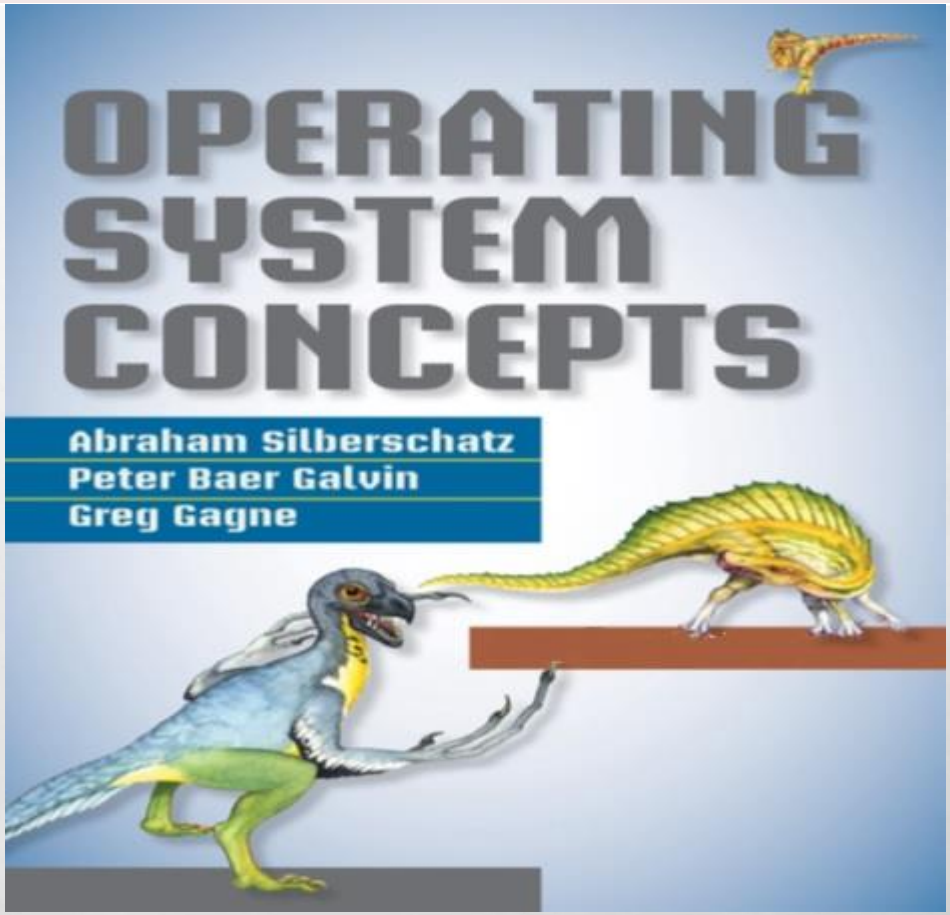
Mustansiriayah University
Collage of Education
Computers Science Department

Chapter Two
Part I



Fourth Class

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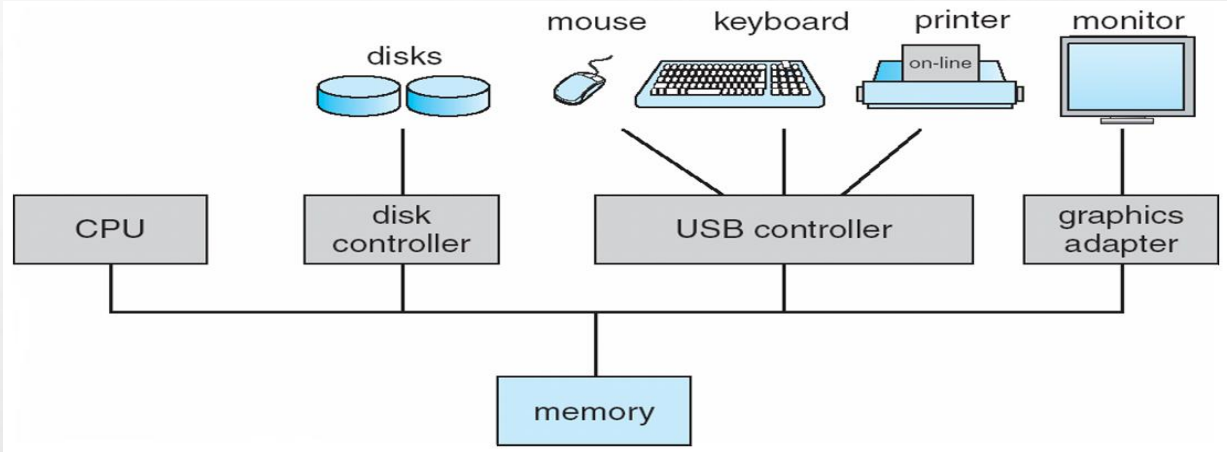
2.1 Computer System Operation

- One or more CPUs, device controllers connect through common bus providing access to shared memory



- Each device controller is in charge (مسؤول) of a particular device type (for example, disk drives, audio devices, or video displays).
- The CPU and I/O devices can execute concurrently (في نفس الوقت)
- Each device controller has a local buffer
- CPU moves data from/to main memory to/from local buffers
- Device controller informs CPU that it has finished its operation by causing an interrupt

Computer Startup

- When it is powered up or rebooted—it needs to have an **initial program** to run.

- **The initial program** or **bootstrap program** is
  - Stored in ROM or EEPROM,
  - Initializes (reset) all aspects (أجزاء) of the system from CPU registers to device controllers to memory contents.
  - Loads operating system (kernel) and starts execution that program

- To accomplish this goal, the bootstrap program must locate the operating-system kernel and load it into memory.
- Once the kernel is loaded and executing, it can start providing services to the system and its users.

2.2 I/O Interrupts

- The occurrence of an event is usually signaled by an **interrupt** from either the hardware or the software.

عادةً ما يتم الإشارة إلى وقوع حدث عن طريق مقاطعة Interrupt من المكونات المادية او البرامجيات وتكون على نوعين:

- **Hardware** may trigger an interrupt at any time by sending a signal to the CPU usually by way of the system bus.

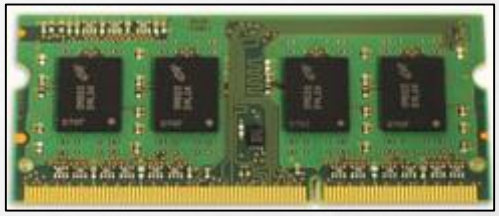
- **Software** may trigger an interrupt by executing a special operation called a system call (also called a monitor call).

- Interrupts are an important part of a computer architecture.

- When the CPU is **interrupted**, it **stops** what it is doing and immediately **transfers** execution to a fixed location.
- The **fixed location** usually **contains** the starting address where the service routine for the interrupt is located.
- The interrupt service routine **executes**; on **completion**, the CPU **resumes** the interrupted computation.

2.3 Storage Structure

Main memory is the only large storage area that the CPU can access directly.



- The CPU can load instructions only from memory, so any programs must be in main memory (also called **Random- Access Memory** or **RAM**) to be executed.
- Implemented in a semiconductor technology called **dynamic random-access memory (DRAM).**

- **Read-only memory, ROM**), one of its types is **Electrically Erasable Programmable Read-Only Memory, EEPROM**). Because ROM cannot be changed, only static programs, such as the bootstrap program, are stored there.

- We want the programs and data to reside in main memory permanently. This arrangement usually is not possible for the following two reasons;

1. Main memory is usually too small to store all needed programs and data permanently.

2. Main memory is a **volatile** storage device that loses its contents when power is turned off or otherwise lost.

2.3 Storage Structure Cont.

Thus, most computer systems provide:

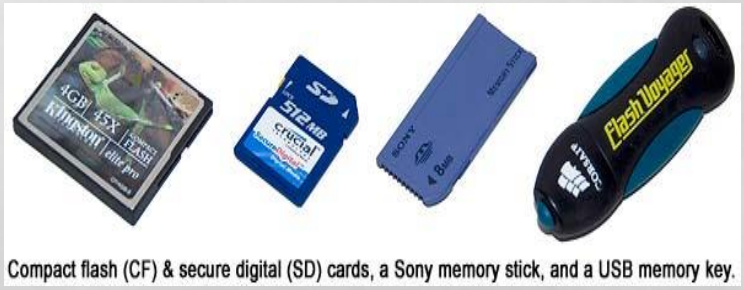
- **Secondary storage** as extension of main memory that provides large nonvolatile storage capacity (Magnetic disk, CD-ROM (740 MB), DVD (4.7, 9 GB)).
- **Hard disks** is a rigid metal or glass platters covered with magnetic recording material

  - Disk surface is logically divided into **tracks**, which are subdivided into **sectors**.

  - The **disk controller** determines the logical interaction between the device and the computer

- **Solid-state disks** – faster than hard disks, nonvolatile

- Various technologies (Flash memory, personal digital assistants (PDAs).



Compact flash (CF) & secure digital (SD) cards, a Sony memory stick, and a USB memory key.

The main differences among the various storage systems are speed, cost, size, and volatility.

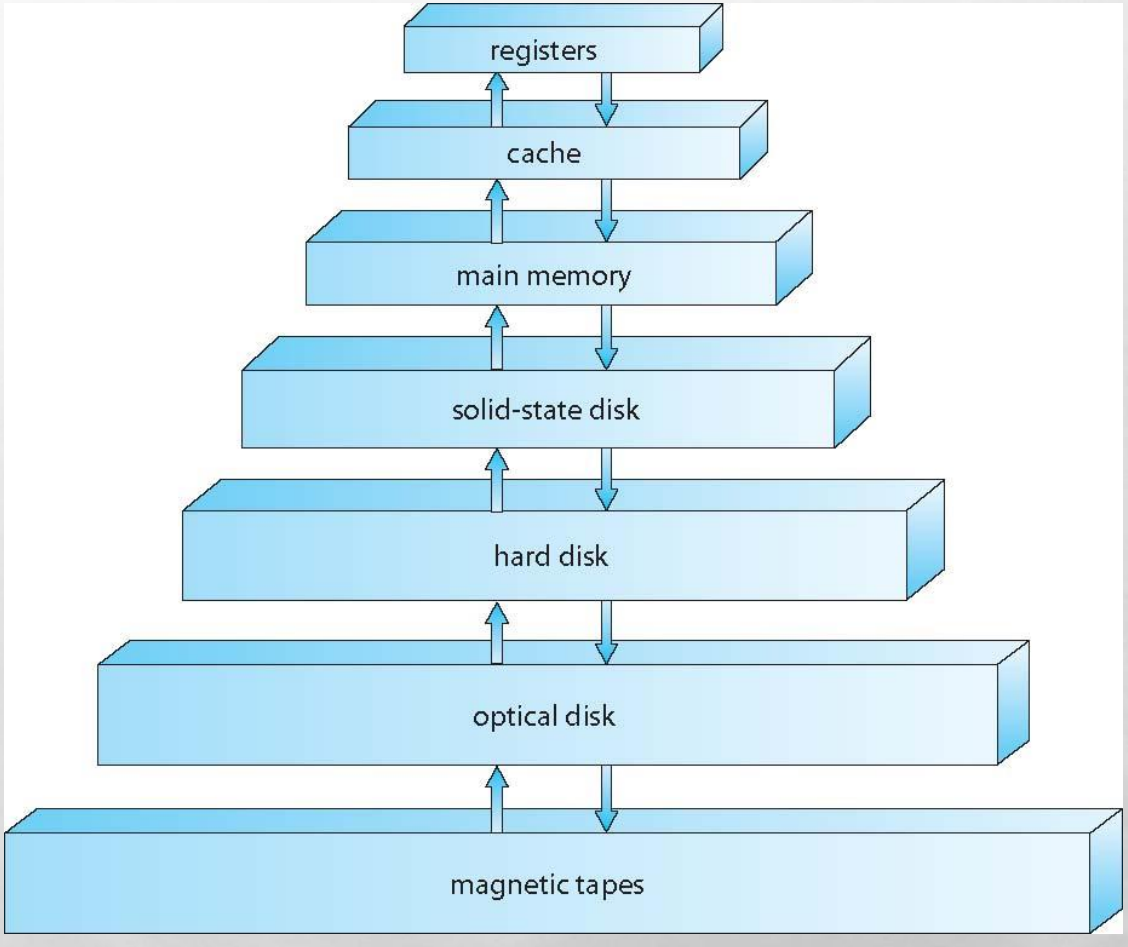
Storage-Device Hierarchy

- Storage systems organized in a hierarchy according to:

- Speed

- Cost

- Volatility



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