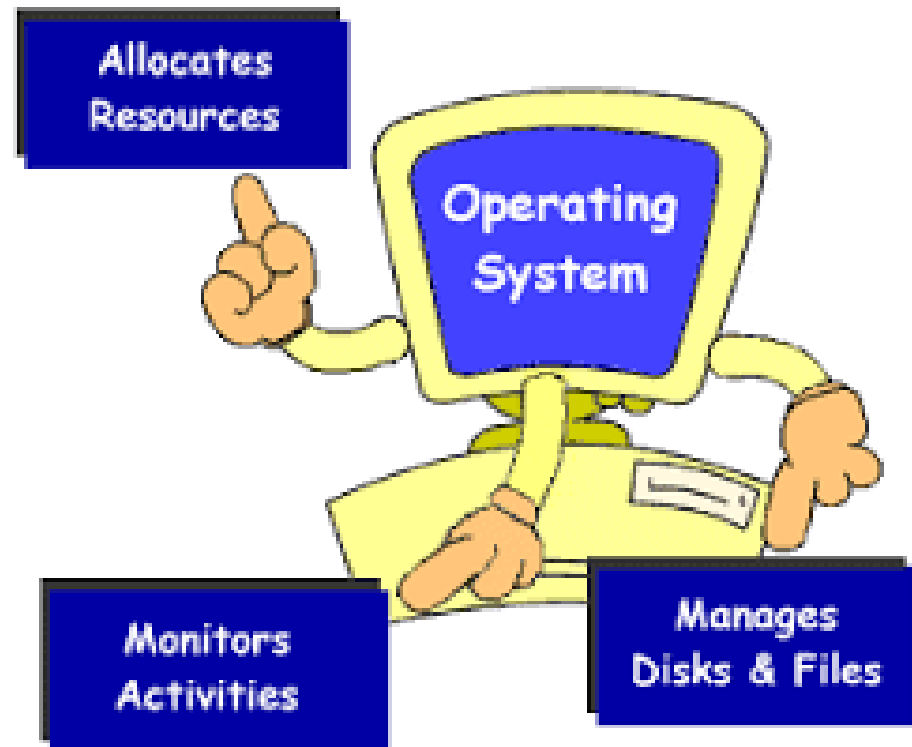


Operating Systems 1

Lecture 1

Dr. Inas Laïla



Course Textbook

Operating Systems Concepts,
9th Edition, by Silberschatz,
Galvin, Gagne.

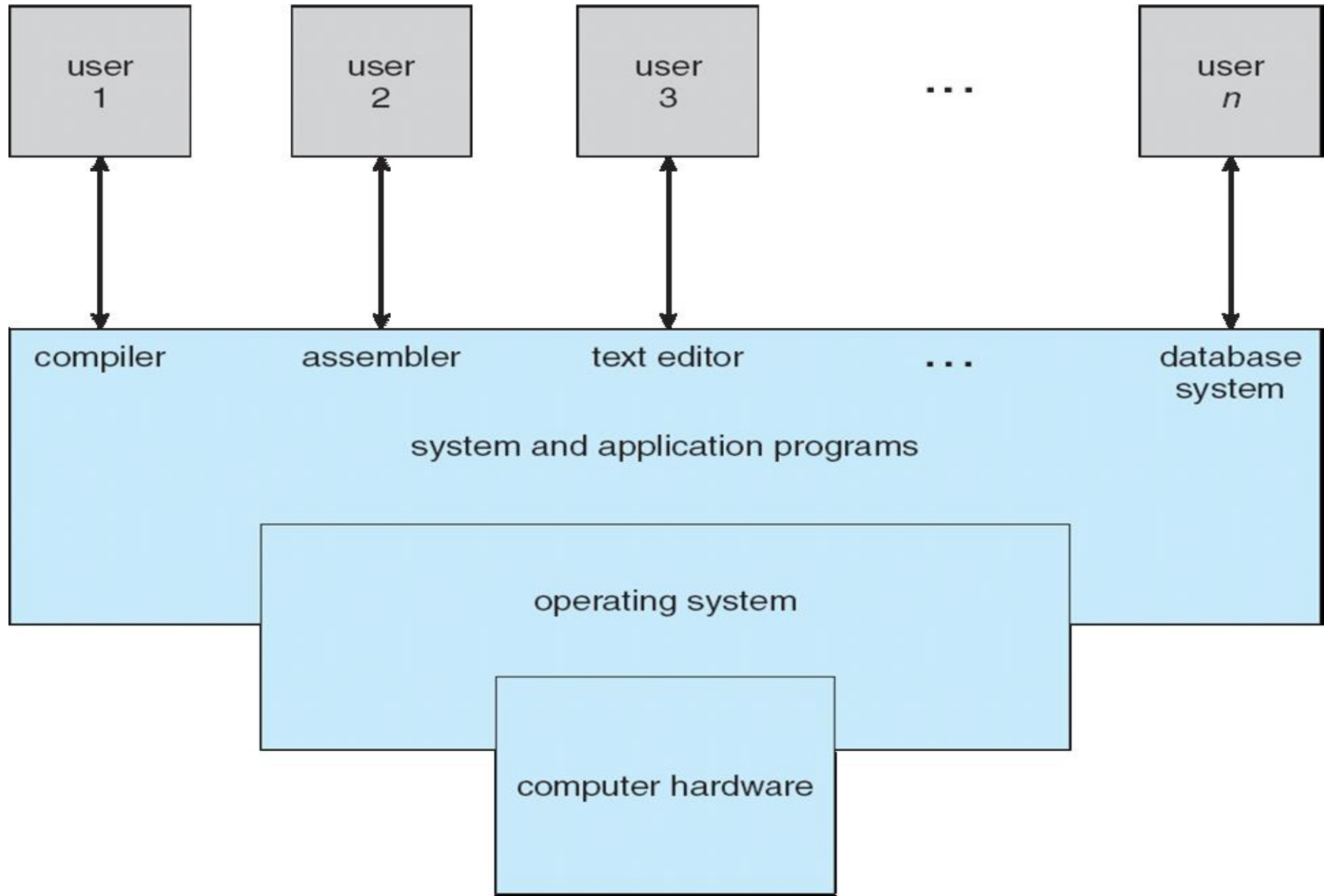


Computer System Structure

■ Computer system can be divided into four components:

- Hardware – provides basic computing resources
 - ▶ CPU, memory, I/O devices
- Operating system
 - ▶ Controls and coordinates use of hardware among various applications and users
- Application programs – (usually called just "applications") are programs that people use to get their work done. Computers exist because people want to run these programs like Word processors, web browsers, database systems, video games.
- Users
 - ▶ People, machines, other computers

Four Components of a Computer System





What Operating Systems Do?

- Depends on the point of view
- **Users** want convenience, **ease of use** and **good performance**
 - Don't care about **resource utilization**
- But shared computer such as **mainframe** must keep all users happy
- Handheld computers are resource poor, optimized for usability and battery life
- Some computers have little or no user interface, such as embedded computers in devices and automobiles



Operating System Definition

Operating System : A program that acts as an intermediary or interface between the applications and the computer hardware

- OS is a **Resource Allocator** : An Operating System performs all the basic tasks like managing files, processes, and memory. Thus, the operating system acts as the manager of all the resources, i.e. **resource manager**.
(Manages all resources+ Decides between conflicting requests for **efficient and fair** resource use (CPU time, memory space, I/O devices...))
- OS is a **control program**
 - Controls execution of programs to prevent errors and improper use of the computer



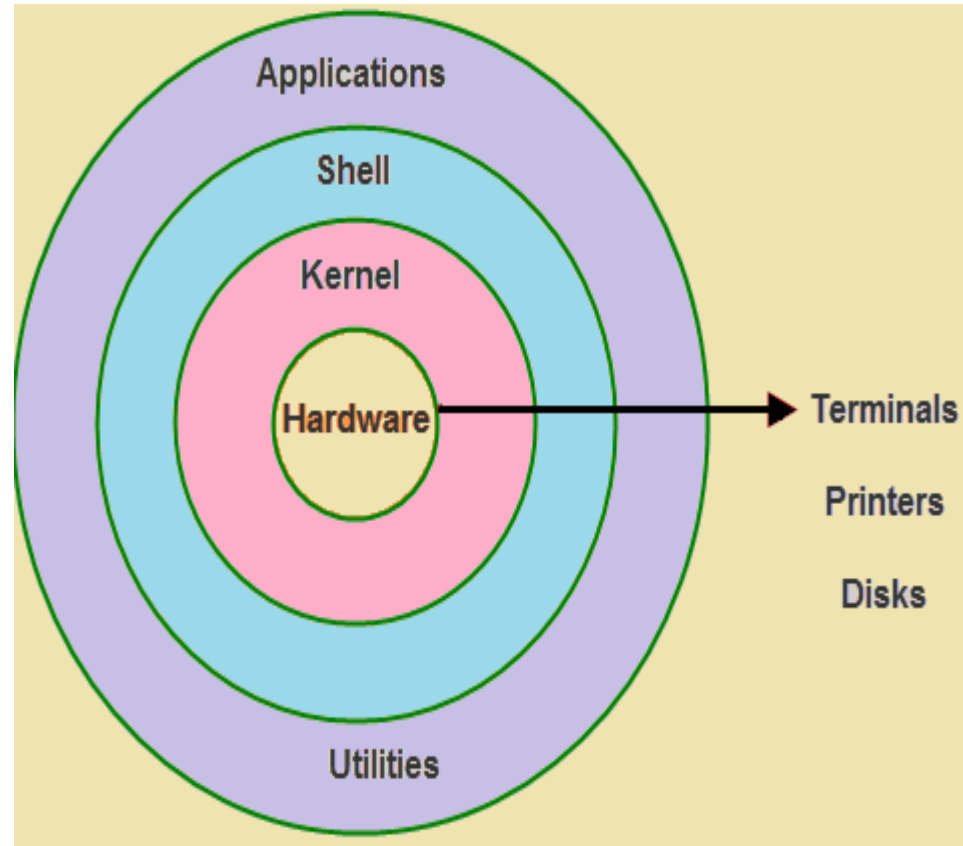
Operating System Definition (cont.)

The one program running at all times on the computer is the kernel.

The **kernel** is a computer program that is the **core** of a computer's operating system, with complete control over everything in the system

A shell is basically an interface present between the kernel and the user. The shell interacts with users and applications by taking user input, interpreting commands, and forwarding them to the kernel for execution.

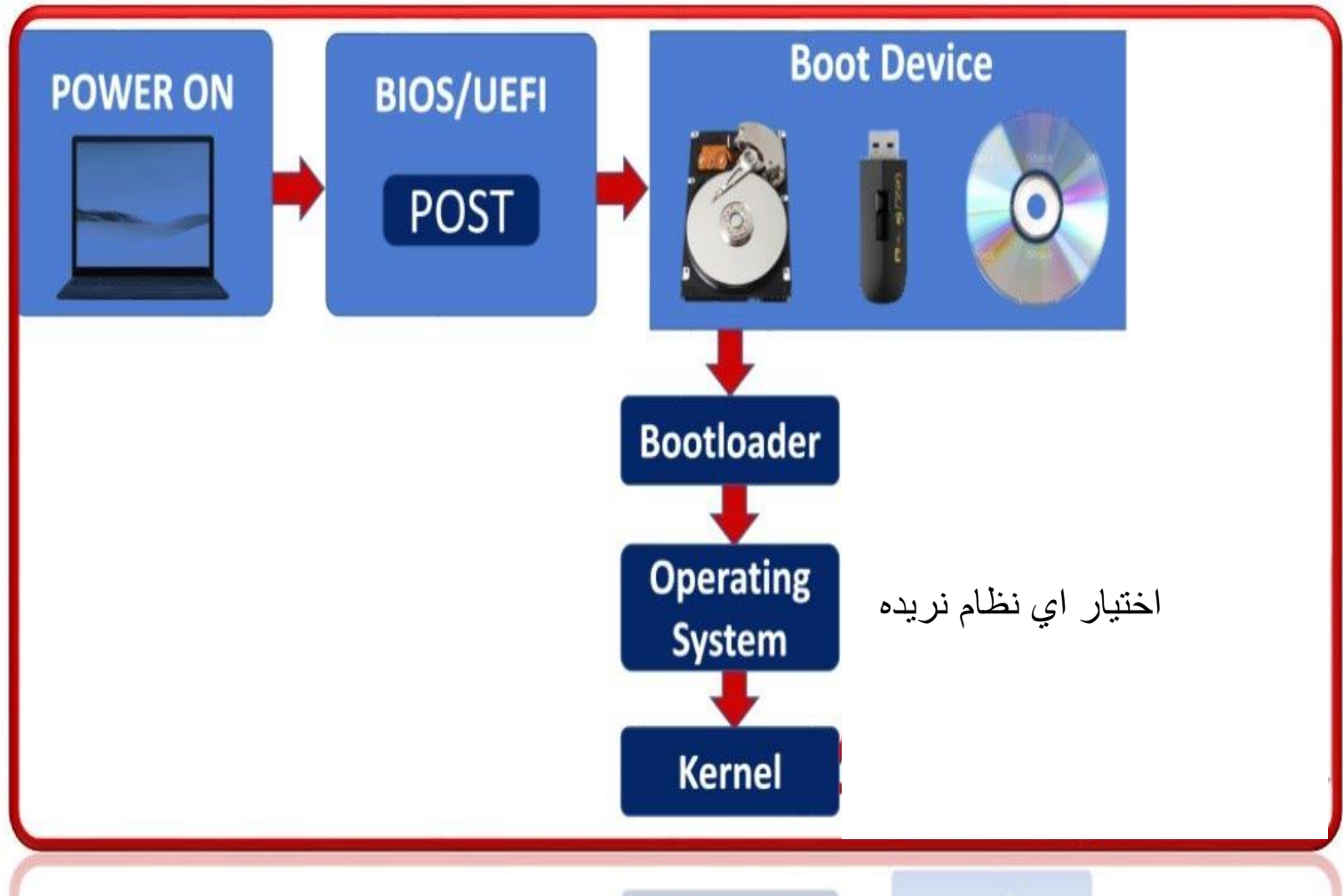
The critical code of the kernel is usually loaded into a separate area of memory, which is protected from **access** by application programs or other, less critical parts of the operating system.



Computer Startup

- **bootstrap program** is loaded at power-up or reboot
 - Typically stored in ROM or EPROM, generally known as **firmware**
 - Initializes all aspects of system
 - Loads operating system kernel and starts execution
- Press the power button on your computer. The CPU starts up but needs some instructions to work on. Since the main memory is empty at this stage, the CPU defers to load instructions from the **firmware** (Typically stored in ROM)
- The firmware code does a Power On Self Test (**POST**), initializes the remaining hardware, detects the connected peripherals devices, and checks if all connected devices are healthy.
 - After POST has completed, the boot process searches in the **boot device list**
.....

Boot Process in Your System



What Is BIOS and When You Need to Use it?

When you build your own PC, you need to configure some settings in the motherboard's BIOS (Basic Input/Output System) before installing an operating system. **The BIOS is a firmware that controls the hardware components and boot process of your PC**

UEFI vs. legacy BIOS

UEFI (Unified Extensible Firmware Interface) is a newer standard that replaces the legacy BIOS. UEFI offers more features and benefits, such as faster boot times, better security, larger disk support, and graphical user interface.

how to access BIOS or UEFI settings and modify them??



How to access the BIOS

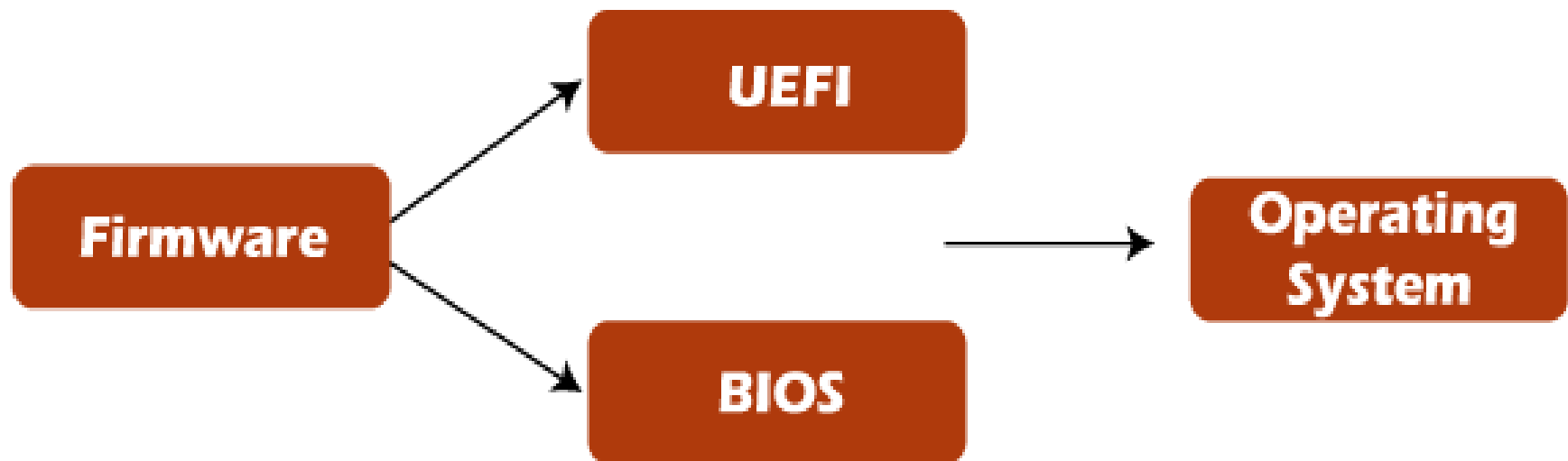
To access the BIOS, you need to press a specific key or combination of keys during the boot process. The exact key depends on your motherboard model and manufacturer, but it is usually one of the following: Del, F2, F10, F12, or Esc.

Once you enter the BIOS, you will see a menu with various settings and options. You can use the arrow keys, Enter, and Esc to navigate and modify the settings.

Computer Manufacturer Model Setup						
Main	Advanced	Security	Power	Boot	Exit	
Boot-time Diagnostic Screen: [Disabled]					Item Specific Help	
QuickBoot Mode: [Enabled]					Displays the diagnostic screen during boot	
Restore On AC/Power Loss: [Stay Off]						
On LAN: [Stay Off]						
First Boot Device [Removable Devices]						
Second Boot Device [Hard Drive]						
Third Boot Device [ATAPI CD-ROM]						
Fourth Boot Device [Network Boot]						
▶ Hard Drive						
▶ Removable Devices						
▶ Removable Format						
Computer Hope (http://www.computerhope.com)						
F1 Help	↑↓	Select Item	-/+	Change Values	F9	Setup Defaults
Esc Exit	↔	Select Menu	Enter	Select ▶ Sub-Menu	F10	Save and Exit

ما المقصود بـ
MBR و GPT

1. the new boot
2. faster & securer
3. based-on GPT



1. old school boot
2. no secure boot
3. based-on MBR

What is the difference

GPT

Vs

MBR



MBR and GPT are partitioning schemes for hard disks

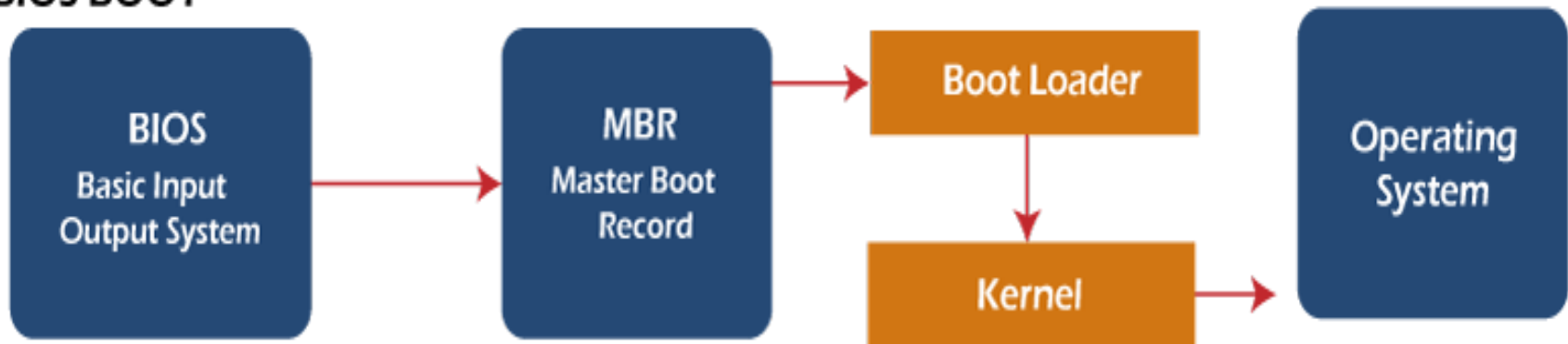
Differences between MBR and GPT include

- MBR is the traditional partition table that supports older operating systems, while GPT is a new replacement that doesn't have limits on the disk size and number of partitions you can create.
- GPT is more robust and allows for larger drives, but MBR is still a perfectly valid option for small drives.
- GPT is more corruption-resilient and has better partition management, plus it's the newer and more reliable standard.
- GPT with UEFI is a far better partitioning system than MBR with BIOS.
- One advantage of GPT disks is that you can have more than four primary partitions on each disk. GPT is also required for disks larger than 2 terabytes (TB).

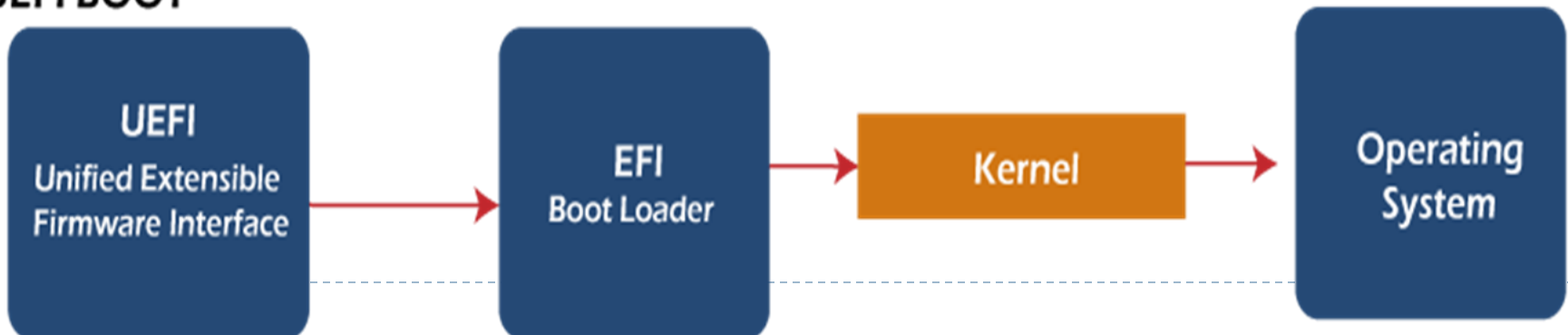
Booting Process with BIOS: When BIOS begins its execution, it first goes for the Power-On Self Test (POST), ensuring that the hardware devices are functioning correctly.

After that, it checks for the *Master Boot Record* in the first sector of the selected boot device. From the MBR, the location of the Boot-Loader is retrieved, which, after being loaded by BIOS into the computer's RAM, loads the operating system into the main memory.

BIOS BOOT



UEFI BOOT





- Computer Management (Local)
 - System Tools
 - Task Scheduler
 - Event Viewer
 - Shared Folders
 - Local Users and Groups
 - Performance
 - Device Manager
 - Storage
 - Disk Management**
 - Services and Applications

Volume	Layout	Type	File System	Status
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)
(E:)	Simple	Basic	NTFS	Healthy (Volume Shadow Copy Service, Primary Partition)
(F:)	Simple	Basic	NTFS	Healthy (Volume Shadow Copy Service, Primary Partition)
(G:)	Simple	Basic	NTFS	Healthy (Volume Shadow Copy Service, Primary Partition)
(H:)	Simple	Basic	NTFS	Healthy (Volume Shadow Copy Service, Primary Partition)
System Reserved	Simple	Basic	NTFS	Healthy (Primary Partition)

Volume	Capacity
(C:)	39896 MB
(E:)	29996 MB
(F:)	29996 MB
(G:)	29996 MB

WDC WD1600BEVT-60ZCT1 ATA Device Properties

General Policies Volumes Driver Details Events

Disk Information

Disk: Disk 0

Type: Basic

Status: Online

Partition style: Master Boot Record (MBR)

Capacity: 152627 MB

Unallocated space: 11 MB

Reserved space: 1 MB

Volumes

Volume	Capacity
(C:)	39896 MB
(E:)	29996 MB
(F:)	29996 MB
(G:)	29996 MB

Properties

OK Cancel

Types of Operating Systems

There are several types of Operating Systems

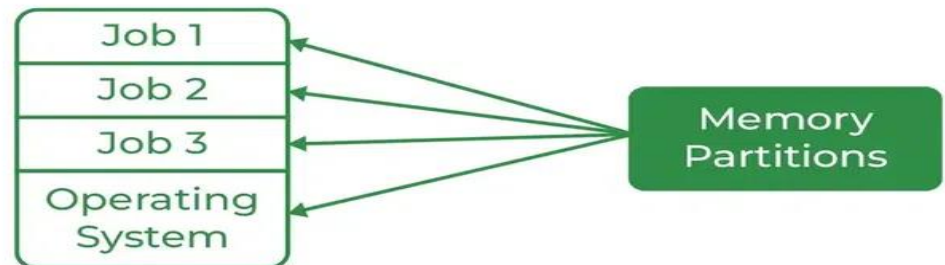
- Multi-Programming System
- Multi-Processing System
- Multi-Tasking Operating System
- Distributed Operating System
- Network Operating System
- Real-Time Operating System



▶ Multiprogramming Operating System

- ▶ needed for efficiency
- ▶ Multiprogramming organizes jobs (code and data) so CPU always has one to execute.
- ▶ A subset of total jobs in system is kept in memory
- ▶ One job selected and run via **job scheduling**
- ▶ When it has to wait (for I/O for example), OS switches to another job

Multiprogramming

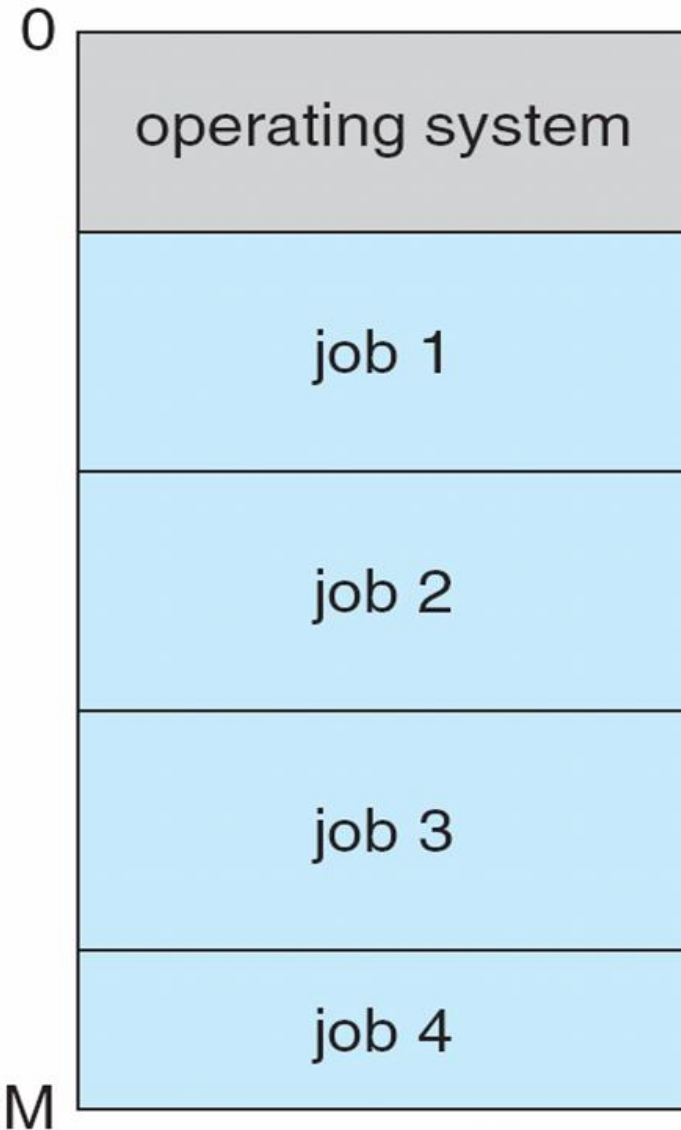


Memory Layout for Multiprogramming System

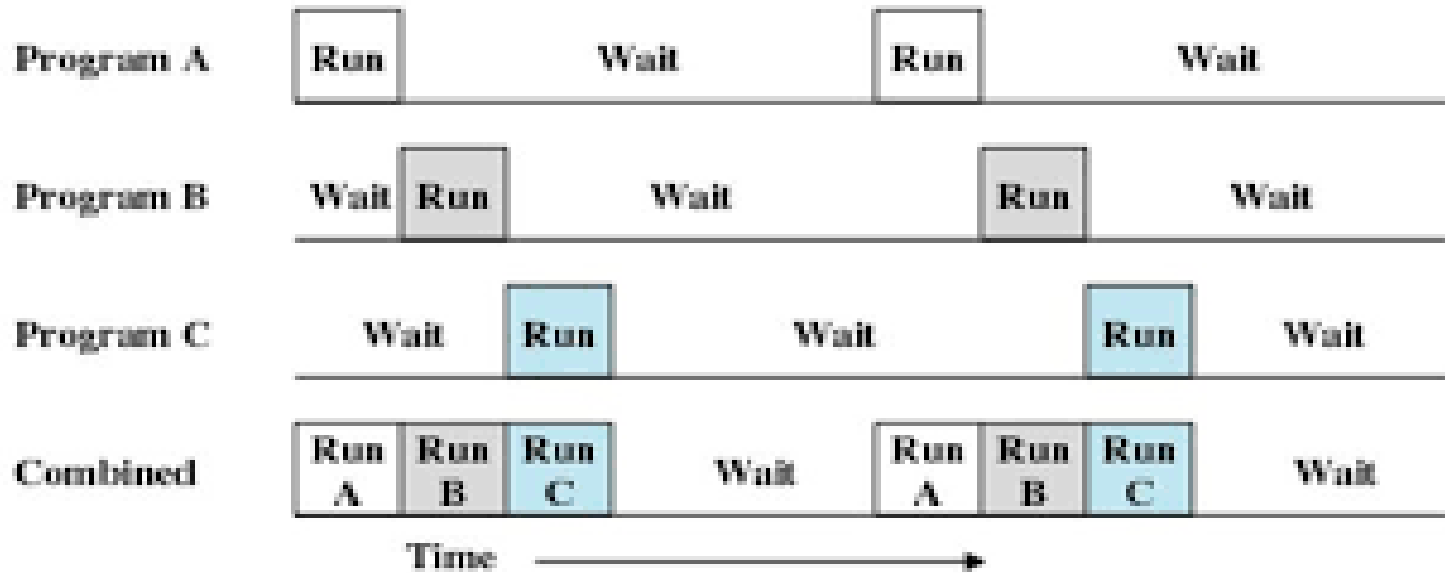
Multi-Programming Operating System

Multiprogramming Operating Systems can be simply illustrated as more than one program is present in the main memory and any **one of them can be kept in execution.**

This is basically used for better utilization of resources.



Multiprogramming needed for efficiency



(c) Multiprogramming with three programs

Advantages of Multi-Programming Operating System

- Multi Programming increases the Throughput of the System.
- It helps in reducing the response time.

Disadvantages of Multi-Programming Operating System

- There is not any facility for user interaction of system resources with the system

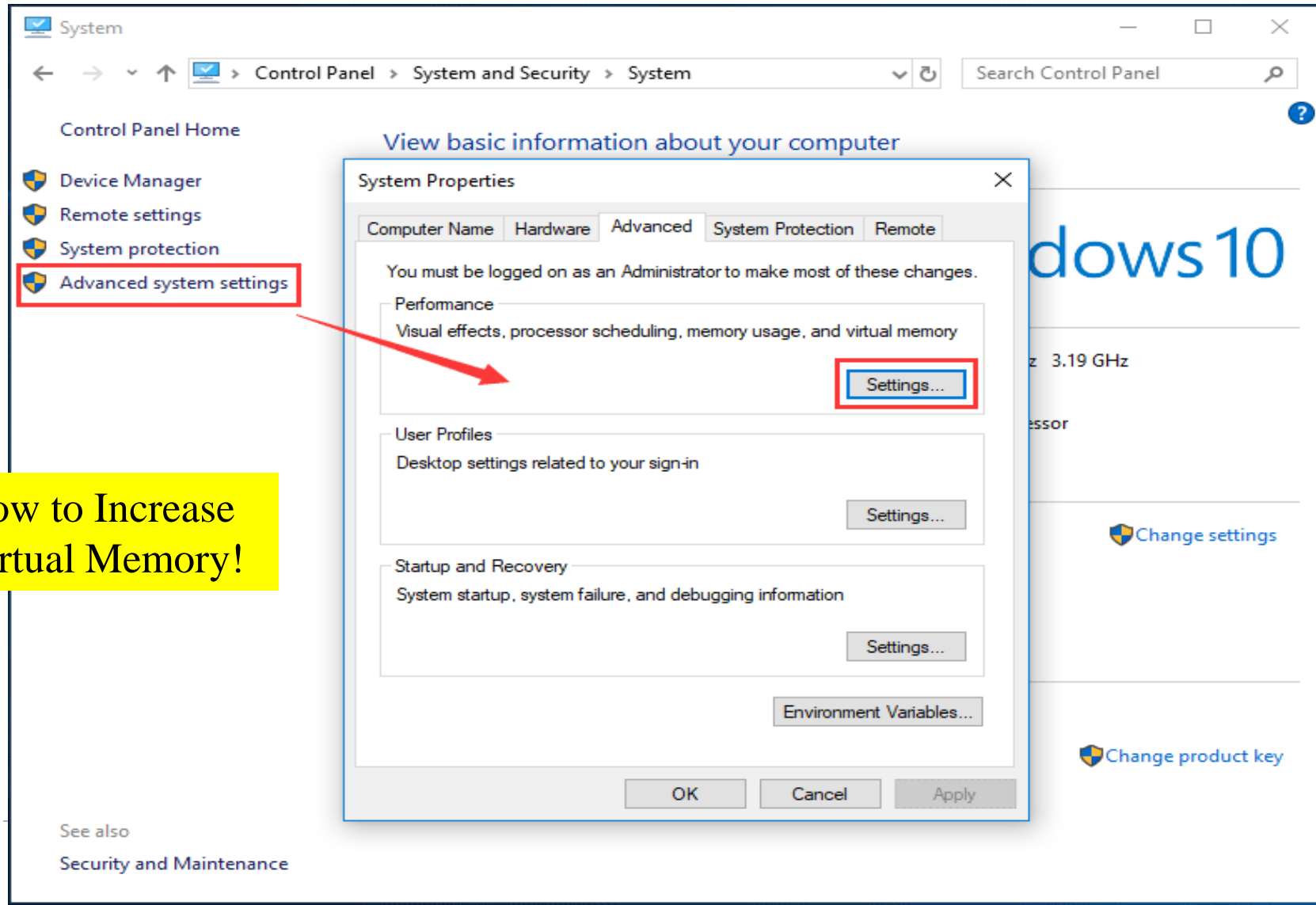
▶ **Multitasking (Timesharing) Operating System**

- ▶ needed for interactive computing
- ▶ Multitasking Operating System is simply a multiprogramming Operating System with having facility of a Round-Robin Scheduling Algorithm. It can run multiple programs simultaneously.
- ▶ CPU switches jobs so frequently (Time slicing) that users can interact with each job while it is running, creating interactive computing
- ▶ **Response time** should be < 1 second
- ▶ If several jobs ready to run at the same time \Rightarrow **CPU scheduling**
- ▶ If processes don't fit in memory, **swapping** moves them in and out to run
- ▶ **Virtual memory** allows execution of processes not completely in memory



Virtual memory allows execution of processes not completely in memory

Virtual memory is an area of a computer system's secondary **memory** storage space (such as a hard disk or solid state drive) which acts as if it were a part of **the** system's **RAM** or primary **memory**



Multi-Processing Operating System

Multi-Processing Operating System is a type of Operating System in which more than one CPU is used for the execution.

It better the throughput of the System.

- ▶ Most systems use a **single general-purpose processor**
- ▶ **Multiprocessors** systems growing in use and importance
 - ▶ Also known as **parallel systems**,
- ▶ **Advantages of Multi-Processing Operating System**

- ❖ It increases the throughput of the system.

- ❖ As it has several processors, so, if one processor fails, we can proceed with another processor (fault tolerance).

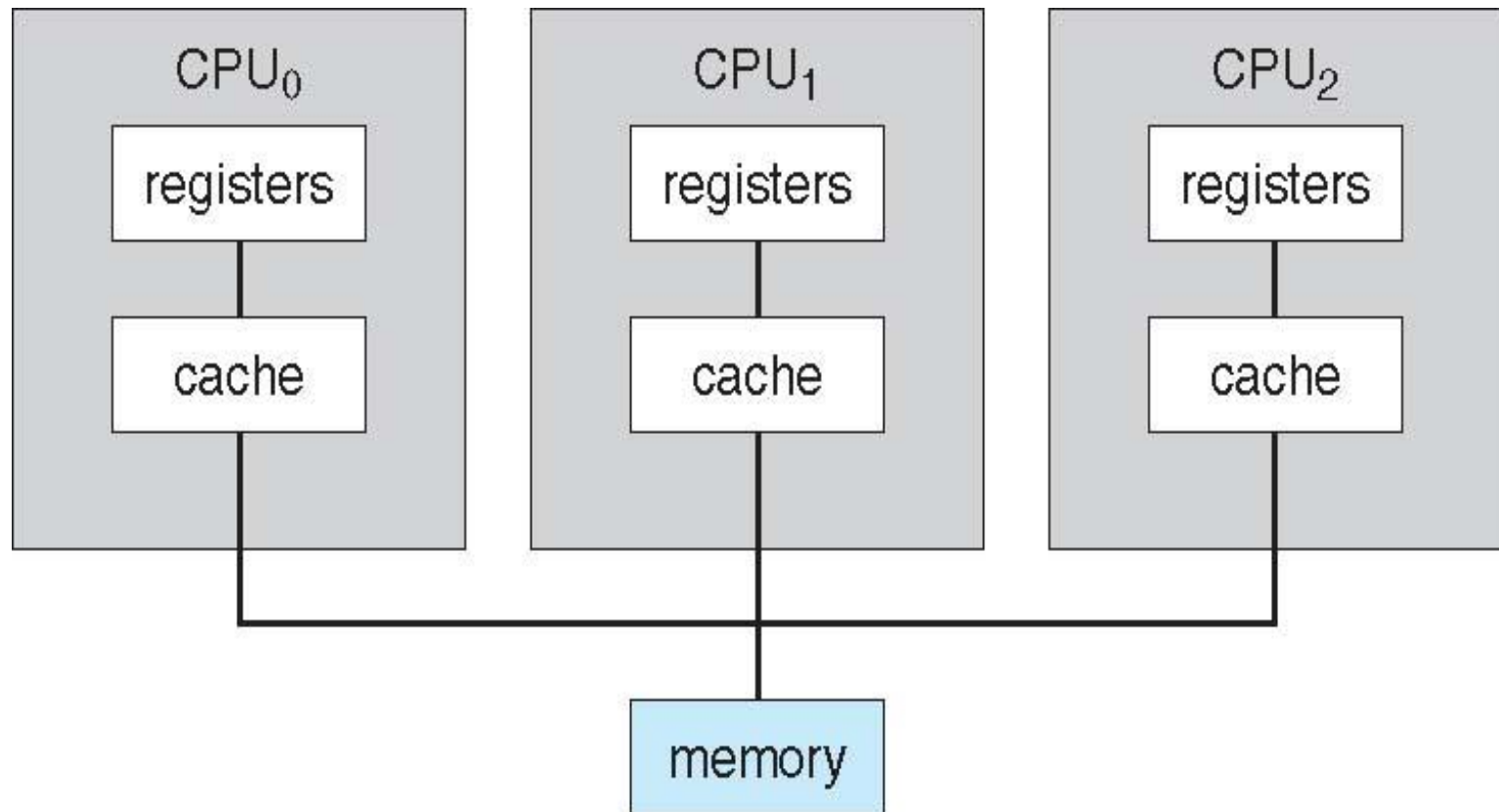
- ▶ **Disadvantages of Multi-Processing Operating System**

Due to the multiple CPU, it can be more complex and somehow difficult to understand.

- ▶ **Two types:**

1. **Asymmetric Multiprocessing** – each processor is assigned a specific task.
2. **Symmetric Multiprocessing** – each processor performs all tasks

Symmetric Multiprocessing Architecture

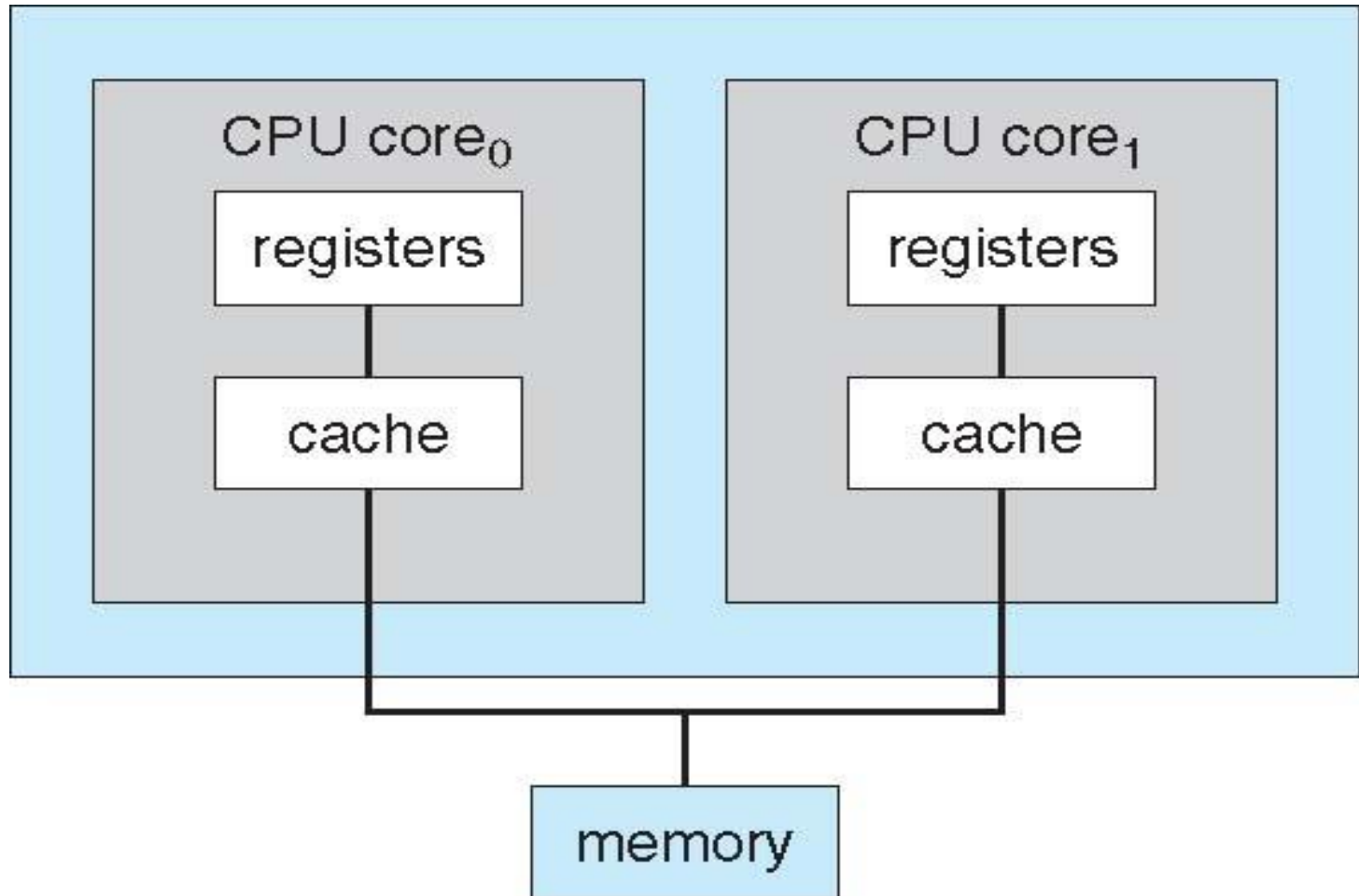


Some operating systems and programs are optimized for multiprocessing, while others are not



A Dual-Core Design

- ▶ Multi-chip and **multicore**





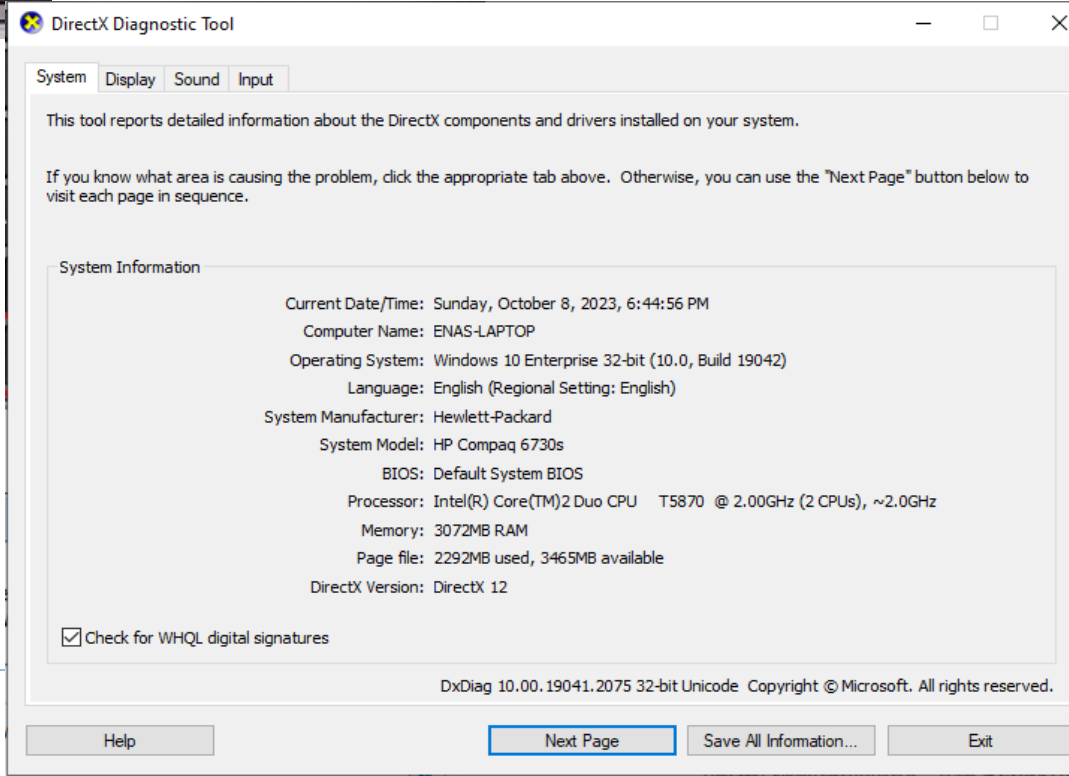
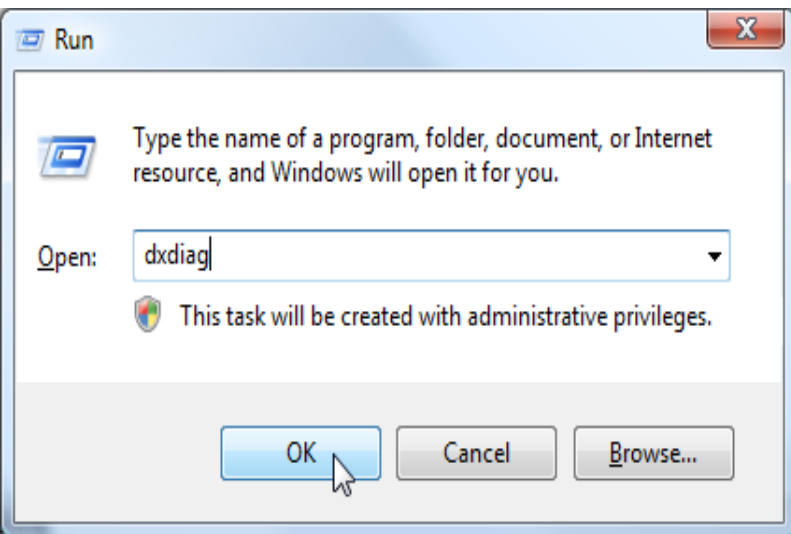
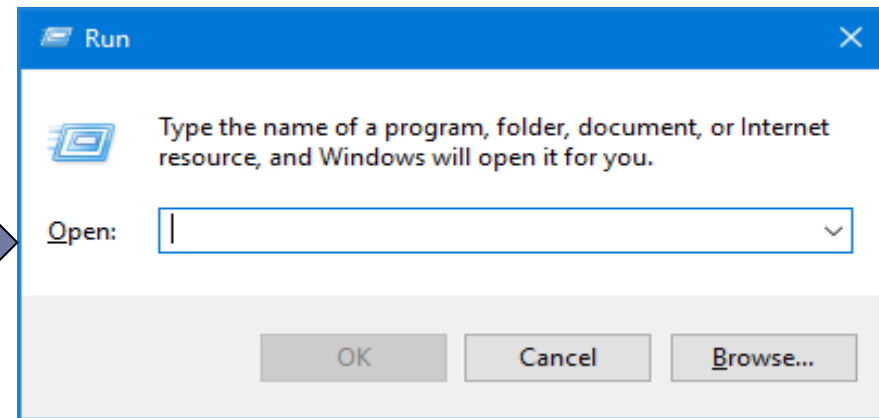
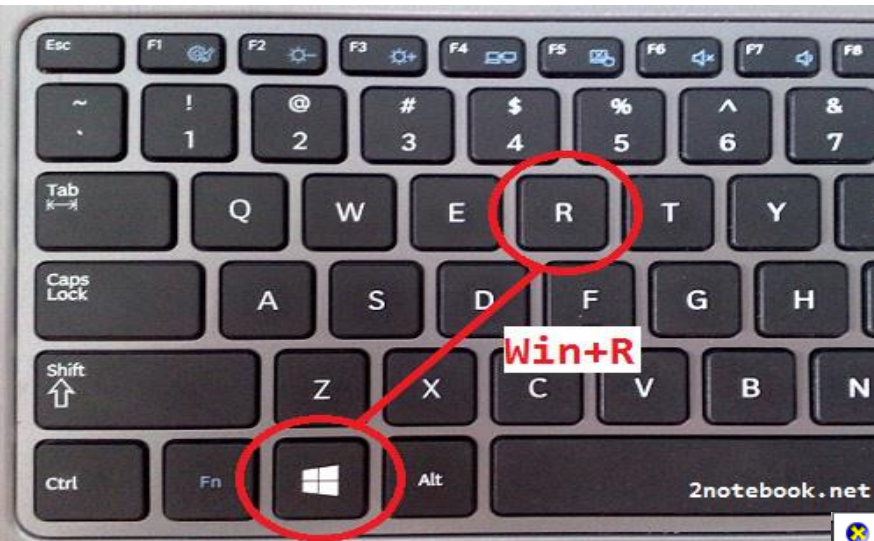
ماهي الفروقات؟؟

	Core i3	Core i5	Core i7
Number of cores			
Clock speed			
Hyper-Threading			
Turbo Boost			
Cache Memory			

ما معنى هذه الخصائص؟؟؟



How To Check Laptop Or PC Specification?? **dxdiag**





كما يمكننا معرفة ذلك من خلال الضغط علي My Computer او This PC بزر الماوس الايمن ثم نختار Properties كما في الصورة

System

View basic information about your computer

Windows edition

Windows 10 Pro

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System

Processor:

Intel(R) Core(TM) i7-3540M CPU @ 3.00GHz 3.00 GH

Installed memory (RAM):

8.00 GB (7.88 GB usable)

System type:

64-bit Operating System, x64-based processor

Pen and Touch:

No Pen or Touch Input is available for this Display



Intel® Core™ i7 - 8650 K processor
Unlocked

جميع المعالجات التي
تحمل هذا الحرف فهي
قابلة لكسر السرعة ورفع
التردد الافتراضي

Intel® Core™ i7 - 8650 H processor
High performance graphics

الجيل الثامن

Intel® Core™ i7 - 8650 HK processor
High performance graphics. Unlocked

ابحث عن معاني
الرموز الأخرى

Intel® Core™ i7 - 8650 U processor
Ultra-low power

U هو اختصار لـ Ultra-
low power، تشير هذه
العبرة إلى أن هذا المعالج أقل
استهلاكاً للطاقة ضمن فئته

لمعرفة معلومات تفصيلية استخدم

استخدم برنامج cpu-z

CPU-Z is a freeware that gathers information on some of the main devices of your system: Processor name and number, codename, process, package, cache levels. Mainboard and chipset. Memory type, ...

رابط التحميل


https://www.cpuid.com/downloads/cpu-z/cpu-z_1.94-en.zip







CPU-Z

System information software

WINDOWS® x86/x64 

WINDOWS® ARM64 

ANDROID® 

- advert -

Hi! For some reason we can't display an ad here, probably because of an ad blocker.

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CPU

Caches

Mainboard

Memory


SPD

Graphics

Bench

About

Processor

Name	Intel Core i7 3540M				
Code Name	Ivy Bridge	Max TDP	35.0 W		
Package	Socket 988B rPGA				
Technology	22 nm	Core VID	1.146 V		
Specification	Intel® Core™ i7-3540M CPU @ 3.00GHz				
Family	6	Model	A	Stepping	9
Ext. Family	6	Ext. Model	3A	Revision	E1/L1
Instructions	MMX, SSE, SSE2, SSE3, SSSE3, SSE4.1, SSE4.2, EM64T, VT-x, AES, AVX				

Clocks (Core #0)

Core Speed	3490.41 MHz
Multiplier	x 35.0 (12 - 37)
Bus Speed	99.73 MHz
Rated FSB	

Cache

L1 Data	2 x 32 KBytes	8-way
L1 Inst.	2 x 32 KBytes	8-way
Level 2	2 x 256 KBytes	8-way
Level 3	4 MBytes	16-way

Selection

Processor #1

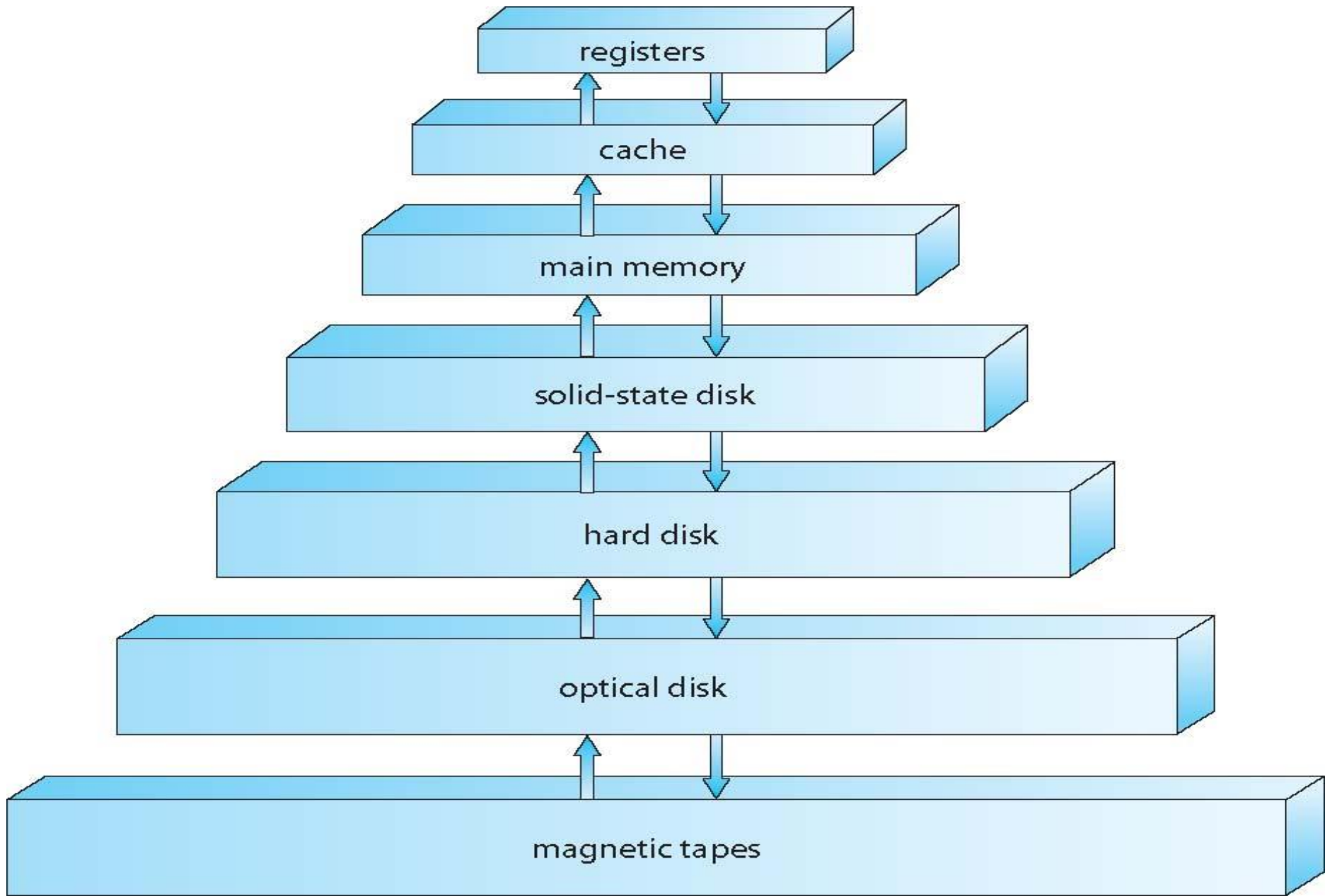
Cores

2

Threads

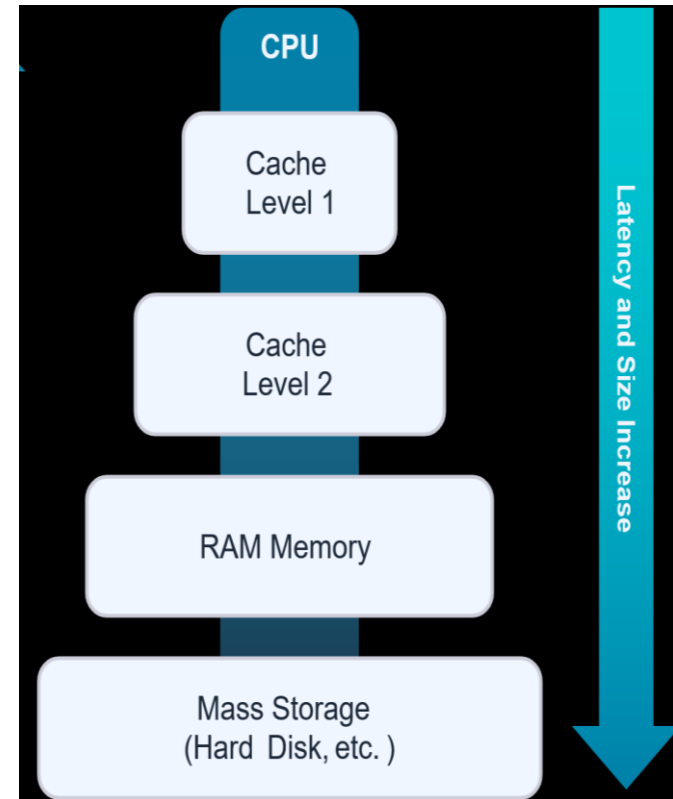
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Storage-Device Hierarchy



Caching

- ▶ Information in use copied from slower to faster storage temporarily
- ▶ Faster storage (cache) checked first to determine if information is there
 - ▶ If it is, information used directly from the cache (fast)
 - ▶ If not, data copied to cache and used there
- ▶ Cache smaller than storage being cached
 - ▶ Cache management important design problem
 - ▶ Cache size and replacement policy



A CPU cache is a hardware cache used by the central processing unit (CPU) of a computer to reduce the average cost (time or energy) to access data from the main memory. A cache is a smaller, faster memory, located closer to a processor core.

Today's CPU chips contain two or three caches, with L1 being the fastest. Each subsequent cache is slower and larger than L1, and instructions and data are staged from main memory to L3 to L2 to L1 to the processor.



Computing Environments - Traditional

- First was Stand-alone general purpose machines
- But later interconnect with others (i.e., the Internet)
- computers interconnect via wire or **wireless**
- Has to use **firewall** to protect from Internet attacks





Computing Environments - Mobile

- Handheld smartphones, tablets, etc
- What is the functional difference between them and a “traditional” laptop?
- Extra feature – more OS features (like gyroscope)
- Leaders are **Apple iOS** ((formerly **iPhone OS**)) and **Google Android**





Real-Time Embedded Systems

■ Real-time embedded systems

- special purpose, limited purpose OS, **real-time OS**
- Use expanding

■ Real-time OS has well-defined fixed time constraints

- Processing *must* be done within constraint
- Correct operation only if constraints met





Virtualization

■ Virtualization

Hardware virtualization refers to the **creation** of a virtual machine that acts like a real computer with an operating system. Software executed on these virtual machines

For example, a computer that is running Microsoft Windows may host a virtual machine that looks like a computer with the Ubuntu Linux operating system; Ubuntu-based software can be run on the virtual machine

- **VMM** (virtual machine Manager) provides virtualization services



Mac OS X

Apple laptop running Mac OS as a host, Windows or Ubuntu as a guest



ubuntu

Open-Source Operating Systems

closed-source VS. Open-Source Operating systems

Windows VS Linux

a) Not Open Source
(paid One)

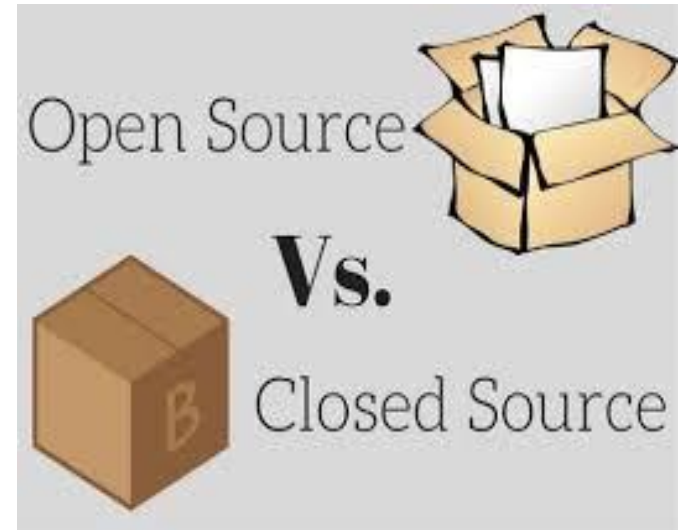
Open source
(Free Download & use all features)

b) Less Security compare
to linux

High Security

c) pay for ms office

free Office (libre)
such as excel, power point and others



thank
you