History Of Operating Systems

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0.1 Introduction

An operating system is a type of software that acts as an interface between the user and the hardware. It is responsible for handling various critical functions of the computer and utilizing resources very efficiently so the operating system is also known as a resource manager. Various tasks that are handled by OS are file management, task management, garbage management, memory management, process management, disk management, I/O management, peripherals management, etc. [1]

0.1.1 Advantages of Operating System

- Operating System manages external and internal devices for example, printers, scanners, and other.
- Operating System provides interfaces and drivers for proper communication between system and hardware devices.
- Allows multiple applications to run simultaneously. Manages the execution of processes, ensuring that the system remains responsive.
- Organizes and manages files on storage devices.
- Operating system allocates resources to various applications and ensures their efficient utilization.

0.1.2 Disadvantages of Operating System

- If an error occurred in your operating system, then there may be a chance that your data may not be recovered therefore always have a backup of your data.
- Threats and viruses can attack our operating system at any time, making it challenging for the OS to keep the system protected from these dangers.

- For learning about new operating system can be a time-consuming and challenging, Specially for those who using particular Operating system for example switching from Windows OS to Linux is difficult.
- Keeping an operating system up-to-date requires regular maintenance, which can be time-consuming.
- Operating systems consume system resources, including CPU, memory, and storage, which can affect the performance of other applications.

0.2 History by Types

Operating Systems have evolved in past years. It went through several changes before getting its current form.

1. No OS - (0s to 1940s)

   Before 1940s, there was no use of OS. Earlier, people are lacking OS in their computer system so they had to manually type instructions for each tasks in machine language(0-1 based language). And at that time, it was very hard for users to implement even a simple task. And it was very time consuming and also not user-friendly. Because not everyone had that much level of understanding to understand the machine language and it required a deep understanding.

2. Batch Processing Systems - (1950s)

   With the growth of time, batch processing system came into the market. Now Users had facility to write their programs on punch cards and load it to the computer operator. And then operator make different batches of similar types of jobs and then serve the different batch(group of jobs) one by one to the CPU. CPU first executes jobs of one batch and them jump to the jobs of other batch in a sequence manner.

3. Multiprogramming Systems - (1960s and 1970s)

   Multiprogramming means more than one program can be active at the same time. It provide user facility to load the multiple program into the memory and provide a specific portion of memory to each program. When one program is waiting for any I/O operations (which take much time) at that time the OS give permission to CPU to switch from previous program to other program(which is first in ready queue) for continuous execution of program with interrupt.

4. Personal Computers Systems - (1970s)

Unix (1971) revolutionized OS design with simplicity, portability, and multitasking. Personal computers emerged, leading to simpler OSs like CP/M (1974) and PC-DOS (1981).

5. Introduction of GUI - (1980s)

   With the growth of time, Graphical User Interfaces (GUIs) came. First time OS became more user-friendly and changed the way of people to interact with computer. GUI provides computer system visual elements which made user's interaction with computer more comfortable and user-friendly. User can just click on visual elements rather than typing commands. Here are some feature of GUI in Microsoft's windows icons, menus and windows.

6. Networked Systems - (1990s)

   At 1980s, the craze of computer networks at it's peak. A special type of Operating Systems needed to manage the network communication. The OS like Novell NetWare and Windows NT were developed to manage network communication which provide users facility to work in collaborative environment and made file sharing and remote access very easy.

7. Mobile Operating Systems - (2000s)

   Invention of smartphones create a big revolution in software industry, To handle the operation of smartphones , a special type of operating systems were developed. Some of them are : iOS and Android etc. These operating systems were optimized with the time and became more powerful.

0.3 History by Personal Computer OS

0.3.1 Windows

Windows is a product line of proprietary graphical operating systems developed and marketed by Microsoft. [7, 4]

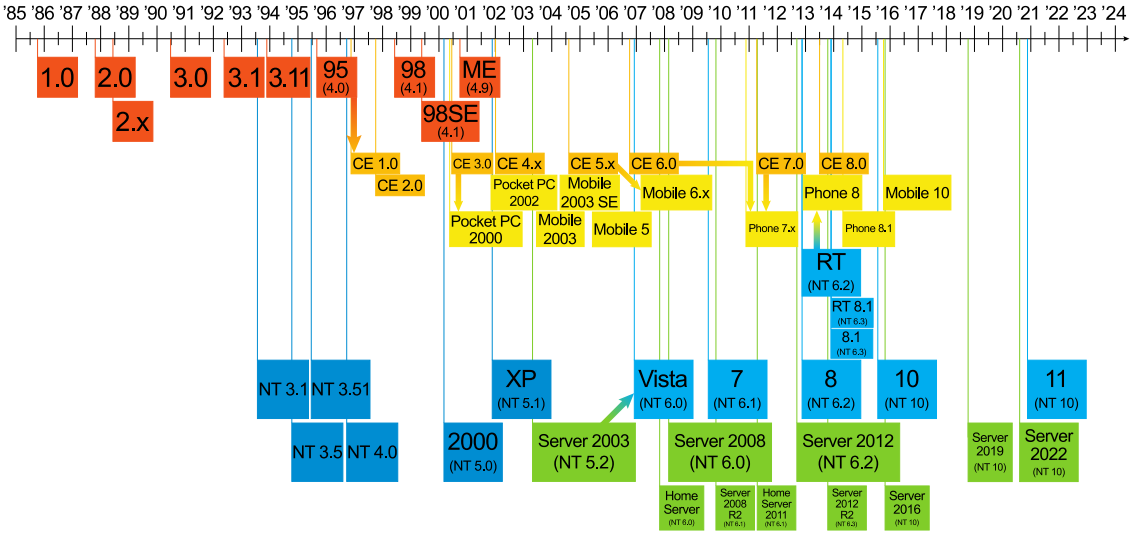

Figure 1: Windows OS Timeline

MS DOS (16bit) Liniage

1. Windows 1.0 (1985) - MS Version 1.0
2. Windows 2.0/286/386 (1987) - MS Version 2.0
3. Windows 3.x (1990-1992) - MS Version 3.x

Windows 95 Lineage (32 bit)

1. Windows 95 (1995) - MS Version 4.0
2. Windows 98 (1998) - MS Version 4.1
3. Windows ME (2000) - MS Version 4.9

Windows NT Lineage (32 & 64 bit)

1. Windows 2000 (2000) - MS Version 5.0

2. Windows XP (2001) - MS Version 5.1
3. Windows Vista (2006) - MS Version 6.0
4. Windows 7 (2009) - MS Version 6.1
5. Windows 8/8.1 (2012-2013) - MS Version 6.2/6.3
6. Windows 10 (2015) - MS Version 6.4
7. Windows 10 S (2017)
8. Windows 11 (2021)

MS Dos Commands

These are some of the commands using the command line interface (CLI) which are used to navigate, access, modify and edit the files and file systems. Even in the modern day windows computers running Windows 11 or 10 etc, we can use these commands to complete tasks that is not normally possible by the Graphical User Interface (GUI). [8]

1. `CD [drive:][path]` - Get the current directory to the specified folder.
2. `DIR [drive:][path]` - Displays a list of files and subdirectories in a directory.
3. `COPY [source] [destination]` - Copies files from one location to another.
4. `DEL [drive:][path]` - Deletes one or more files.
5. `REN [drive:][path][filename1] [filename2]` - Renames a file or directory.
6. `MKDIR [drive:][path]` - Creates a new directory.
7. `RMDIR [drive:][path]` - Removes an existing directory.
8. `TYPE [drive:][path]` - filename Displays the contents of a text file.
9. `EDIT [drive:][path]filename` - Opens the MS-DOS text editor for editing a specified file.

10. `CHKDSK [volume:][[path]filename] [/F] [/V] [/R] [/X] [/I] [/C] [/L[:size]] [/B]` - Scans and fixes errors on a disk.
11. `FORMAT volume [/FS:file-system] [/V:label] [/Q] [/L[:size]] [/A:size] [/C] [/X]` - Prepares a storage medium for data storage.
12. `XCOPY [source] [destination] [/E] [/C] [/H] [/R] [/Y]` - Copies files and directories, including subdirectories.
13. `TREE [drive:][path]` - Graphically displays the folder structure of a drive or path.
14. `DATE [MM-DD-YYYY]` - Displays or sets the system date.
15. `TIME [HH: MM: SS]` - Displays or sets the system time.
16. `HELP [command]` - Provides help information for MS-DOS commands.
17. `EXIT` - Exits the MS-DOS command prompt or a batch file.
18. `ATTRIB [+ R|-R] [+A|-A] [+ H|-H] [+ S|-S] [d:][path]filename [/S]` - Sets or clears file attributes (Read-Only, Archive, System, Hidden), managing file visibility and access in MS-DOS.
19. `MODE [device] [BAUD=b] [PARITY=p] [DATA=d] [STOP=s]` - Configures system devices.
20. `DISKCOPY [drive1:][path1][filename1] [drive2:][path2][filename2]` - Copies the contents of one disk to another.
21. `MEM[/program|/debug|/classify|/free|/module(name)] [/page]` - Displays the amount of used and free memory in the system.
22. `SCANDISK [/SURFACE] [/AUTOFIX] [/CHECKONLY]` - Scans and fixes disk errors.
23. `UNDELETE [drive:][path][filename]` - Restores a deleted file.
24. `ASSIGN [drive1:=[drive2:]]` - Redirects requests for drive letters to a different drive.

25. `FDISK` - Manages disk partitions.
26. `BACKUP [source] [destination] [/S]` - Backs up files and directories.
27. `RESTORE [source] [destination] [/S]` - Restores files and directories from a backup.
28. `MSCDEX [/D: driver /L:drive] [/M:bufsize] [/E /S /V]` - Provides CD-ROM access.
29. `SYS [drive1:][path]` - Transfers system files to a disk.
30. `SHARE [/F:(space)] [/L:(locks)]` - Installs file-sharing and locking capabilities.
31. `SMARTDRV [size] [/E /V] [/C] [/L:size]` - Disk caching utility.
32. `SETVER [drive:][path]filename [/B:bytes]` - Sets the MS-DOS version number for a program.
33. `ASSIGN [/D]` - Disables automatic drive-letter assignments.
34. `FASTHELP [command] [command] /?` - Provides a quick overview of MS-DOS commands.
35. `FC [/A] [/C] [/L] [/LBn] [/N] [/OFF[LINE]] [/T]` - Compares two files or sets of files and displays the differences between them.
36. `FIND [/V] [/C] [/N] [/I] [/OFF[LINE]] "string" [[drive:][path]filename[ ...]]` - Searches for a text string in files.
37. `MORE [filename]` - Display the content of a text file one screen at a time
38. `ECHO [on/off]` - This command can either show or hide the text of the commands you type. Command echoing is on by default
39. `ECHO [<message>]` - Specifies the text to display on the screen.
40. `PATH [[drive:][path] [;...]]` - Displays or sets a search path for executable files.

41. `SET [variable=[string]]` - Sets or displays environment variables.
42. `VOL [drive:]` - Displays a disk label and serial number.
43. `SUBST [drive1: [drive2:]path]` - Associates a path with a drive letter.
44. `EDLIN [drive:][path][filename]` - Edits text files.
45. `DEBUG [drive:][path][filename]` - Starts the Debug program for testing and debugging assembly-language programs.
46. `HIMEM.SYS [/TESTMEM:off] [/HMAMIN=amount]` - Provides upper memory block (UMB) and high memory area (HMA) support.
47. `UNFORMAT [drive:][path]` - Restores a formatted disk.
48. `QBASIC [drive:][path]` - Starts the MS-DOS-based application for creating and running BASIC programs.
49. `KEYB [/CODEPAGE=page[,country]] [/E]` - Configures a keyboard for a specific language.
50. `CHOICE [/C:choices] [/N] [/S] [/T:c,nn]` - Provides a prompt with a list of choices.
51. `DISKCOMP [drive1:][drive2:]` - Compares the contents of two floppy disks.
52. `PRINT [/D:device] [filename]` - Sends a text file to a printer.
53. `SORT [drive:][path][filename]` - Sorts the contents of a text file.
54. `APPEND [[drive:]path[;...]]` - Sets or displays the search path for data files.
55. `ASSOC [.ext[=[fileType]]]` - Associates file extension with a file type.
56. `LABEL [drive:][label]` - Creates, changes, or deletes the volume label of a disk.
57. `RECOVER [drive:][path][filename]` - Recovers readable information from a bad or defective disk.

58. `FASTOPEN [/X] [drive:] [path] [/R]` - Speeds up the opening of files.
59. `GOTO <label>` - Directs the command interpreter to a labeled line in a batch program.
60. `SHIFT [/n <N>]` - Shifts the position of batch parameters in a batch file.
61. `JOIN path [drive:]` - Joins a drive letter and directory path.
62. `SMARTDRV [size] [buffers] [doublebuffer] [/E] [/C] [/L] [/V] [/B]` - Manages and optimizes disk caching.
63. `BATCH [filename]` - Executes the commands specified in a batch file.
64. `CALL [drive:][path]filename [batch-parameters]` - Calls one batch program from another

0.3.2 Mac OS

macOS, originally Mac OS X, previously shortened as OS X, is a Unix-based operating system developed and marketed by Apple since 2001. It is the primary operating system for Apple's Mac computers. Within the market of desktop and laptop computers, it is the second most widely used desktop OS, after Microsoft Windows and ahead of all Linux distributions. As of 2024, the most recent release of macOS is macOS 15 Sequoia, the 21st major version of macOS. [6, 5, 9]

MacOS Release Timeline

1. Mac OS X 10.0 Cheetah, March 24, 2001
2. Mac OS X 10.1 Puma, September 25, 2001
3. Mac OS X 10.2 Jaguar, August 23, 2002
4. Mac OS X 10.3 Panther, October 24, 2003
5. Mac OS X 10.4 Tiger, April 29, 2005
6. Mac OS X 10.5 Leopard, October 26, 2007
7. Mac OS X 10.6 Snow Leopard, August 28, 2009
8. Mac OS X 10.7 Lion, July 20, 2011
9. OS X 10.8 Mountain Lion, July 25, 2012
10. OS X 10.9 Mavericks, October 22, 2013
11. OS X 10.10 Yosemite, October 16, 2014
12. OS X 10.11 El Capitan, September 30, 2015
13. macOS 10.12 Sierra, September 20, 2016
14. macOS 10.13 High Sierra, September 25, 2017
15. macOS 10.14 Mojave, September 24, 2018

16. macOS 10.15 Catalina, October 7, 2019
17. macOS 11 Big Sur, November 19, 2020
18. macOS 12 Monterey, October 25, 2021
19. macOS 13 Ventura, October 25, 2022
20. macOS 14 Sonoma, September 26, 2023
21. macOS 15 Sequoia, September 16, 2024

0.3.3 Linux

Linux is a family of open-source Unix-like operating systems based on the Linux kernel, an operating system kernel first released on September 17, 1991, by Linus Torvalds. It was created by Linus because he felt that the Unix system was lacking, hence he created the linux kernel with the thought *something that he could use at his home*. Torvalds made his personal mascot a penguin named “Tux,” which became a recognizable symbol for Linux around the world. [3, 2]

Linux is the *most widely used operating system* (mainly used in servers and mobile devices like smartphones as Android). When comparing to the general public, windows has the highest market share.

Linux is distributed to the general public as distributions(distros). The most famous being Ubuntu which is based on another distro named Debian. Similarly there are other distributions like Arch Linux, NixOS, Gentoo, Fedora etc. Since the kernel itself is opensource, anyone can create their own disto and distribute it to the general public. Here is a link to a very large image which contains many distributions and their timeline.

`https://upload.wikimedia.org/wikipedia/commons/1/1b/Linux_Distribution_Timeline.svg`

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