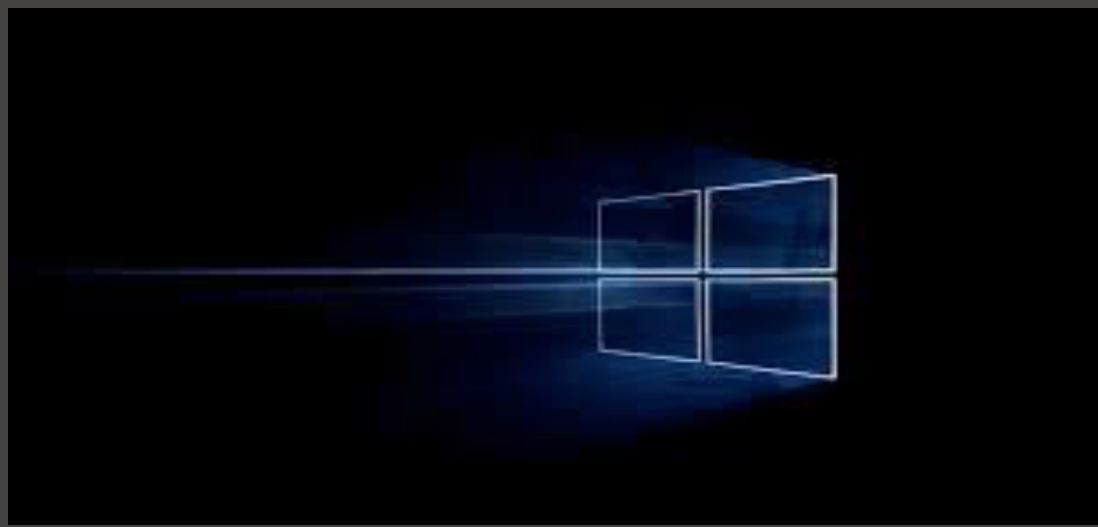# Chapter -3
Windows Operating System

What is meant by Windows Operating System?

❖ A group of several graphical operating system families, all of which are developed, marketed, and sold by Microsoft.

❖ As a graphical operating system shell for MS-DOS in response to the growing interest in graphical user interfaces (GUIs).

❖ As of December 2017, the most recent version of Windows for PCs, tablets, smartphones and embedded devices is Windows 10.

❖ The most recent versions for server computers is Windows Server 2016.

1.0 (1985) 3.1 (1992) 95 (1995) XP (2001)
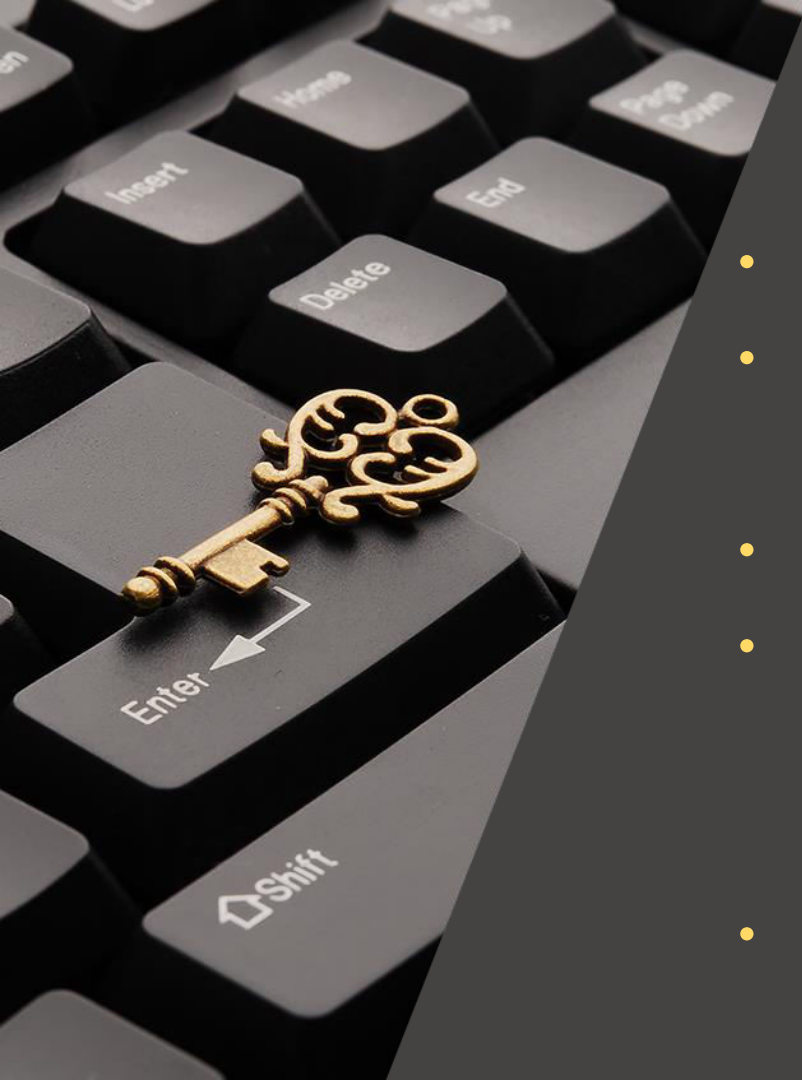
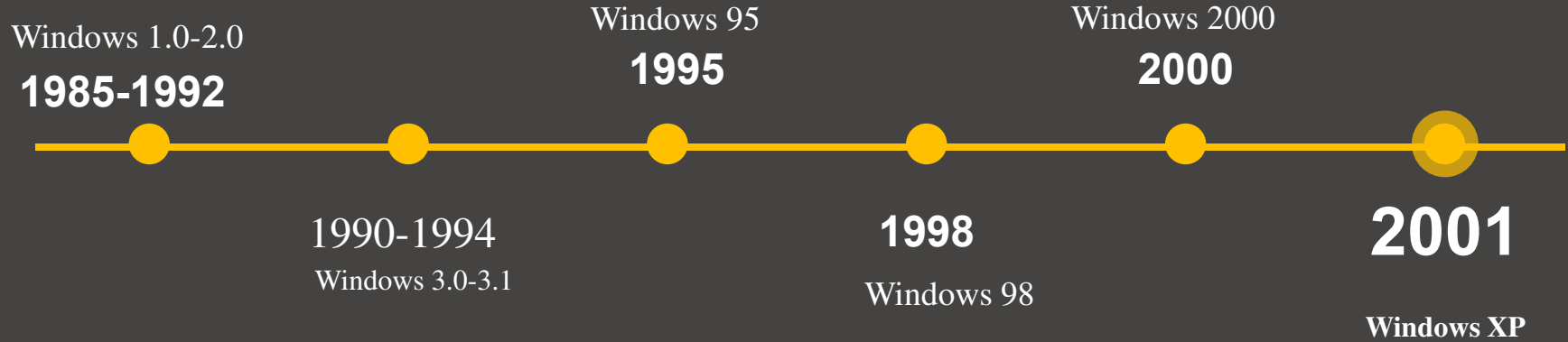Vista (2006) 7 (2009) 8 (2012) 10 (2015))11(2021)
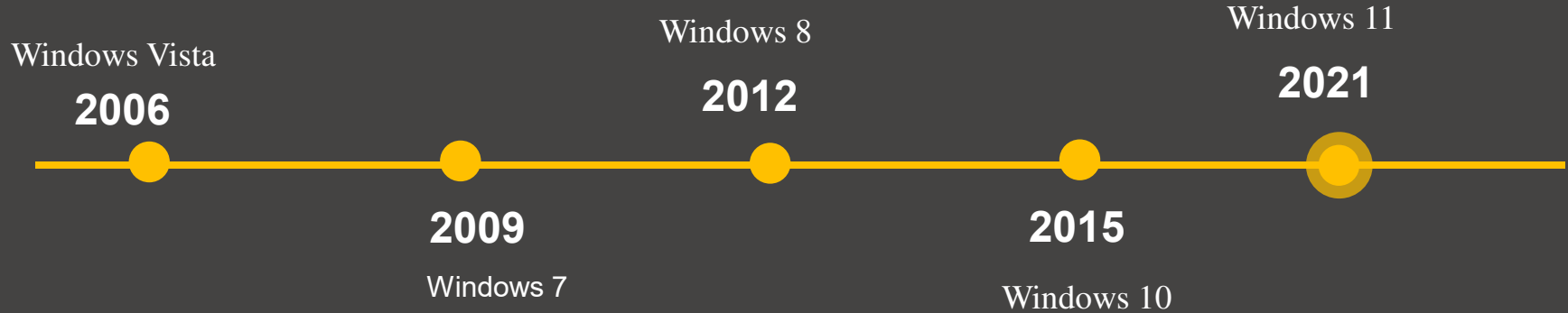
History
&
Development

- Earlier, there were no operating systems

- Each user used the machine for a scheduled period of time

- Often on punched paper cards and magnetic

- The program would be loaded into the machine, and the machine would be set to work until the program completed or crashed

- Then Windows introduced

Windows Timeline

Windows 1.0-2.0
1985-1992

1990-1994
Windows 3.0-3.1

Windows 95
1995

1998
Windows 98

Windows 2000
2000

2001
Windows XP

Windows Timeline(Contd.)

Windows Vista
2006

2009
Windows 7

Windows 8
2012

2015
Windows 10

Windows 11
2021
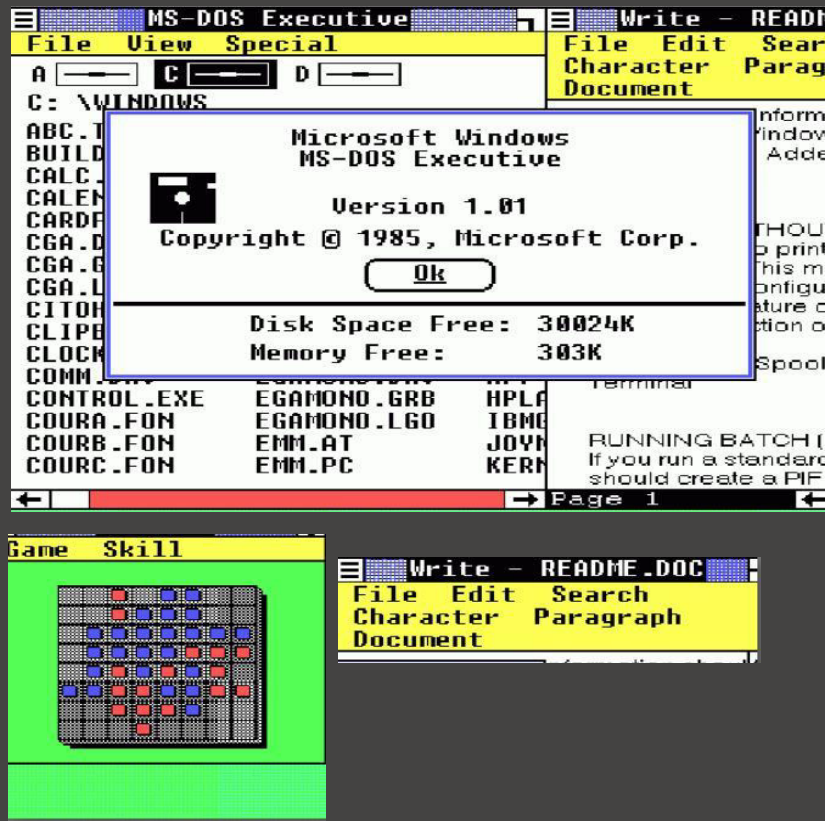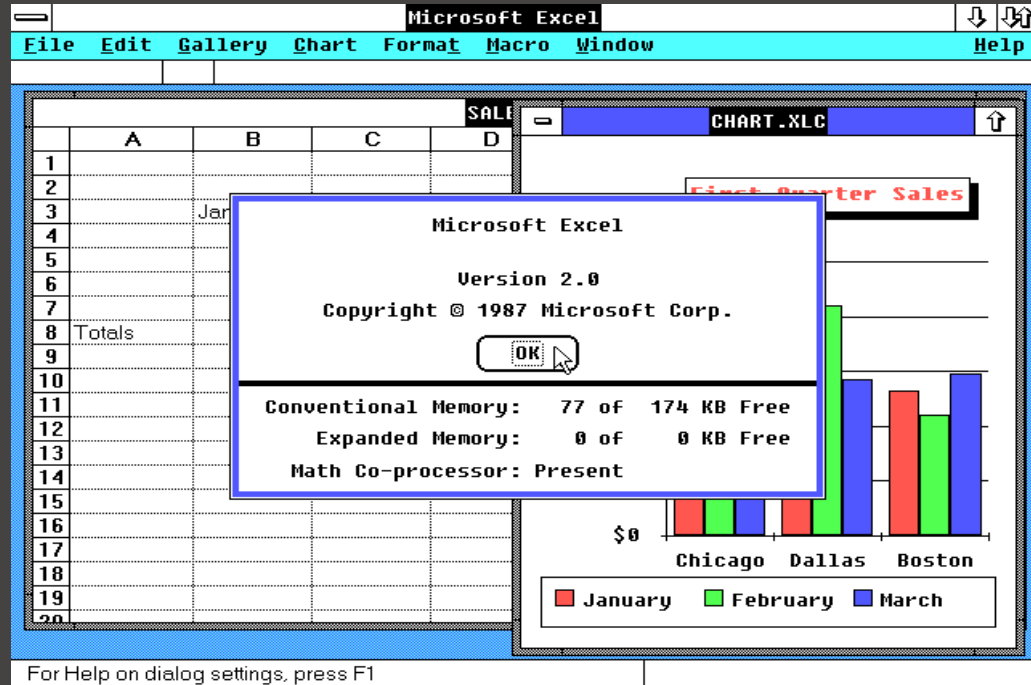
Windows 1.x

- Pure operating environment
- Used GUI(Graphical user interface)
- Simple graphics

Windows 2.x

- 16-bit Microsoft **Windows** GUI-based operating environment
- Faster than 1.x
- Introduced the control panel
- Introduced first version on excel and word

Windows 3.x

- Operated with 8086 microprocessor
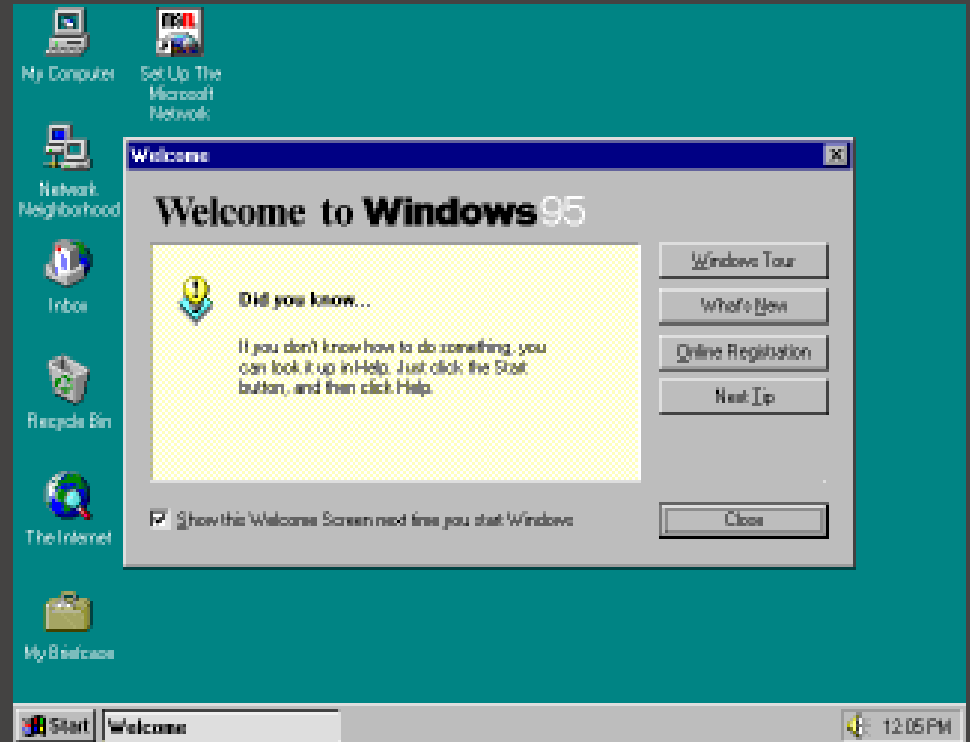- Virtual memory
- Operated with 6-7 MB of free space of hard drive
- Better multitasking
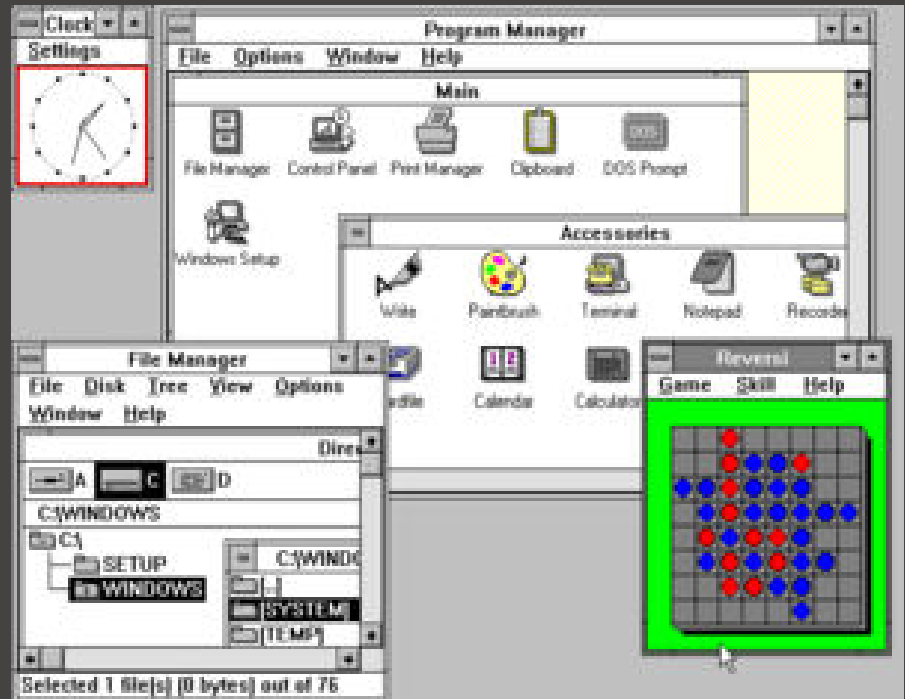
Windows 95

- A complete operating system
- Improved windows control and appearance
- Right button menu
- Task bar and start menu

Windows XP

- Advanced portable PC support
- Automatic wireless connection support
- Fast start-up
- Help and support center
- Better graphical user interface

Windows 7

- Introduced a large number of new features
- Incremental upgrade to the Windows line
- Windows 7 has multi-touch support
- redesigned Windows shell with an updated taskbar
- a home networking system called Home Group, and performance improvements.
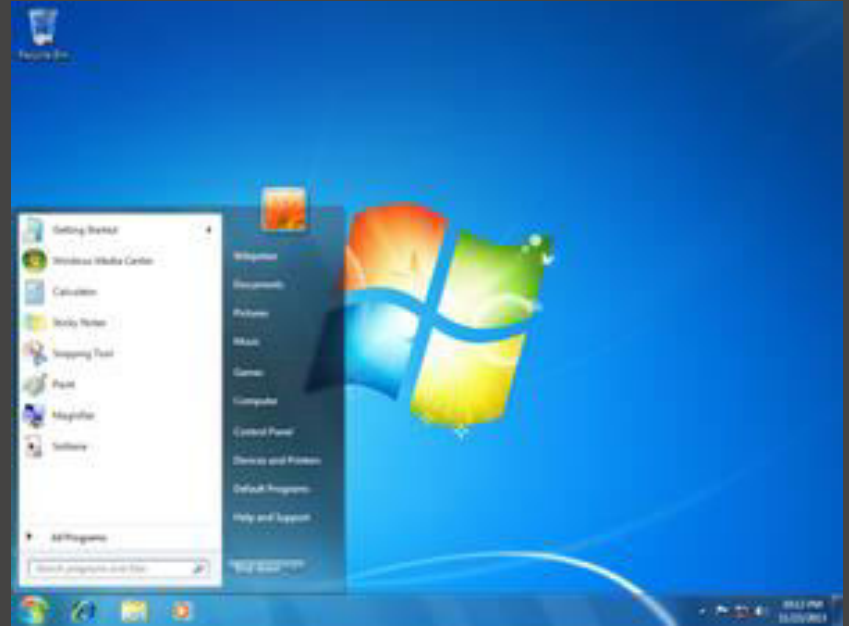
Windows 8

- Optimizations for touch-based
- Devices such as tablets and all-in-one pcs
- Increased integration with cloud services
- Other online platforms (such as social networks and microsoft's own onedrive (formerly skydrive) and xbox live services)
- The Windows Store service for software distribution

Windows 10

- Addresses shortcomings in the user interface first introduced with windows 8
- The return of the start menu
- A virtual desktop system
- The ability to run windows store apps within windows on the desktop rather than in full-screen mode
- Includes new icons and right-click context menus, default printer management, four times as many tiles allowed in the start menu, find My Device, and Edge updates.

Windows 11

- Start Menu Folders
- New Touch Gesture
- Improved quick Access
- Do Not Disturb & Focus Mode
- Live Captions
- Redesigned Task Manager

Advantages

- Beautiful, more consistent new design.
- Great window layout options.
- Strong video gaming updates.
- Performance-improving features.
- Better multi-monitor functionality.
- Planned support for Android apps.

Versions of Windows

Windows1 1985 | Windows 3.1 1992 | Windows 95 1995 | Windows XP 2001 | Windows Vista 2006 | Windows 7 2009 | Windows 8 2012 | Windows 10 2015

Application in Windows

❑ We can find almost all types of application in windows store. Which we need in our daily   life.

❑ Many applications like Adobe Photoshop Enterprise, Adobe Reader, Facebook, Messenger, Media Players etc can be found in Windows Store.
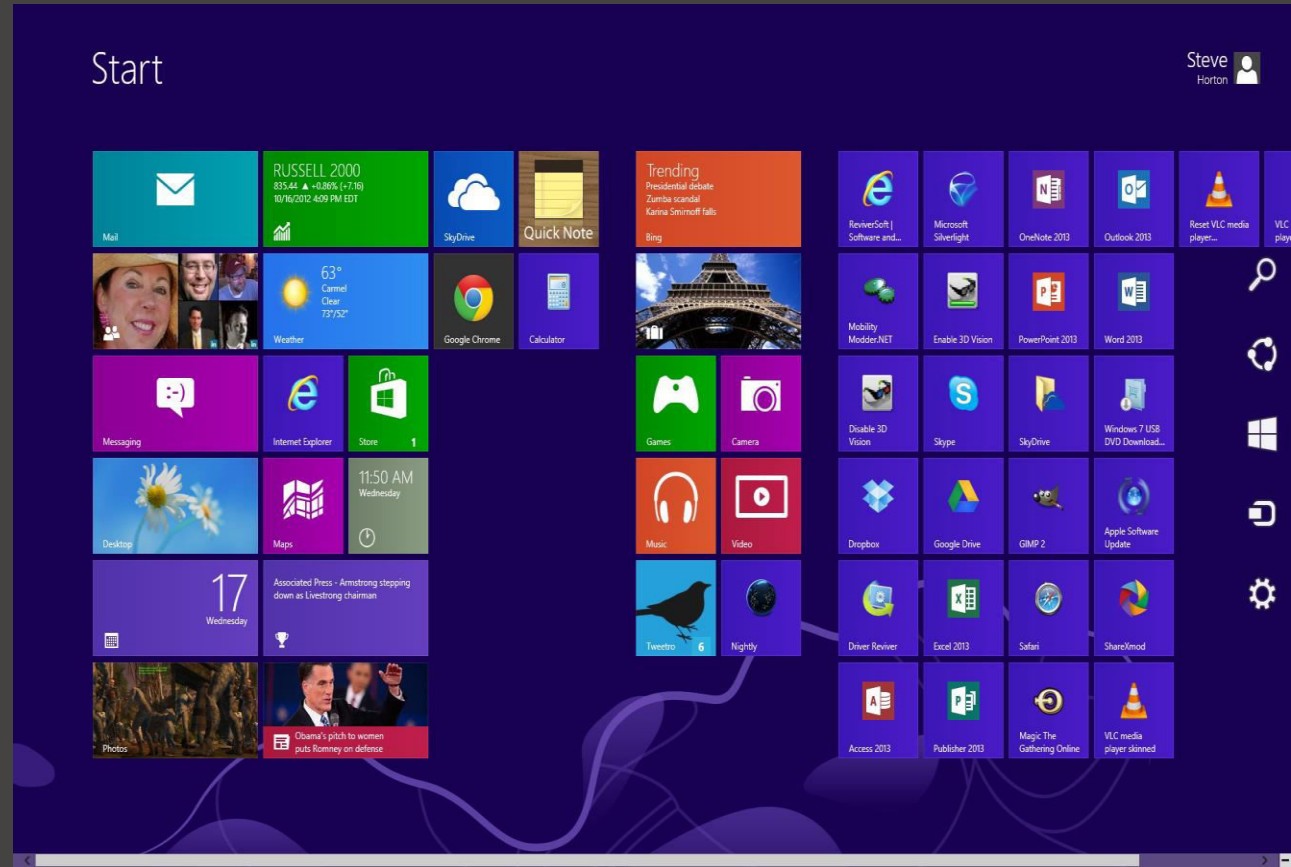
Most Common Features

❑ Program Execution

❑ Providing user interface

❑ Handling input/output operations

❑ Error handling

❑ Memory management

❑ Process management

Functions of an operating system

1. **Process management**
    - ❑ Code execution
    - ❑ Context switching
    - ❑ Multitasking

2. **Memory management**
    - ❑ Allocation
    - ❑ Sharing
    - ❑ Protection
    - ❑ Virtual memory

3. **Device management**
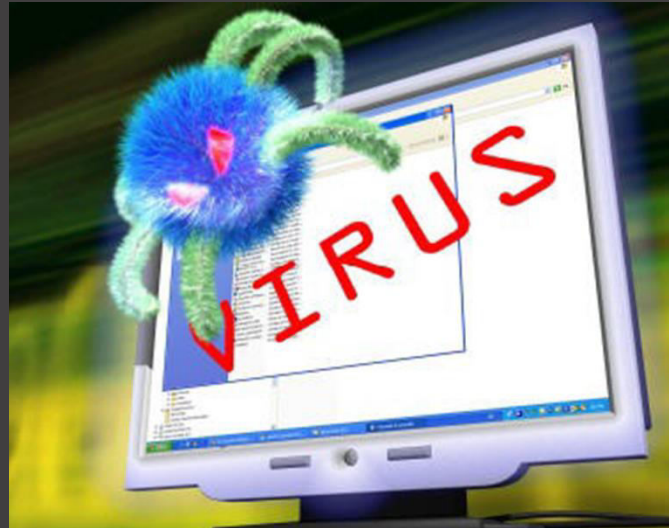   - ❑ Input / Output
    - ❑ Disk access
    - ❑ Interrupt handling

Compatibility

- ❑ Any one can install any types of software & games into windows.
- ❑ It is compatible of all types of software & games.

Security

- It is less secured than other Operating System due to its popularity.
- There are about 60,000 viruses known for Windows.
- There are numerous anti virus program in windows.

Popularity

- ❏ Currently Windows is the most popular OS
- ❏ About 63.07% of total user, uses Windows Operating System.
- ❏ People like Windows OS because of its Low Price as well as the GUI's.

Ars Technica OS market share: October 2009
Percent

iPhone/iPod
Linux 2.75
5.90

Mac OS X 27.43

63.07 Windows
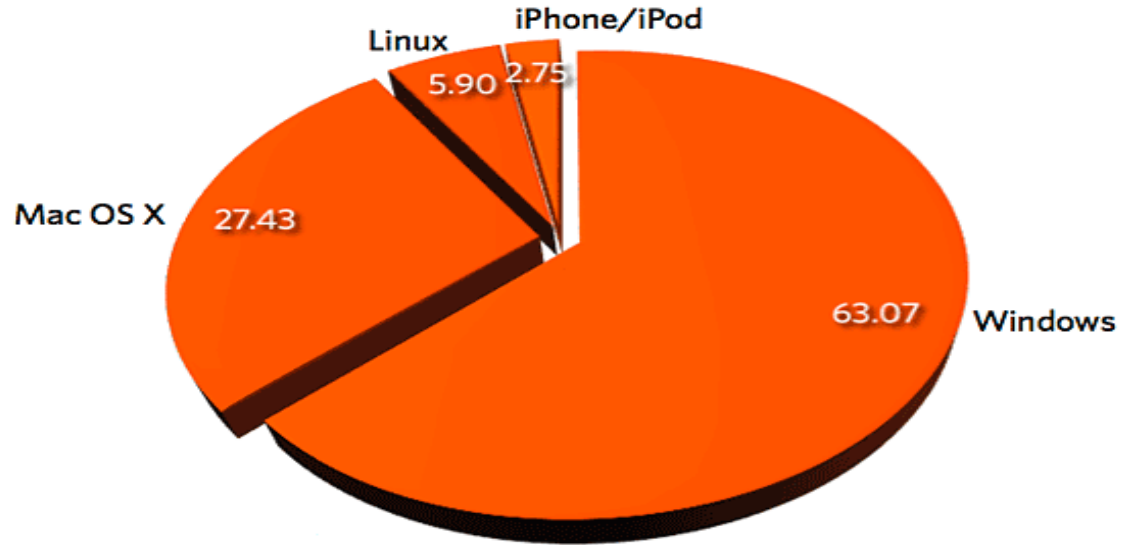
Popularity (Cont.)

❑ Now a days Windows Operating System provides the highest amount of vendors among all the Operating System

❑ Windows OS provides more than 50% of the total Vendors while Mac OS X provides about 20% and Linux provides about 25%.

OS vendors

- Linux
- Mac OS X
- Windows
- SunOS
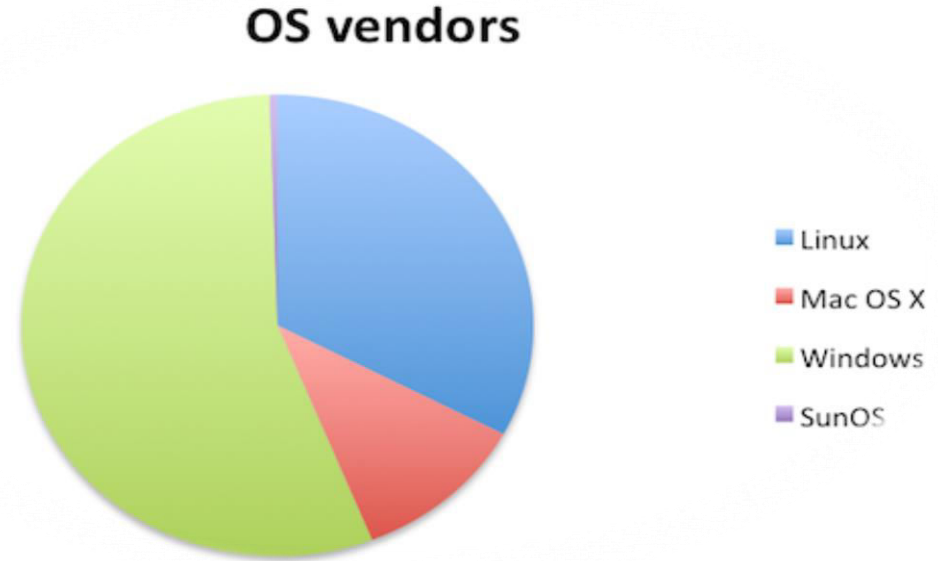
Price?

❑Windows is less expensive.

❑It can be found around 40 % cheaper than a Mac.

❑Current prices are available on Amazan.com

Apple Inc. - ASP for January-September 2011

	Average Selling Price
Mac + iPad ASP	$852
Mac + iPad + iPhone ASP	$733
Windows PC ASP	$491
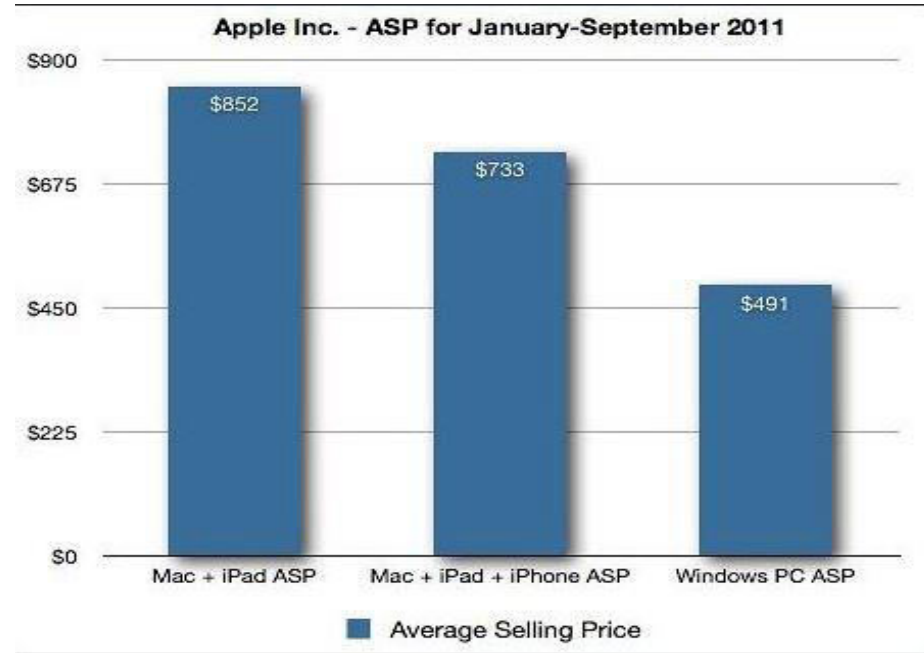
Functionality of Operating System

Process Management

The processor is the execution of a program that accomplishes the specified work in that program. It can be defined as an execution unit where a program runs. It is also called CPU Scheduling.

Activities of process management:

➢ All process start to shut down
➢ Booting, Open, save, install, copy, print etc.
➢ Creation & deletion of user & system process
➢ Detailed discussion: https://www.youtube.com/watch?v=OrM7nZcxXZU

Functionality of Operating System

Memory Management

It is the management of the main or primary memory. Whatever program is executed, it has to be present in the main memory. Main memory is a quick storage area that may be accessed directly by the CPU. When the program is completed, the memory region is released and can be used by other programs. Therefore, there can be more than one program present at a time.

The operating system:
➤ Allocates and deallocates the memory.
➤ Keeps a record of which part of primary memory is used by whom and how much.
➤ Distributes the memory while multiprocessing.
➤ In multiprogramming, the operating system selects which processes acquire memory when and how much memory they get.
➤ Detailed Discussion: https://www.youtube.com/watch?v=qdkxXygc3rE

Functionality of Operating System

Device Management

An operating system regulates device connection using drivers. The processes may require devices for their use. This management is done by the OS. It controls Input/Output devices like disk, microphone, keyboard, printer, magnetic tape, USB ports, camcorder, scanner,

The operating system:

➢ Allocates and deallocates devices to different processes.
➢ Keeps records of the devices.
➢ Decides which process can use which device for how much time.

Deadlock

Deadlock is a situation where the execution of two or more processes is blocked because each process holds some resource and waits for another resource held by some other process.
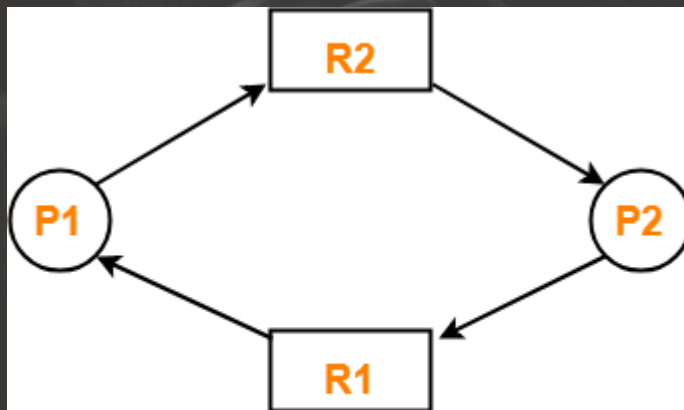
Example of a deadlock

Deadlock

Here,

Process P1 holds resource R1 and waits for resource R2 which is held by process P2.
Process P2 holds resource R2 and waits for resource R1 which is held by process P1.
None of the two processes can complete and release their resource.
Thus, both the processes keep waiting infinitely.

Conditions For Deadlock

There are following 4 necessary conditions for the occurrence of deadlock-

- Mutual Exclusion
- Hold and Wait
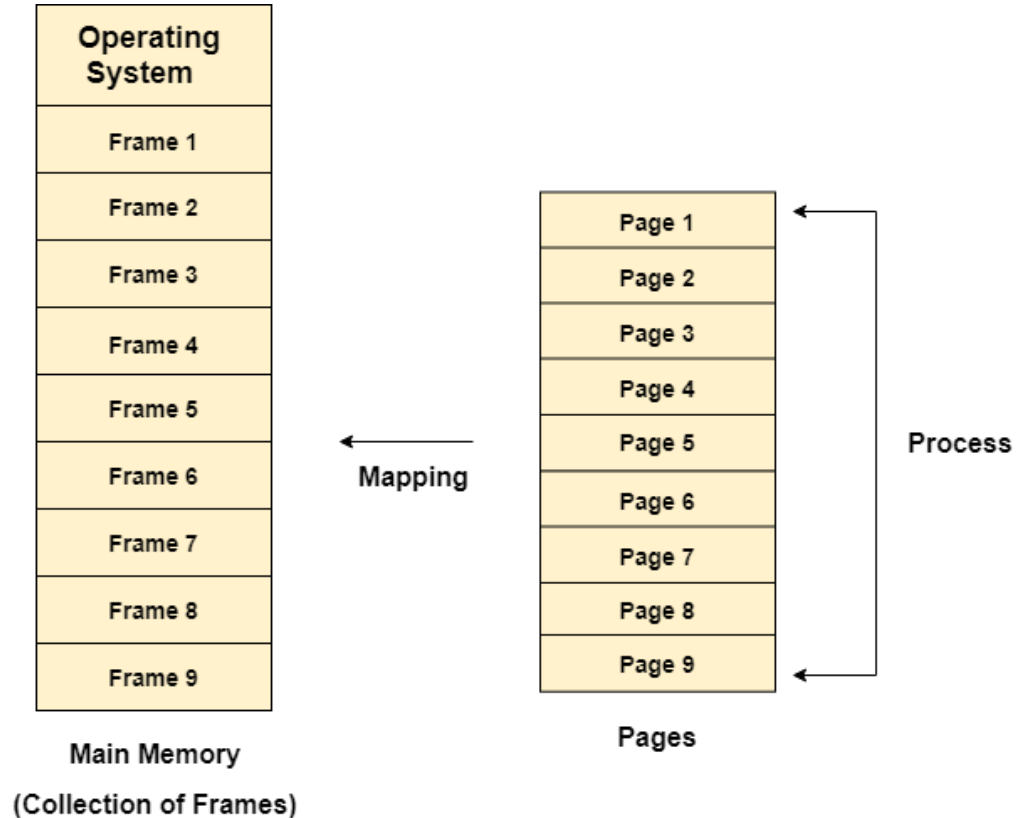- No preemption
- Circular wait

Paging

Paging is a storage mechanism used to retrieve processes from the secondary storage into the main memory in the form of pages.

- It divides each process in the form of pages. The main memory will also be divided in the form of frames.
- One page of the process is to be stored in one of the frames of the memory. The pages can be stored at the different locations of the memory but the priority is always to find the contiguous frames or holes.
- Pages of the process are brought into the main memory only when they are required otherwise they reside in the secondary storage.

Paging

Different operating system defines different frame sizes. The sizes of each frame must be equal. Considering the fact that the pages are mapped to the frames in Paging, page size needs to be as same as frame size.

| Operating System |
| Frame 1 |
| Frame 2 |
| Frame 3 |
| Frame 4 |
| Frame 5 |
| Frame 6 |
| Frame 7 |
| Frame 8 |
| Frame 9 |

Main Memory
(Collection of Frames)

Mapping

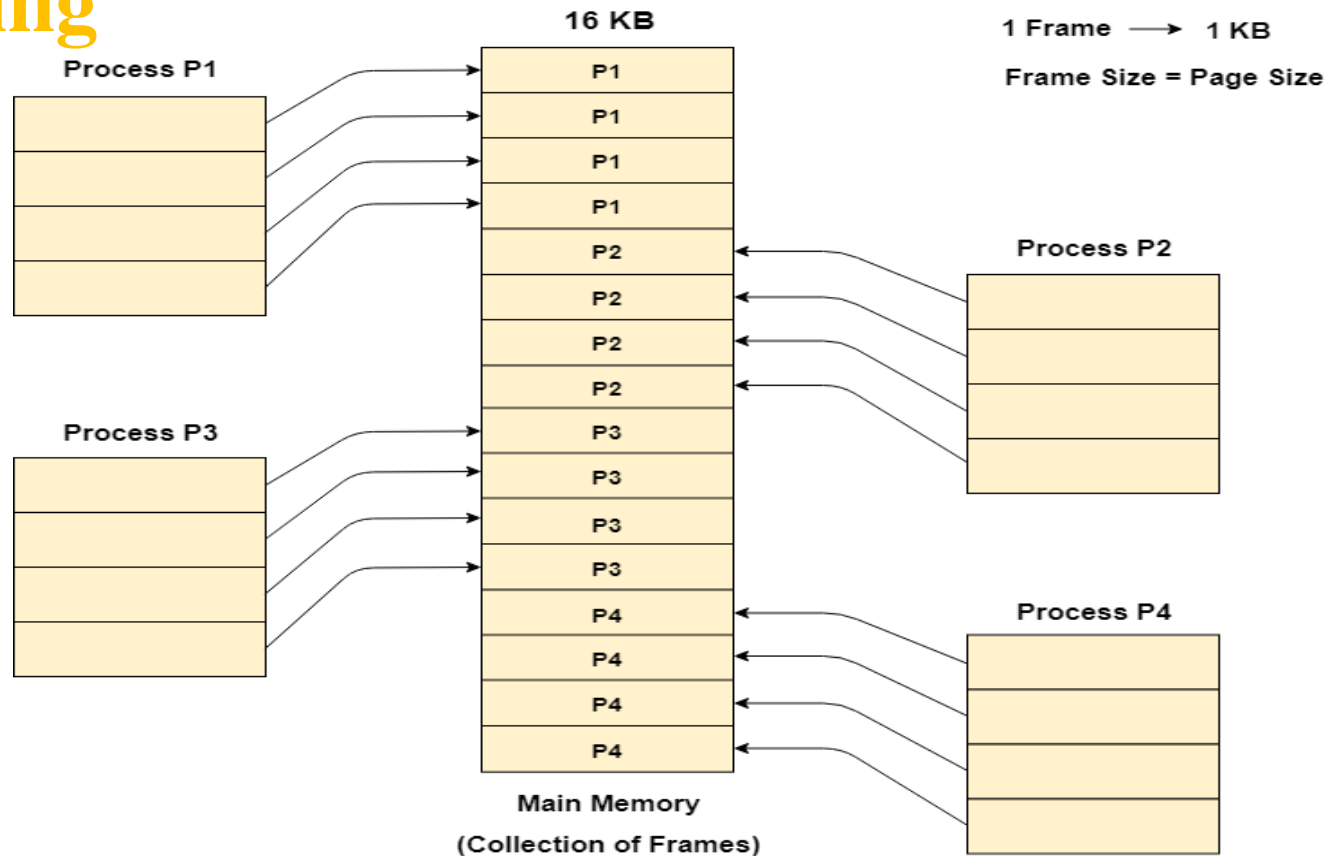| Page 1 |
| Page 2 |
| Page 3 |
| Page 4 |
| Page 5 |
| Page 6 |
| Page 7 |
| Page 8 |
| Page 9 |

Process

Pages

Paging

Example

Let us consider the main memory size 16 Kb and Frame size is 1 KB therefore the main memory will be divided into the collection of 16 frames of 1 KB each.

There are 4 processes in the system that is P1, P2, P3 and P4 of 4 KB each. Each process is divided into pages of 1 KB each so that one page can be stored in one frame.

Initially, all the frames are empty therefore pages of the processes will get stored in the contiguous way.

Paging

Process P1

16 KB

1 Frame ⟶ 1 KB

Frame Size = Page Size

P1
P1
P1
P1
P2
P2
P2
P2
P3
P3
P3
P3
P4
P4
P4
P4

Process P2

Process P3

Process P4

Main Memory

**(Collection of Frames)**

Paging

Threading

A thread is a single sequential flow of execution of tasks of a process so it is also known as thread of execution or thread of control. There is a way of thread execution inside the process of any operating system.

➢ There can be more than one thread inside a process.
➢ Each thread of the same process makes use of a separate program counter and a stack of activation records and control blocks.
➢ Thread is often referred to as a lightweight process.
➢ The process can be split down into so many threads. For example, in a browser, many tabs can be viewed as threads. MS Word uses many threads - formatting text from one thread, processing input from another thread, etc.

Threading
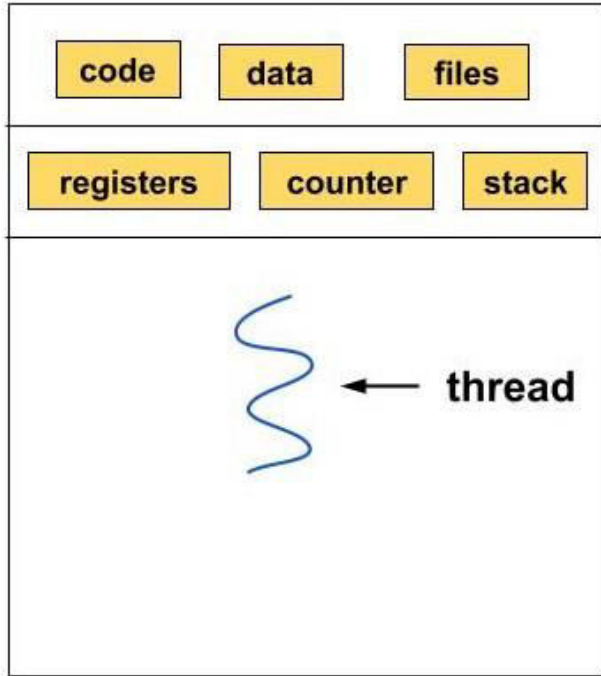
Single-threaded process
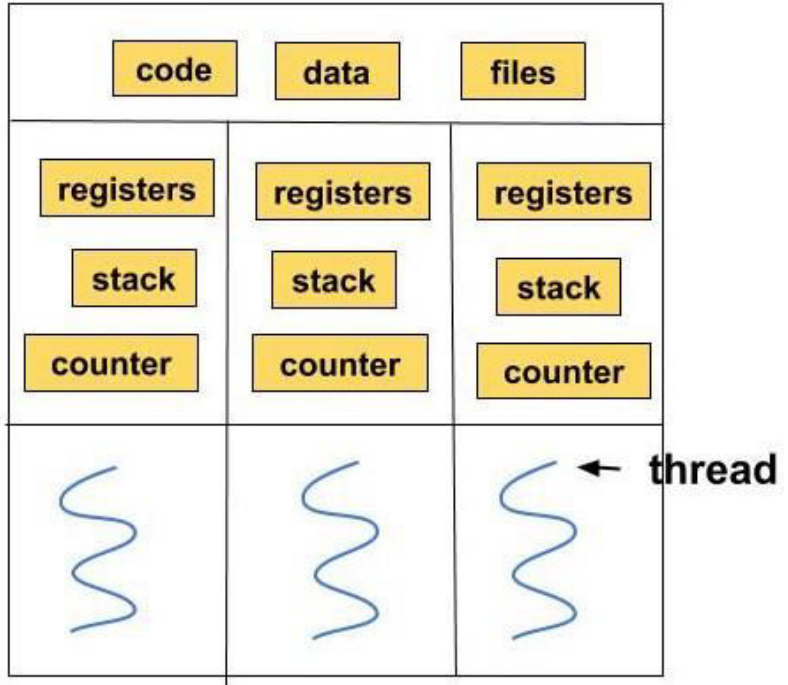
Multi-threaded process

Threading

Needs of Threading

- It takes far less time to create a new thread in an existing process than to create a new process.

- Threads can share the common data, they do not need to use Inter- Process communication.

- Context switching is faster when working with threads.

- It takes less time to terminate a thread than a process.

Threading

<u>Types of Thread</u>
1)   User-Level Thread
2)   Kernel-Level Thread

<u>User-Level Thread</u>
➢ The user-level threads are managed by users and the kernel is not aware of it.
➢ These threads are faster to create and manage.
➢ The kernel manages them as if it was a single-threaded process.
➢ It is implemented using user-level libraries and not by system calls. So, no call to the operating system is made when a thread switches the context.
➢ Each process has its own private thread table to keep the track of the threads.

Threading

Kernel-Level Thread

➤ The kernel knows about the thread and is supported by the OS.

➤ The threads are created and implemented using system calls.

➤ The thread table is not present here for each process. The kernel has a thread table to keep the track of all the threads present in the system.

➤ Kernel-level threads are slower to create and manage as compared to user-level threads.

Thank you