**History:**The first version of Windows, released in 1985, was simply a GUI offered as an extension of Microsoft’s existing disk operating system, or MS-DOS. Based in part on licensed concepts that Apple Inc. had used for its Macintosh System Software, Windows for the first time allowed DOS users to visually navigate a virtual desktop, opening graphical “windows” displaying the contents of electronic folders and files with the click of a mouse button, rather than typing commands and directory paths at a text prompt [1] .In 1988, Microsoft decided to develop a “new technology” (NT) portable operating system that supported both the OS/2 andPOSIX APIs [2].Originally, NT was supposed to use the OS/2 API as its nativeenvironment but during development NT was changed to usethe Win32 API, reflecting the popularity of Windows 3.0.Many versions of Windows along the way, XP, Vista, 7, 8, and now 10 .Many older versions still in use, less secure, some unpatched. Microsoft introduced an operating environment named Windows on November 20, 1985, as a graphical operating system shell for MS-DOS in response to the growing interest in graphical user interfaces (GUIs) [3]. Microsoft Windows came to dominate the world's personal computer (PC) market with over 90% market share, overtaking Mac OS, which had been introduced in 1984, while Microsoft has in 2020 lost its dominance of the consumer operating system market, with Windows down to 30%, lower than Apple's 31% mobile-only share (65% for desktop operating systems only, i.e. "PCs" vs. Apple's 28% desktop share) in its home market, the US, and 32% globally (77% for desktops), where Google's Android leads.

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**Design principal:** Design principal depends on Security, Extensibility, Portability, Reliability, Compatibility, Performance, International support, Energy efficiency e.t.c [2].

Security: Access control lists (ACLs) – both attribute-based and claimbased.Exploit mitigations – address-space layout randomization (ASLR) , Data Execution Prevention (DEP), Control-Flow Guard (CFG), and Arbitrary Code Guard (ACG).Device Guard option for fine grain control over what signers code is allowed on the system.

Extensibility: Remote procedure calls (RPCs),advanced local procedure calls (ALPCs.

Portability: Windows 10 can be moved from one hardware architecture to another with relatively few changes.

(i)Processor-specific portions are written in assembly language for a

given processor architecture (small amount of such code).

(ii)Platform-dependent code is isolated in a dynamic link library

(DLL) called the “hardware abstraction layer” (HAL)

Reliability: Windows 10 uses hardware protection for virtual memory, and software protection mechanisms for operating system

Resources.

Performance: Windows 10 subsystems can communicate with one another via high-performance message passing.

(i) Preemption of low priority threads enables the system to respond quickly to external events

(ii) Designed for symmetrical multiprocessing

Compatibility :applications that follow the IEEE 1003.1 (POSIX) standard can be complied to run on 10 without changing the source code.

**Process management :** Provides services for creating, deleting, and using threads and processes .Issues such as parent/child relationships or process hierarchies are left to the particular environmental subsystem that owns the process [4].Process is started via the Create Process routine whichloads any dynamic link libraries that are used by theprocess, and creates a primary thread. A thread running within a process can execute application code, create new threads, create new independent processes, and manage communication and synchronization among the threads.

Scheduling in Win32 utilizes four priority classes [2].

1. IDLE\_PRIORITY\_CLASS (priority level 4)

2. BELOW\_NORMAL\_PRIORITY CLASS (NT priority level 6)

3. NORMAL\_PRIORITY\_CLASS (level 8 — typical for most processes

4. ABOVE\_NORMAL\_PRIORITY\_CLASS (level 10)

5. HIGH\_PRIORITY\_CLASS (level 13)

6. REALTIME\_PRIORITY\_CLASS (level 24

By creating and managing processes, applications can have multiple, concurrent tasks processing files, performing computations, or communicating with other networked systems. It is even possible to improve application performance by exploiting multiple CPU processors [3].

**Memory management :** There is two type of memory architecture in windows os . 32 bit and 64 bit . Here we talk about 64 bit memory architecture in windows os. The 64-bit Windows Operating System addressable memory space is shared between active applications and the kernel as shown in. The kernel address space includes a System Page Table Entry (PTE) area (kernel memory thread stacks), Paged Pool (page tables, kernel objects), System Cache (file cache, registry), and Non Paged Pool [4].

Windows operating system allocates 2GB for the process and 2GB for the Kernel. On Disk paging, Windows operating systems use a dynamically allocated page file to manage the memory. This to mean that a page file is created on the disk to hold items that are not often accessed and/or utilized by the system; and/or the user leaving the more actively used objects to use the ram. This form of allocation more often than not suffers from slow-downs due to fragmentation of the files on the disk that are utilized for the virtual memory allocation [5].

The virtual address translation in Windows 10 uses several data structures . Each process has a page directory that contains 1024 page directory entries of size 4 bytes [2].Each page directory entry points to a page table whichcontains 1024 page table entries (PTEs) of size 4 bytes. Each PTE points to a 4 KB page frame in physical memory

**File System :**The Windows File System (WinFS) is Microsoft's new storage system for its upcoming SQL Server release [6]. Along with serving as a database for structured, semi-structured and unstructured data, WinFS serves as a programming model that lets developers exchange data across applications and organize data in more constructive ways. According to Microsoft, it is not intended to replace NTFS, or the New Technology File System, which is used in Windows NT, but will serve as a link between NTFS and Vista's application layer.

Initially, WinFS was Microsoft's storage system of choice for its upcoming Windows Vista operating system, and WinFS, the Windows Presentation Foundation and Windows Communication Foundation made up the so-called "three pillars" of Vista. In 2004 [5], Microsoft announced that WinFS would not be included in Vista, and in June 2006 the company said WinFS would be bundled into the next release of SQL Server and would not be a stand-alone product.

The fundamental structure of the Windows 10 file system (NTFS) is a volume [2].Created by the Windows 10 disk administrator utility. Based on a logical disk partition;May occupy a portions of a disk, an entire disk, or span across several disks .All metadata, such as information about the volume, is stored in

a regular file.

**Security :** Windows Defender Security Center provides basic**protection against viruses, Trojans, ransomware, and other malware forms** [7]**.** It’s installed with Windows by default, so even if you don’t wish to install a third-party solution**, your system has at least some level of protection against these threats.**Additionally, the program **automatically detects other antivirus systems you may have installed.**This makes it easy to remove any old scanners if you want to entrust Windows Defender with being the sole protection against online threats.

Security of an NTFS volume is derived from the Windows 7 object model . Each file object has a security descriptor attribute stored in this MFT record [5].. This attribute contains the access token of the owner of the file, and an access control list that states the access

privileges that are granted to each user that has access to the file [2].

**Networking :** Windows 7 implements transport protocols as drivers that can be

loaded and unloaded from the system dynamically. Windows 10 supports both peer-to-peer and client/server networking, it also has facilities for network management. Windows uses the concept of a domain to manage global access rights within groups. Windows provides three models of setting up trust relationships [2].

* One way, A trusts B
* Two way, transitive, A trusts B, B trusts C so A, B, C trust

each other

* Crosslink – allows authentication to bypass hierarchy to cut

down on authentication traffic.

The server message block (SMB) protocol is used to send I/O requests over the network. It has four message types:

1. Session control

2. File

3. Printer

4. Message

Windows uses the TCP/IP Internet protocol version 4 and version 6 to connect to a wide variety of operating systems and hardware platforms. PPTP (Point-to-Point Tunneling Protocol) is used to communicate between Remote Access Server modules running on w indows machines that are connected over the Internet.

**Programer Interface :** Here we talk about two type of programmer interface.

**(i) Access to Kernel Object :** A process gains access to a kernel object named XXX by calling

the Create XXX function to open a handleto XXX; the handle is

unique to that process.

Windows provides three ways to share objects between processes [2].

* A child process inherits a handle to the object
* One process gives the object a name when it is created and the second process opens that name
* DuplicateHandle function.
* Given a handle to process and the handle’s value asecond process can get a handle to the same object, and thus share it.

**(ii) Process Management :** Process is started via the CreateProcess routine which loads any dynamic link libraries that are used by the process, and creates a primarythread*.* Every dynamic link library or executable file that is loaded into the address space of a process is identified by an instancehandle [2]*.*

**conclusion:**Microsoft realized the importance of network effects and made the most use of the installed base it already had from MS-DOS. The upgrade path to Windows was manageable but not easy, because of switching costs due to human factors such as unwillingness to learn another environment [9].However, due to the superiority of the Windows platform over MS-DOS and the proliferation of PCs in both the business and home markets in the early 90's, Windows easily became the dominant operating system.

The end of an era! That is how it honestly felt when I started this journey writing about Windows 10. It’s no surprise, the 90s and even the 2000s have been filled with reviews of technologies such as operating systems that are written in thousands of words; I personally looked forward to reading them, but looking at the future, this methodology of covering the latest version of a Windows release will eventually come to an end [10]. Windows 10 is certainly the last major (what they call big bang) release of the company’s popular desktop operating system. I have been evaluating Windows 10 since October 1st 2014 and I have managed to the see the operating system go through its ups and downs during that time. The experience has afforded me the ability to have an intimate experience with this platform.

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