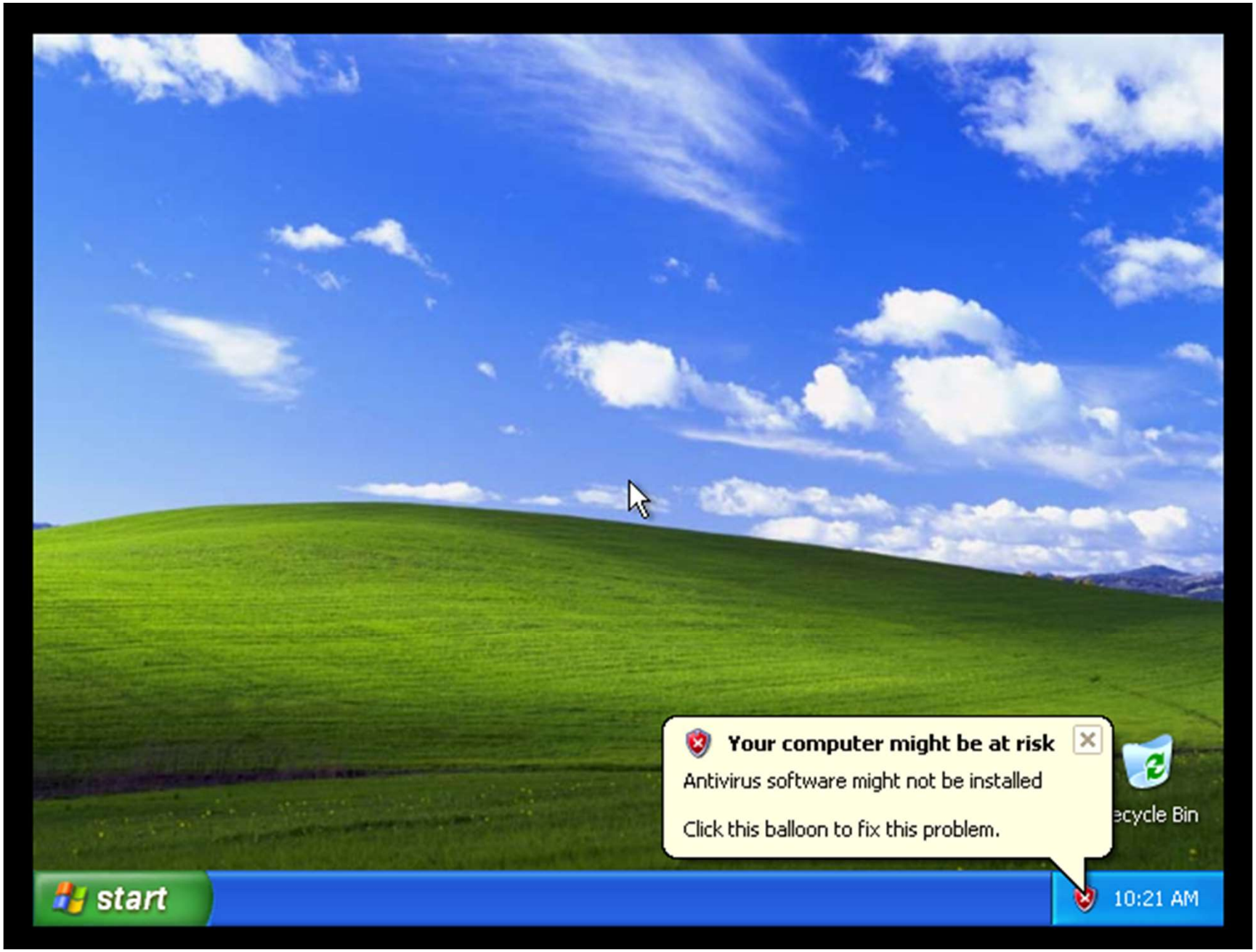

Windows 10 installation

Networking

- Topologies
  - Bus
  - Ring
  - Star
  - Mesh
  - Hybrid

IP Addressing

- IPv4 : 32 bit
- IPv6 : 128 bit

IP Addressing (cont…)

- IPv4
- Class range
  - Class A (0.0.0.0 to 127.255.255.255)
  - Class B (128.0.0.0 to 192.255.255.255)
  - Class C (192.0.0.0 to 223.255.255.255)
  - Class D (224.0.0.0 to 239.255.255.255)
  - Class E (240.0.0.0 to 255.255.255.255)
- Assigning IP Address in a system.

Client-Server Architecture

- Server : provide service
- Client : receive service