Seneca

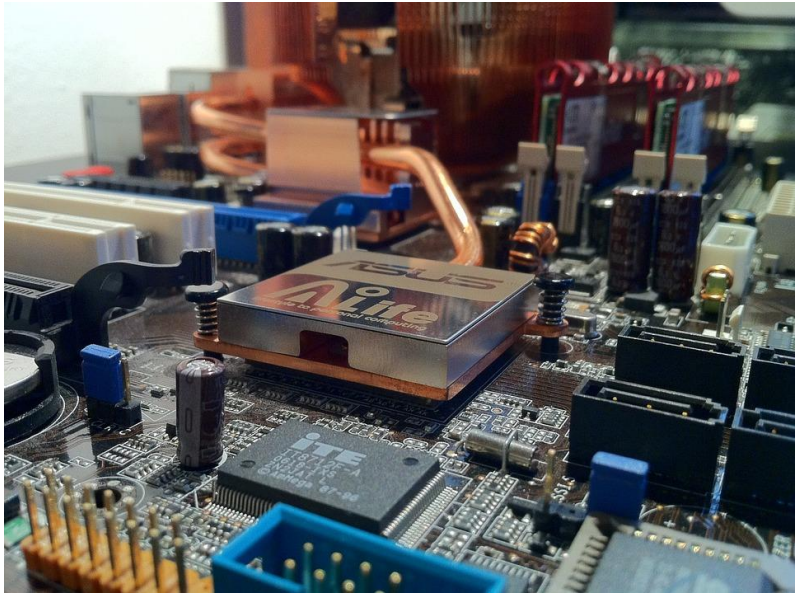
# Introduction to Computer Hardware

# Agenda

- Processor
- Memory
- Hard Drive
- Motherboard
- Graphics Adapter
- Power Supply

# Introduction to Computer Hardware

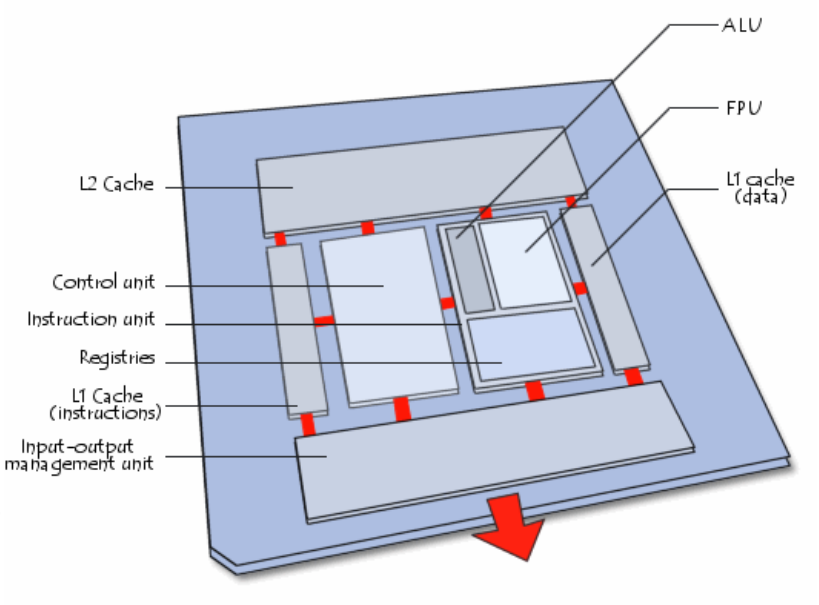
- Computers come in different shapes and sizes
- Generally computers consist of the following components:
  - Processor
  - Memory
  - Hard Drive
  - Motherboard
  - Graphics Adapter
  - Power Supply



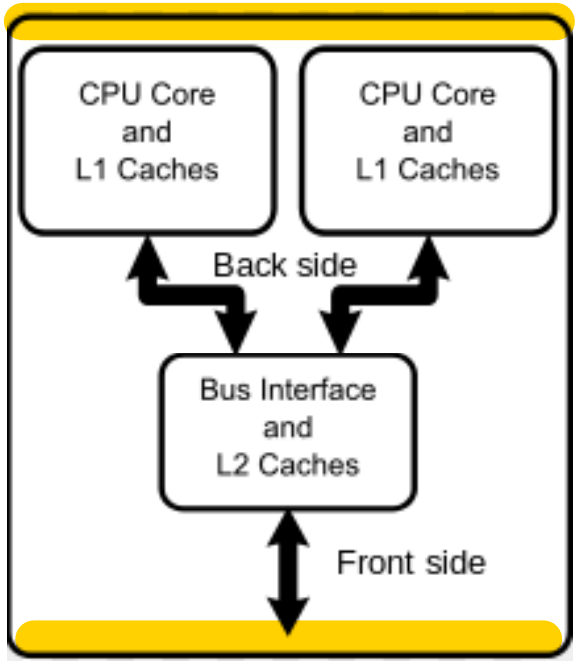
# Processor

- A **central processing unit** (**CPU**) is the electronic circuitry within a computer that carries out the instructions of a computer program by performing the basic arithmetic, logical, control and input/output (I/O) operations specified by the instructions.
- The computer industry has used the term "central processing unit" at least since the early 1960s.
- Traditionally, the term "CPU" refers to a processor, more specifically to its processing unit and control unit (CU), distinguishing these core elements of a computer from external components such as main memory and I/O circuitry.

# Processor: Elements

# Processor: Front Side / Back Side Bus



# Processor: Technologies

- Most modern CPUs are microprocessors, meaning they are contained on a single integrated circuit (IC) chip.
- Some computers employ a multi-core processor, which is a single chip containing two or more CPUs called "cores"; in that context, one can speak of such single chips as “sockets”.
- Hyper-Threading takes a single core and makes it appear as two logical CPUs
- Array processors or vector processors have multiple processors that operate in parallel, with no unit considered central.
- There also exists the concept of virtual CPUs.

# Processor: Specifications Activity

- Search for a CPU online and review its specifications

# Processor: Question

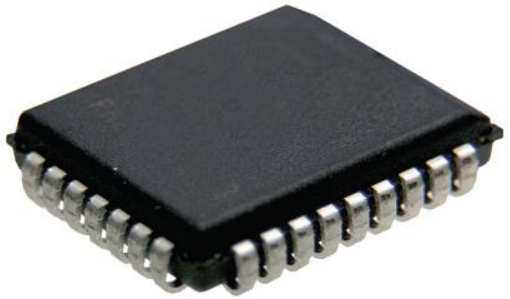
- Where can you find information about your processor?
- Hint: CTRL + SHIFT + ESC

# Memory

- The CPU processes instructions from memory
- Two main types of memory
  - RAM (Random Access Memory)
  - ROM (Read-Only Memory)

# Memory: ROM

- ROM is nonvolatile (info is in ROM even when the compute is powered off)
- Can be found on adapters such as SCSI, Network, and Video cards
- Software contained inside the ROM chip is allowed to execute during the boot process and initialize the adapter and possibly detect devices attached to the adapter.



# Memory: RAM

- Found on the MB and stores the OS, the Software applications and the data being used by all of the software
- RAM is also found on adapters (e.g. video cards)
- RAM is volatile memory

# Memory: RAM Types Activity

- In groups, research and present one of the RAM types:
  1. Static RAM (SRAM)
  2. Dynamic RAM (DRAM)
  3. Synchronous Dynamic RAM (SDRAM)
  4. Single Data Rate Synchronous Dynamic RAM (SDR SDRAM)
  5. Double Data Rate Synchronous Dynamic RAM (DDR SDRAM, DDR2, DDR3, DDR4)
  6. Graphics Double Data Rate Synchronous Dynamic RAM (GDDR SDRAM, GDDR2, GDDR3, GDDR4, GDDR5)
  7. Flash Memory

# Hard Drives

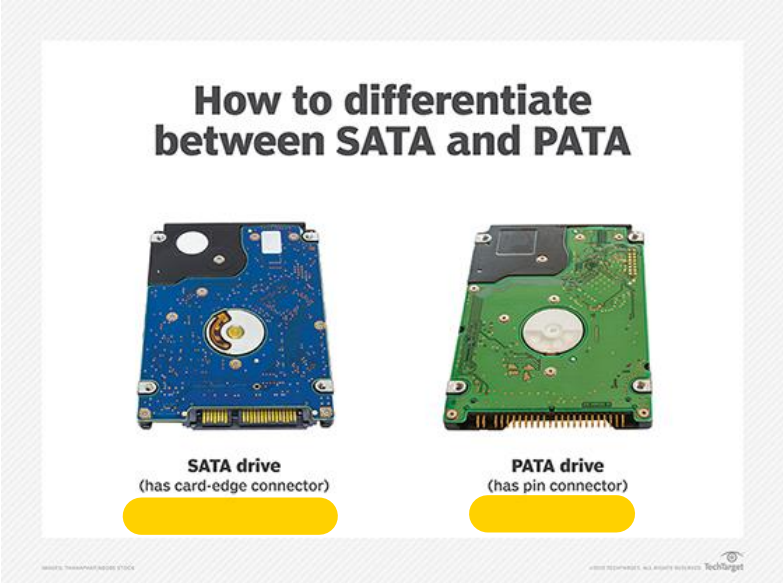
- Types of Hard Drives
  - Parallel Advanced Technology Attachment (PATA)
  - Serial ATA (SATA)
  - Small Computer System Interface (SCSI)
  - Solid State Drives (SSD)

# Hard Drives: Parallel Advanced Technology Attachment

- Introduced in 1980s
- Uses parallel signaling technology to transmit data
- Ribbon cables were used to connect to PATA devices
- PATA speed: 66 MB/s - 133 MB/s

# Hard Drives: Serial ATA

- Uses serial signaling technology to transmit data
- SATA cables are thinner, more flexible and smaller with faster transfer rates
- SATA speed: 150 MB/s – 600 MB/s



# Hard Drives: Small Computer System Interface

- Developed in 1981
- SCSI speed: 4 MB/s - 320 MB/s
- Serial Attached SCSI (SAS) allowed for higher speeds: 22.5 Gb/s (2.8 GB/s)

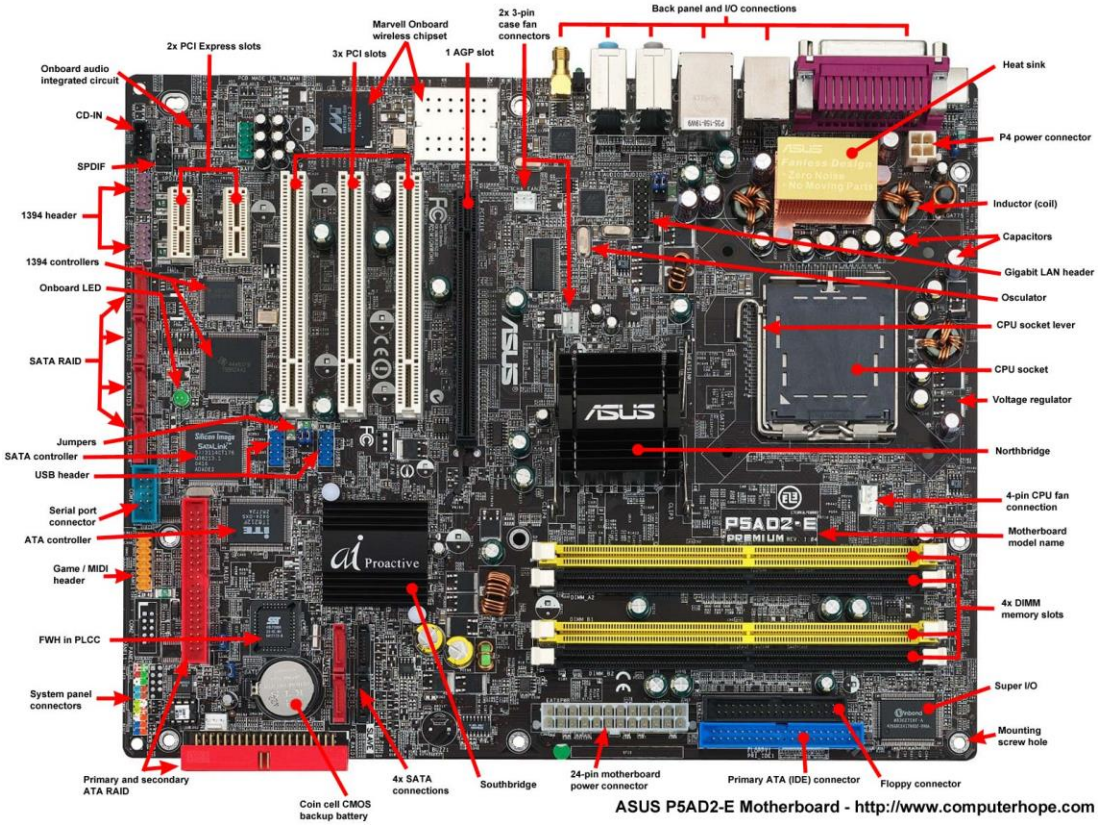

# Hard Drives: Solid State Drives

- Uses flash memory where data is written to memory chips
- Types of connections:
  - SATA III (Serial Advanced Technology Attachment)
  - PCIe (Peripheral Component Interconnect Express option)
  - NVMe (Non-Volatile Memory Express)
- SSD speed: up to 5,000 MB/s

# Motherboard

- Alternatively referred to as the mb, mainboard, mboard, mobo, mobd, backplane board, base board, main circuit board, planar board, system board, or a logic board on Apple computers.
- The motherboard is a printed circuit board that is the foundation of a computer, located on the back side or at the bottom of the computer chassis.
- It allocates power and allows communication to the CPU, RAM, and all other computer hardware components.

# Motherboard: Components

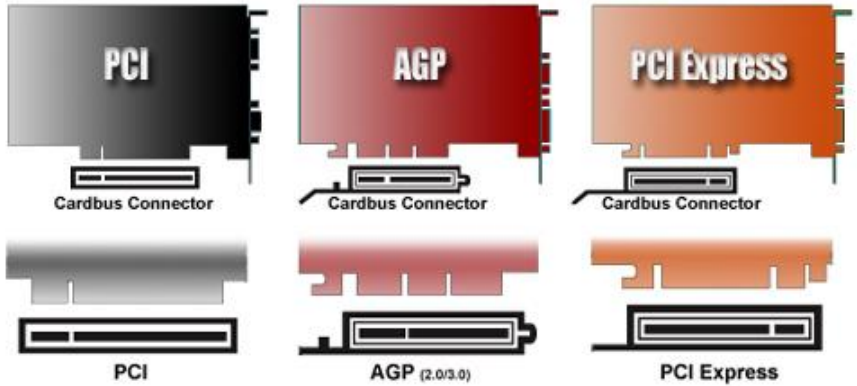


# Video Card

- Also known as a display card, graphics card, display adapter
- Provides output to a display such as a monitor
- Video cards may have their own graphics processor to process images
- Typically installed in AGP or PCI-E expansion slots

# Video Card: PCI vs AGP

- PCI provides fast communication between the CPU and peripherals, but peripheral devices have to compete with each other for bandwidth.
- PCI is able to handle 2D images and general business graphics quite competently, but it can be challenged by intense 3D graphics.
- The AGP specification is based on the PCI 2.1 specification, but unlike PCI, AGP is designed solely for use with graphics cards.



# Video Card: Question

- What are the different video card display ports available?

# Power Supply

- A power supply unit (or PSU) converts main AC (120V) to low-voltage regulated DC power (3.3V, 5V, or 12V) for the internal components of a computer.
- Modern personal computers universally use switched-mode power supplies.
- Some power supplies have a manual switch for selecting input voltage, while others automatically adapt to the mains voltage.

# Power Supply: Connectors Activity

- In groups, identify and explain the purpose of each PSU connector:

# Computer Hardware: Activity #1

- Learn more about Computer Hardware through Activity #1

# Additional References

- Troubleshoot PC issues yourself
- Building the perfect PC