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## History of operating systems (mac OS as an example)

Before we can talk about the macOS we need to talk about what's an OS, how it started in the first place and what were the human needs at the time that required OS to be created. The operating system is a software that is used to link the hardware of a machine to the user so the user can interact with the machine. OS does not mean a computer or a smart phone, OS can be in any device like cars, refrigerators, and more. So, what changes did the OS add to the machines? Before there was OS the code was written to communicate directly to the hardware but at that time of course the tasks that the machines had to process were simple and the computer could only process one task at a time. The first OS that was ever created was the GMOS, it was created by IBM. And it was created because computers at that time were very slow and we needed to improve. Later one multiprogramming was introduced. Computers are now able to perform more than one task at one time with techniques we are going to talk about later. After this era everything started to grow in the direction of multiprogramming. Early versions of the operating systems we use today were introduced, since they were just using command lines not everyone could use a computer until graphical user interface was introduced which allowed the users to use icons to navigate and use the computers.

Throughout these different periods of time there were different OS types from these types we have

- 1) batch OS: in the batch OS, tasks are divided into batches for easier processing and it can allow multiple users to use it. So, this OS was able to process large application. Before actually using the device, users had to prepare their tasks offline before submitting them.
- 2) Time-sharing (multitasking) OS: on shared computer it makes each user use the processor for a small period of time called time slice. In this period of time the task can be completed or no. There are three states for each user in this OS:
  - 1] active: the task being processed
  - 2] ready: waiting its time to be executed
  - 3] waiting: the program is waiting for I/O

3) Distributed OS: from its name, it's not just on one device. It's divided into different machines but each of them has its own processor. That means in this type of software you can actually run different tasks at the same time depending on how many devices or processors you have.

4) Network OS: it was a group of pcs connected with a local are network (LAN) that allowed the computers connected to the network to share the resources they have that can be devices like sharing a printer for example. This type of OS is no longer available

5) Real time OS: this type of OS is used when there's a need for the computer to process a large amount of tasks and events that needs to be processed in a short amount of time. The processing time is really small and for that it's used in robots, traffics, and heart pacemakers.

Examples on operating systems are: Windows, IOS, Android, Unix, chrome OS, and more importantly for us because it's the main OS we will talk about the Mac OS.

## **History of Mac OS:**

macOS, which was known before as Mac OS X, is an operating system designed for Macintosh computers developed by Apple Inc. Based on Unix, macOS is built atop XNU, which is a hybrid kernel consisting of a BSD Unix kernel with the Mach microkernel. macOS has been the primary operating system used for Macintosh computers since 2001.

The first version of macOS was called the Mac OS X 10.0 Cheetah, was released in March 2001. It was a huge progress from previous versions of the Mac operating system, introducing a new Aqua graphical user interface and a Unix foundation. macOS 10.0 was also the first version of the Mac operating system to support preemptive multitasking which means it divides computing time between different processes.

## **Versions of mac OS:**

1] we already talked about the Mac OS x 10 (cheetah)

2] Mac OS X 10.1 (Puma): there were few improvements from the cheetah

- 3] Mac OS X 10.2 (Jaguar): they added search to the finder. It now supports the MPEG-4 which is a way to compress audio and video making them less in size
- 4] Mac OS X 10.3 (Panther): At that time the world used to use the internet explorer, but apple said not any more and made the safari browser the default browser for the Mac OS. Safari existed in Jaguar but it was not default.
- 5] Mac OS X 10.4 (Tiger): This was a huge update for apple, the Apple TV was also released with it. It was the first time apple used intel processors. They also added spotlight search
- 6] Mac OS X 10.5 (Leopard): 64-bit was introduced in apple
- 7] Mac OS X 10.6 (Snow Leopard): 64-bit got expanded and the App store was made.
- 8] Mac OS X 10.7 (Lion): Support for Mac App Store, Mission Control, and Launchpad.
- 9] OS X 10.8 (Mountain Lion): features from the IOS were added and notification banner.
- 10] 10. OS X 10.9 (Mavericks): Was an update on security and password encryption
- 11] OS X 10.10 (Yosemite): New design, Continuity features, and improved notifications.
- 12] OS X 10.11 (El Capitan): The performance boost in this version was so great it made app open 40% faster
- 13] macOS 10.12 (Sierra): They changed the name to macOS and added Siri
- 14] macOS 10.13 (High Sierra): HEIC was introduced which is an image file format with high quality
- 15] macOS 10.14 (Mojave): Dark mode added
- 16] macOS 10.15 (Catalina): Changes to entertainment apps
- 17] macOS 11 (Big Sur): It was such a huge update that apple had to not name it 10.16 and is called 11. Now you can run IOS apps on your mac
- 18] macOS 12 (Monterey): Universal Control, Live Text, and Shortcuts.
- 19] macOS 13 (Ventura): Big update for GUI
- 20] macOS 14 (Sonoma): Update to widgets

## Operating system function:

For an OS to be complete there must be few functions that it does, each OS can do these functions a little different with different techniques but in the end they exist through all OS. These functions are:

- 1] process management: in order for a process to be done on a computer it needs some resources, they can be some memory, storage, and it needs to use the processor. Process management manages which task goes first and how the next one is going to be chosen
- 2] Memory management: the memory is where temporary data is stored in order for your process to be completed, the memory management decides what should be in the memory for the task being processed and how much it should use from the memory
- 3] File system: responsible for the files you have in your computer and how they are stored, accessed, created, deleted, and anything related to files
- 4] I/O management: We use devices to enter data to our computers like mouse, keyboard, mic, and others. In order for this input to be regularized and the output of the processes we do there must be something controlling them. It's the I/O management
- 5] Security: it may not look like a big problem if you have your own pc but imagine a computer that multiple users use, how are the different users data protected? Who can access and change which files? That's why security is a crucial operation in OS
- 6] User interface: since the operating system is used by users to be able to interact with the computer it needs a way of interacting. User interface can be a command line like the old days or it can have graphical user interface (GUI) with icons and clicking the mouse

## MacOS implementation

Now let's talk about the implementation of the macOS. In order to talk about it we must talk about the main components of the macOS. We talk about each of them in details

1] The kernel: Developed by apple in 1996 the XNU kernel, written in c++, is the core of the macOS. The kernel is the base layer of the OS and it makes the system able to perform basic services like file management and others. XNU stand for “x is not UNIX” because it was based on UNIX. The base of the XNU is the Mach microkernel which handles task that are low in level like memory management. The other high level functions are handled by a derived system from the BSD OS. That makes the XNU a hybrid kernel.

2] The graphical user interface (GUI): macOS GUI changed over the years as at first it was the finder which was so famous. Later in the 2000s the aqua GUI was deployed and that was a leap in the GUI of the macOS. The GUI continued to improve from that time until it reached the point we’re at now.

3] Window manager: from its name it allows the user to interact with the window. Resize, move, close, open. That helps organizing the desktop

4] File system: we mentioned before what the file system does and why it’s important in the OS. The macOS uses the Hierarchical File System (HFS+)

5] services: they are tasks that runs in the background like printing a file. macOS contains a lot of built-in services

The previous components exist in all OS, what makes macOS special is that it has additional components like safari, the finder which is a file management system, facetime, messages, mail

## **Machine Type:**

Unlike other OS, macOS runs exclusively on the macintosh computers. The computers have different models like, iMac, MacBook with its versions, Mac pro, Mac mini. All of them are different a little but they all run the macOS