

CASE STUDY – OS/2 WARP

COURSE CODE : 19CSE103

COURSE NAME: OPERATING SYSTEMS

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IBM - OS/2

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Introduction :-

OS/2 developed as an alternative to MS-DOS, was developed by a team of programmers from Microsoft and IBM, with Microsoft doing most of the programming. It was designed to be shipped with the IBM PS/2 (Personal System 2) as an alternative to MS-DOS and Windows. Having better features like voice recognition and inbuilt support for Java.

In 1991, after four years of development, Microsoft and IBM decided to stop the partnership, with Microsoft putting up Windows as a direct competitor. The last major update, OS/2 Warp was released in 2001 and support was plugged in the year 2006. The project has since been sold to other companies, although still managed to withhold a portion of the enterprise market. Years later it was still found on some servers and even ATMs on the street. It wasn't offered in a retail package - but for those who had a contractual agreement with IBM for OS/2 support. After this the foundation of OS had evolved into what is now known as "eComstation".

In this guide, I'll be using Oracle VirtualBox 6.1.18 on a Windows 10 machine. For this guide you'll need to have :-

- Oracle VirtualBox installed
- CDs (8) ISO images of IBM OS/2 Warp 4.52v.

Installation :-

- The final release, OS/2 Warp 4.52, which is being installed, comes with driver files needed to run it on a generic computer. Installing earlier versions will require extra patching.

Requirements :-

1. OS/2 boot CD
2. OS/2 Client CD
3. Suitably setup Virtual Machine.

Procedure :-

- The boot CD and the client CD's are available for download from several websites. Out of these, we have sourced today from:
<https://winworldpc.com>
- In virtualBox, to install OS/2, a special machine configuration is available. In the create new machine window, the 'IBM OS/2' option is available in the drop-down menu.
- On selecting OS/2 Warp 4.5 in the Version and clicking next. VirtualBox suggests 128 MB of RAM, and a 2GB virtual hard disk which are both acceptable. I decided to use 256 MB of RAM with a 4.3 GB hard disk. This version of OS/2 requires a minimum of 120 MB, though with all features installed can exceed up to 450 MB of disk space.

More on specifications are as follows. :-

- The specifications are as follows :-

- Type : IBM OS/2
- Version : OS/2 Warp 4.5
- RAM : 256 MB (for better support)
- Chipset : PII X3 (south bridge - emulated)
- Processor : 1 (1 thread out of 12 possible threads)
- Video RAM : 5 MB
- Storage : 2GB IDE hard disk

⇒ To begin installing, choose the OS/2 boot disk image in the storage dropdown and start the machine.

⇒ The VM boots off the selected disk and displays a prompt to insert the OS/2 Warp CD-ROM (in below steps).

⇒ At this point, from the storage dropdown, choose the OS/2 Warp Client CD and in the VM, press ENTER, use host key i.e., (right ctrl) to switch VM and host.

⇒ This begins the installation and displays the initial welcome pages, Agreements page etc, which can be leave as default, by pressing Enter.

⇒ On the next page issuing a warning about minimum disk size (120 MB) press enter and this drops users in the Disk formatting tool.

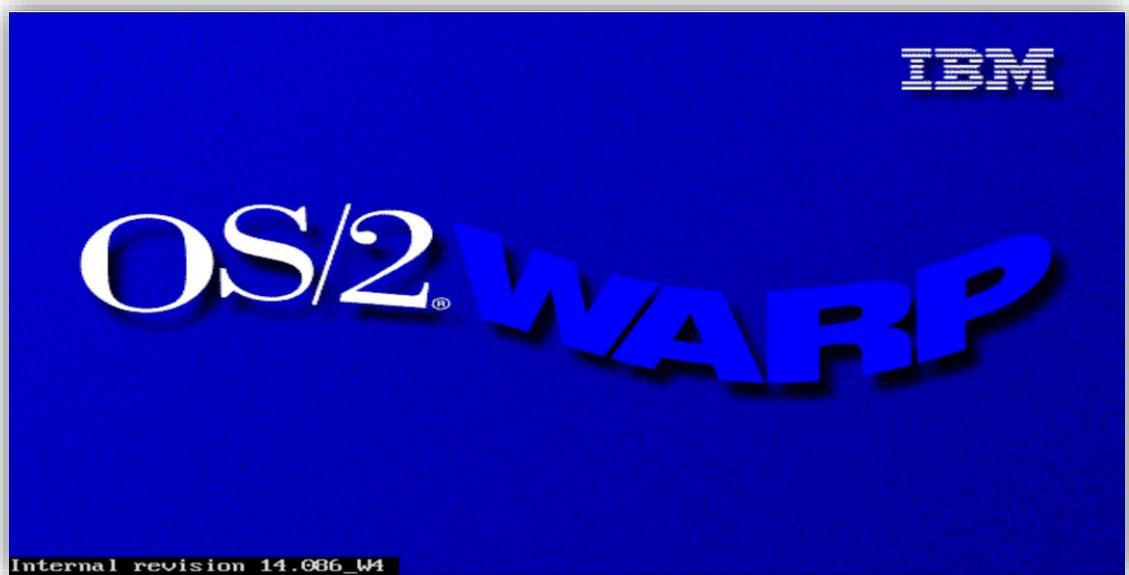
- Press F5 here to see the physical disks, choose the 2GB IDE disk attached, then press ENTER to create a new bootable volume, choose the drive letter (C:II) and press Enter. Assign the drive a name.
- After this press F3, choose 'Save changes and Exit' and reboot the device, following the same two disc procedures as earlier.
- On rebooting and going through the welcome screens again, we get to the disk selection process, where the newly created disk partition has to be chosen. Installation starts here with file copying.
- The installer now switches to graphical mode, displaying options for applications and features and device settings. Change the 'Country/Region' option and use the defaults for everything else.
- In the following screens, choose the required software options and features, additional applications, set the hostname and domain name (all capital), user name and password. If intending to use the Internet, follow the next step 8) leave at default and press Next. This completes the installation process.
- To make the internet work, remove default network device, choose 'AMD PCNet Ethernet Adapter' set protocol to TCP/IP.

Following pages will show stepwise pictorial view of installation process of OS/2 followed by Features of OS/2.

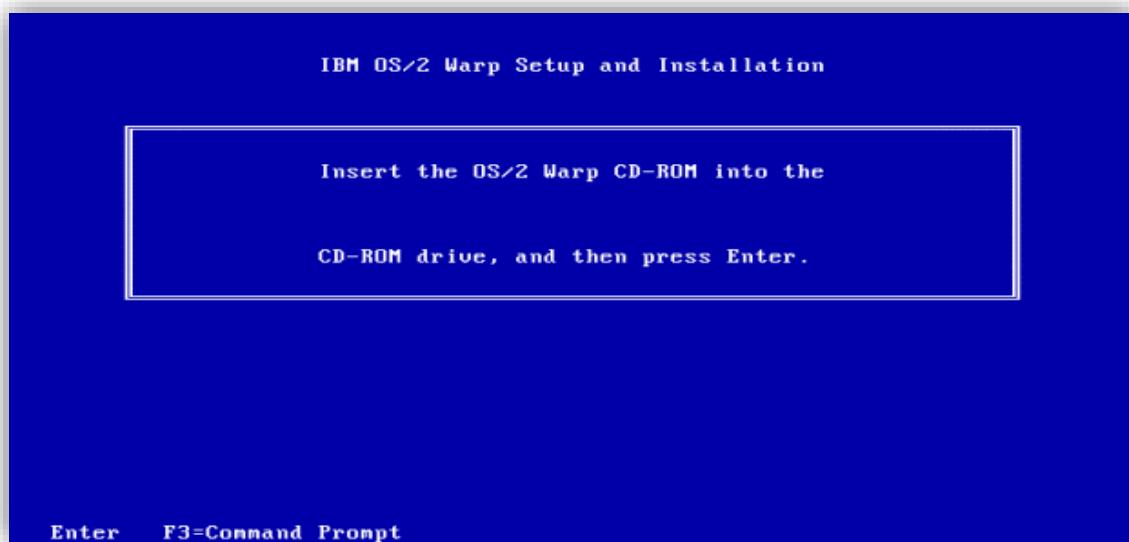
INSTALLATION PROCESS OF OS/2

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1. Boot Screen :



2. Disc Change :



3. Disk Partition Tool :

Logical Volume Management Tool - Logical View				
Logical Volume	Type	Status	File System	Size (MB)
[CDROM 1]	*->C: Compatibility		CDFS	513
Disk Partition	Size (MB)	Disk Name		

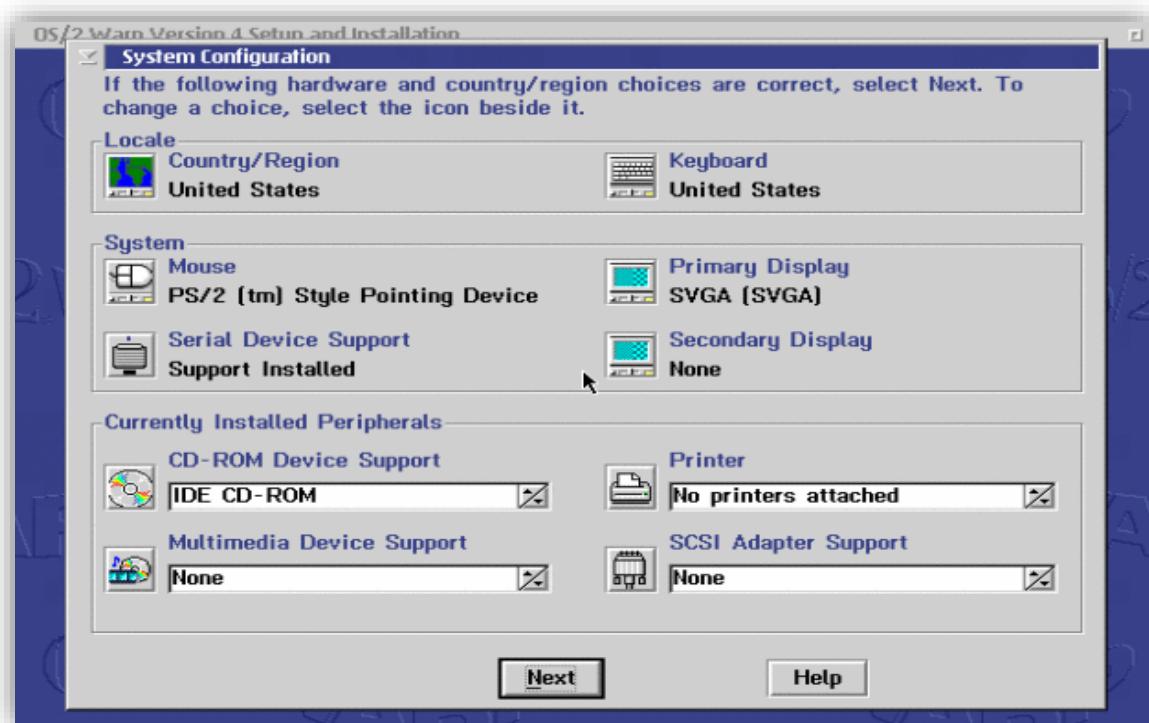
F1=help F3=exit F5=Physical View Enter=Options Tab=Window

4. Partitioning new disk :

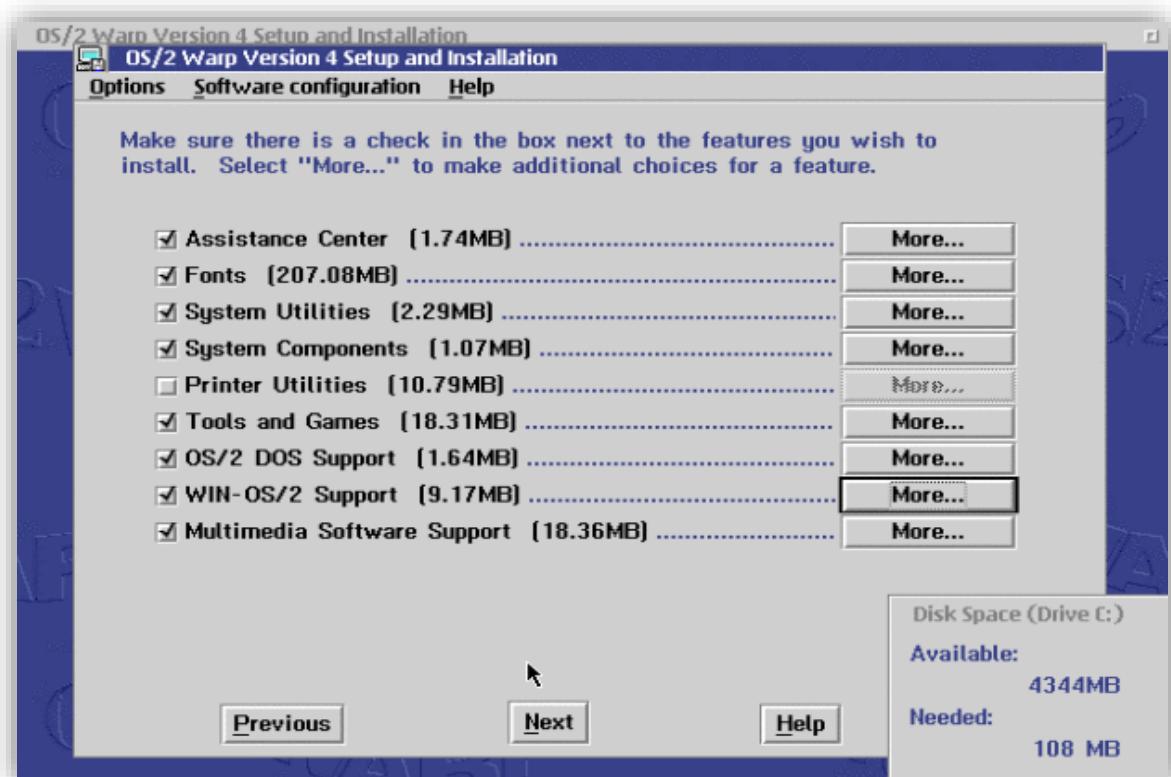
Logical Volume Management Tool - Physical View				
	Size (MB)	Free Space:	Total	Largest
Use existing partition				
Allocate from free space	4400	4400	4400	4400
Ch				
[free space 1]	4400			
Enter a name for the partition: [A]				
Enter a size for the partition: [4400]				
Disk Partition	Size (MB)	Type	Status	Logical Volume
[free space 1]	4400			

Enter the partition size in megabytes F1=help

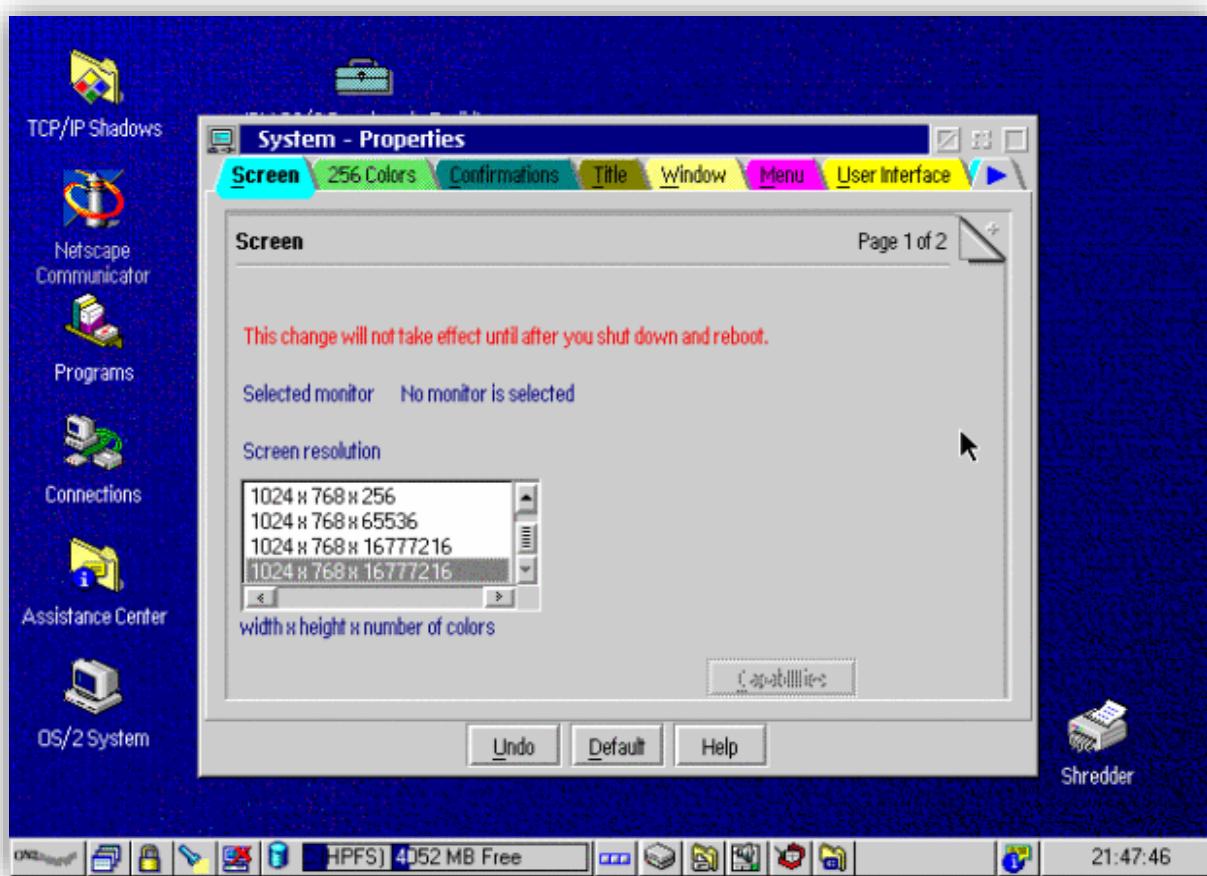
5. Graphical installer -configuration :



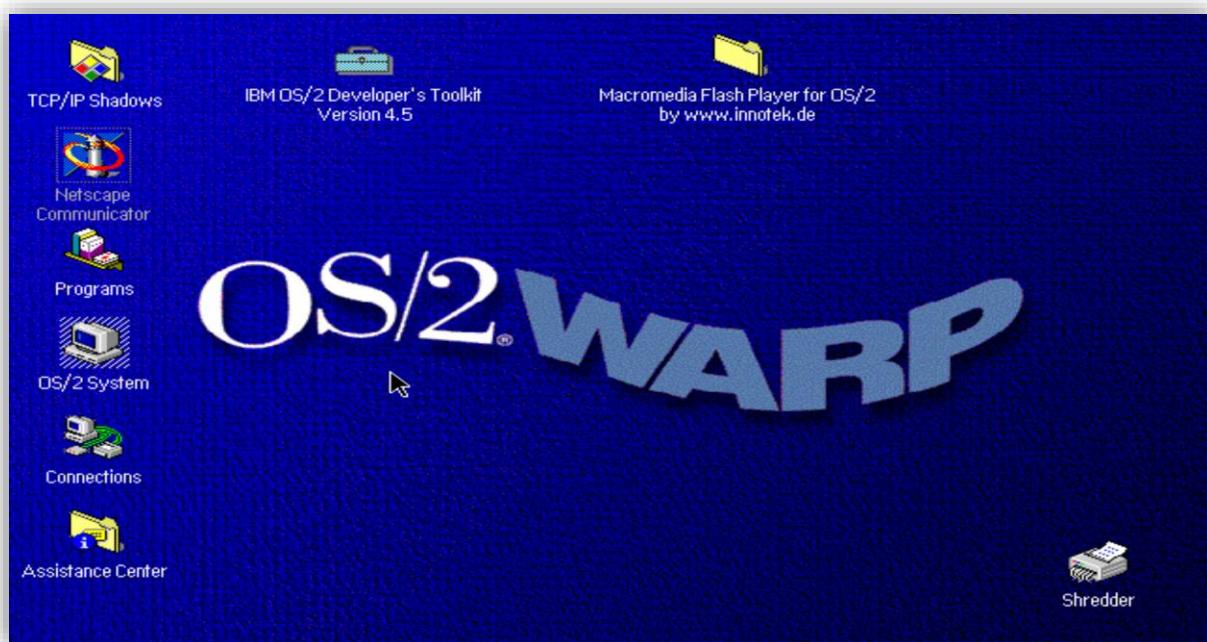
6. Choosing Features :



7. Improving The Display :



8. Final Desktop :



FEATURES OF OS/2

Performance:

- Pre-emptive Multitasking :- The operating system, rather than the application, determines the sharing of overall system resources to achieve optimal system performance. This prevents resource-intensive applications from monopolizing system resources.
- Multithreading :- Multiple units of work operate simultaneously to improve overall performance. An example is a word processor performing spellcheck while accepting keystrokes.
- Async Read-Ahead :- This file system enhancement studies disk read patterns, anticipates a disk read, and makes it available in memory to improve system throughput.
- System Page Tuning :- Frequently used functions are grouped together so they can be located with the least number of I/O operations.
- High Performance file system (HPFS) :- HPFS has been updated to optimize software for 486 and Pentium exploitation and optimize cache handling by allowing multiple lazywrite worker routines.
- Crash Protection :- Applications are isolated so errant programs cannot corrupt and overwrite memory of other well-behaved programs.
- Disk Cache :- Frequently referenced disk locations are stored in memory for ready use.

- Connectivity :

- Network Adapters and Protocol Services :- NDIS version 2.0.2 device driver support for variety of LAN adapters has been added.
- Socks security :- permits TCP/IP applications to access the Internet through Socks version 4-compliant servers, and provides "versatile" Socks client support such as dynamic Domain Name Service (DDNS). DDNS simplifies network access, operation, and changes with dynamic update of IP addresses and IP hostname transparently.
- Winsock :- Support enables Winsock 1.1 to be used in conjunction with Open32 and Presentation Manager(R) for the porting of Windows 3.x and Win95 TCP/IP applications.
- IP Alias Support :- Allows a system with a single LAN adapter card to have several IP addresses. This enables OS/2 Warp to support several web servers on a single system.
- Multicast :- Allows packets to be transmitted to multiple users especially useful for multimedia, telephone and video conferencing.
- Remote access client :- LAN access is provided via dial connections. The remote access client can dial into either a LAN Distance (R) connection server or OS/2 Warp server. Also, one remote access client can dial another remote access client directly to establish a virtual network.
- Web Explorer (IE) :- Web Explorer 1.2 supports HTML 2.0 including expanded table support, and contains numerous fixes and updates.

- Application Compatibility :
- Security enabling services :- Enables installable security Subsystem to provide robust operating systems security services.
- Open Doc :- Runtime support for cross-platform compound documents.
- True type Engine :- New PM support is provided for true type fonts.
- Dual Boot :- with dual boot, a user can easily switch back and forth between OS/2 Warp and DOS/windows for specific applications.
- XMS, EMS memory support :- Older memory extension specifications still being used by DOS applications are supported.
- SOM/DOM/2.11 :- OS/2 Warp includes support for a language-independent cross platform architecture for sharing objects through SOM/DOM.
- OpenGL :- OpenGL on OS/2 Warp is a highly precise 3D rendering API. This portable API allows software developers to include high-quality 3D functionality in their applications. OpenGL is used by CAD, entertainment, industrial design and modeling, biochemistry and scientific visualization applications.
- Open 32 :- To ease the porting of 32-bit windows applications, support for a subset of Win32 API's and message is available.

- Hardware Support :-
- New device support :- In addition to the drivers on the OSFPAK, the following new drivers have been added to OS/2 Warp 4: Trantor (SCSI), QLogic, Iomega (SCSI), IBM RAID, S3 Trio, Optical, and ESS 1688, ESS1A88, ESS188, Aztech Washington 32 . Support for more than 80 new printers, including the ProPrinter, low-cost HP DeskJet and Canon Bubble Jet printers have added.
- self monitoring analysis and reporting Technology (S.M.A.R.T) :- The OS/2 Warp generic IDE driver conforms to the S.M.A.R.T. specification and has been enhanced to include a user interface that warns the user of impending hard drive failure. Data transfer rates for PCI IDE hard drives are faster due to the use of direct memory access(DMA).
- Realtime MIDI :- OS/2 Warp provides a framework and API for delivering quality, 32-bit MIDI applications.

System Management :

- System Anchor Block :- Serviceability is improved by providing pointers to the servers key data structures, minimizing the need for OS/2 files.
- Software registration (ART) :- This online registration tool enables the user to register software electronically via a modem on the internet, fax, mail or even by telephone. The user is gently reminded periodically until registration is complete.

USER INTERFACE:

i) Graphical user interface:

GUI is a form of user interface that allows users to interact with electronic devices through graphical icons and audio indicators.

GUI in OS/2:

The graphic system has a layer named Presentation manager that manages windows, fonts and icons. This is similar in functionality to a non-networked version of Windows GUI. On top of this lies the workspace shell (WPS) introduced in OS/2 2.0. WPS is an object-oriented shell allowing the user to perform traditional computing tasks such as accessing files, printers, launching legacy programs, and advanced object oriented tasks during using built-in and third party application objects that extends the shell in an integrated fashion not available on any other mainstream OS. WPS follows IBM's common user access user interface standards.

WPS represents objects such as disks, folders, files, program objects, printers using the System Object Model, which allows code to be shared among applications, possibly written in different languages. A distributed version called DSOM allowed objects on different computers to communicate. DSOM is based on CORBA. The object

Oriented aspect of SOM is similar to, and a direct competitor to, Microsoft's Component Object Model, though it is implemented in a radically different manner, for instance, one of the most notable differences between SOM and COM is SOM's support for inheritance. COM does not have such support. SOM and DSOM are no longer being developed.

The multimedia capabilities of OS/2 are available through media control Interface commands. The last update added support for MPEG files. Support for new formats such as PNG, Progressive JPEG, MP3 comes from third parties. sometimes it is integrated with the multimedia system, but in other offers it comes as standalone applications.

OS/2 Warp 4.0 was released in 1996, its new features include new graphical icons and widgets. The interface includes OpenGL, OpenDoc, and a full server development kit, which includes server virtual machine. OS/2 is a 32-bit interface with multitasking and multi threading.

Command line Interface:

CLI is a tool that processes the commands to a computer program in the form of line of text. operating systems usually implement a command line interface in a shell for interactive access to operating system functions or services.

The command line utilities in OS/2 comprises of suite of native pure 32-bit OS/2 commands that provide many useful abilities to the OS/2 user. They are called 'command line' utilities because they are all driven by the command line making them useful in command scripts.

The utilities contain no 16-bit code whatsoever, and use no 16-bit OS/2 system. They are designed to always use the native paradigms of 32-bit OS/2, whenever possible, and to operate in a way that takes best advantages of the way that 32 bits OS/2 works and 32-bit OS/2 features.

All the utilities that deal with dates are fully capable of handling dates beyond the year 2000, beyond the year 2038 which is drop dead date for much 32 bit C and C++ code. The ability in touch and xdir commands has revealed two year 2100 bugs in OS/2 own FAT and HPF's fileSystem, drivers.

No more arbitrary 16-bit limits :- All the utilities are limited only by available virtual memory.

For example, the commands were not upset by large directories. The dir examples command in IBM's cmd, the default command interpreter supplied with IBM OS/2, refuses to sort a directory visiting containing more than 2073 files.

The dump, find, grep, sort, etc. commands can be used as filter commands, for use in a command pipeline acting upon what they receive from their standard input and producing results on their standard outputs. All the utilities can display the date & time in the format appropriate to the current settings given for COUNTRY in CONFIG.SYS - they also use OS/2's system message file to display errors and so will display error messages in local language.

Some commands in CLI :-

- (i) cmd.exe :- This is default command line interface for the OS/2. This when executed gives the version of the cmd as output.
- (ii) dir :- This command is used for computer files and directory listing.
- (iii) ifconfig :- This command displays active interface details.

TRYING OUT SOME COMMANDS

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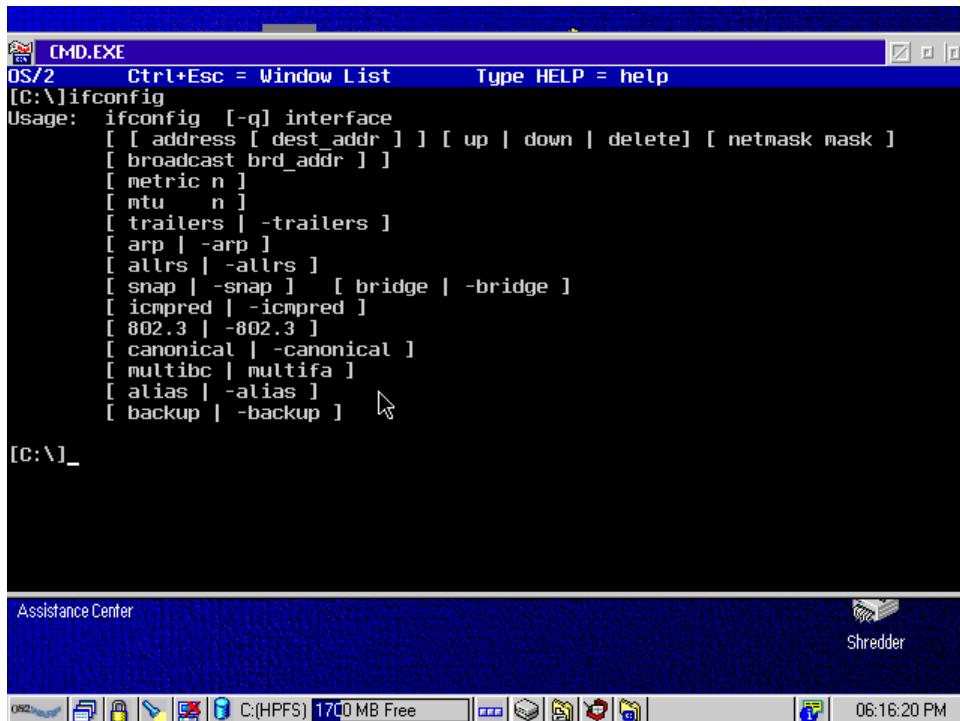
1. cmd.exe



2. dir



3. Ifconfig :



The File and directory management

Objects in os/2 : object desktop for os/2 is an advanced desktop environment. It uses IBM's system object model (som) and the workplace shell (wps) to add features, power, ease of use, and performance to the base operation system. object desktop is targeted at all users of os/2, but particularly those on small networks and in the home. object desktop is like a third-party upgrade to os/2.

object desktop is represented by icons in os/2 is also called an object. and all of them fall into one of the three general categories. And when new versions of os/2 are introduced to the general object desktop will automatically inherits those new features and extend them as well.

Files in os/2 : There are three general categories of files they are.

- * A real file is something that physically takes up space on disk. It can be an executable program file, a word processor document, a bitmap, etc.
- * An abstract object doesn't take up disk space, except insofar as it uses an entry in the system file. Some abstract objects don't have a visible representation, and therefore

don't concern the user) but many of them occur as desktop icons with properties notebooks.

- * The abstract objects that is most likely on a desktop is a program object. That, in effect, is a pointer to an executable program file. A shadow is a pointer to a real file or a pointer to an abstract object.

Directory in os/2 : A directory is a location for storing files on the computer. In os/2 directories are found in a hierarchical file system, c the drivers, folders, and the user to see in groups, which allows the user to see in the group only the files they're interested in seeing

System and management : while providing support for many different file systems, os/2 wrap prefers IBM's proprietary High Performance file system (HPFS), which implements the operating system's native file management functions.

HPFS provides all the standard file management functions such as opening/closing, creating/deleting, and reading/writing files and directories, as well as proving some file security and other functions via various file attributes.

HPFS uses the directory organization of FAT, but added automatic sorting of the directories based on filenames. Filename length was extended to up 255 characters. It offers resistance to file fragmentation, improved media error handling and smaller cluster size. HPFS also allowed a file to be composed of 'data' and special attributes to support other naming conventions and security. In addition, allocation units were changed from clusters to physical sectors, reducing lost disk space.

OS/2 Warp's High Performance File System clearly offers some advantages features concerning its file management options and performance capabilities.

File data structures OS/2 Warp implements its native file system through various data structures including file nodes, sectors runs, B+ trees, and B- trees, each which plays an important role in the high performance of HPFS. Every file or directory is fixed on a data structure called Fnode. The Fnode is the first sector allocated to a file or directory. Each Fnode contains control and access control lists, the file length, the directory name and an allocation structure, which defines the size and location of the files or directory name, and an allocation through a collection of sections of contiguous bytes.

called sector runs (fragment).

os/2 Warp's file data structures including Fragments, Sector runs, B+ trees, and B-trees allow for quick, efficient implementation of operations on files and directories, providing a vast improvement in file system performance.

Scheduling

The corner stone of a multiprocessor operating system is the scheduling. Scheduling insures that every process has a chance to perform its task on the CPU. The os/2 uses a preemptive scheduler to handle its multiprocessing ability. The `PSTAT`, entered at the command prompt, allows the users to get information about the processes that are utilizing the CPU. Information such as, which process and how long they are utilizing the CPU.

System calls: The interface invokes intended system call in os kernel and return status of the system call and any return values. File management is a type of system call used in os/2.

OS/2 COMMANDS

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NAVIGATING TO THE COMMAND SHELL

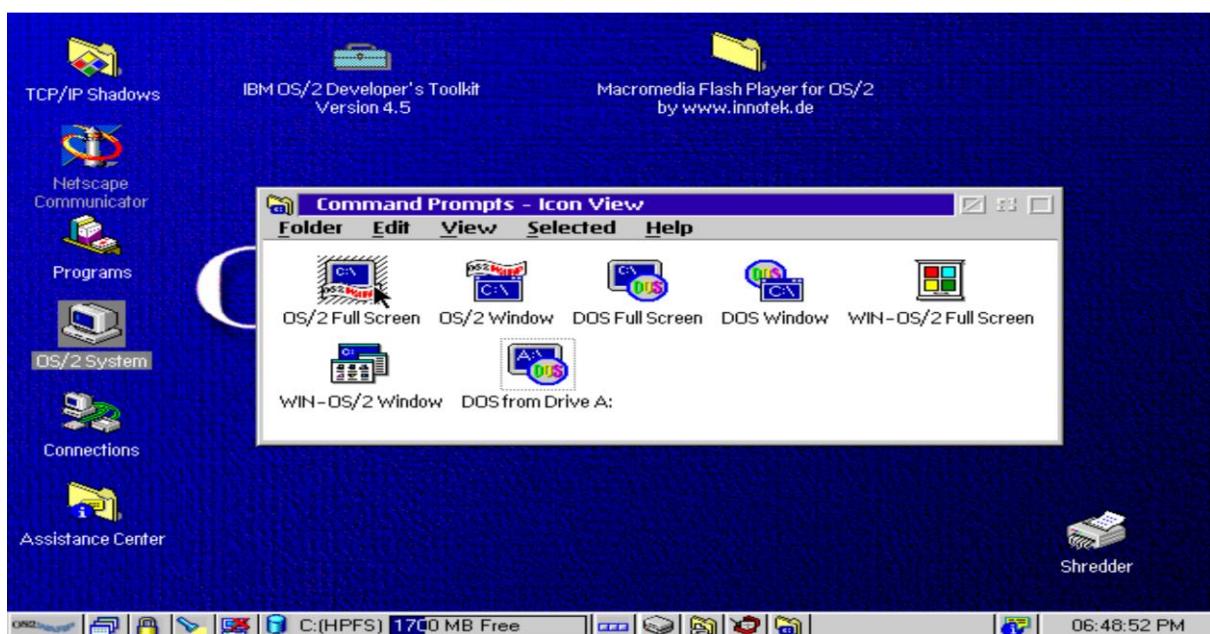
Steps :

1. Desktop
2. OS/2 System
3. Command Prompt
4. OS/2 Window

SCREEN SNIPPETS OF PATH :

(step-wise as follows)





IMPLEMENTATION OF BASIC COMMANDS

1. echo :

a command that outputs the strings it is being passed as arguments

2. mkdir :

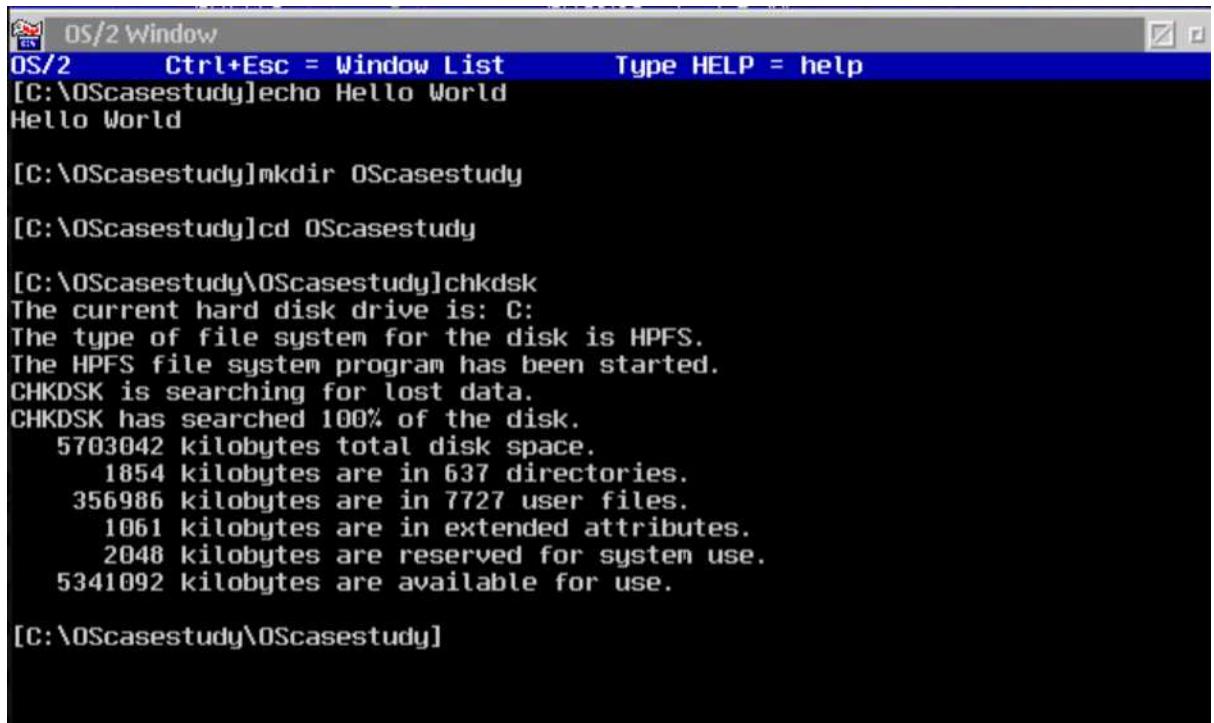
Makes new subdirectories within the root directory. It creates a multilevel directory structure, which is helpful in keeping related program or data files together.

3. cd :

Changes the current directory

4. chkdsk :

Analyzes directories and files, determines the file system type, and produces a disk status report. CHKD SK also displays the volume label and the volume serial number of the disk.



The screenshot shows a terminal window titled "OS/2 Window". The window title bar includes "OS/2", "Ctrl+Esc = Window List", and "Type HELP = help". The main area of the window displays the following command-line session:

```
[C:\OScasestudy]echo Hello World
Hello World

[C:\OScasestudy]mkdir OScasestudy

[C:\OScasestudy]cd OScasestudy

[C:\OScasestudy\OScasestudy]chkdsk
The current hard disk drive is: C:
The type of file system for the disk is HPFS.
The HPFS file system program has been started.
CHKDSK is searching for lost data.
CHKDSK has searched 100% of the disk.
 5703042 kilobytes total disk space.
    1854 kilobytes are in 637 directories.
   356986 kilobytes are in 7727 user files.
    1061 kilobytes are in extended attributes.
    2048 kilobytes are reserved for system use.
 5341092 kilobytes are available for use.

[C:\OScasestudy\OScasestudy]
```

5. **dir** : Lists the files and subdirectories in a directory.

```
OS/2      Ctrl+Esc = Window List      Type HELP = help
26/10/01  10:09a      6688          0  INST32.DLL
30/01/21  5:16p      <DIR>        0  Java11
30/01/21  4:58p      <DIR>        0  LANGUAGE
30/01/21  4:59p      <DIR>        372 Maintenance Desktop
30/01/21  5:12p      <DIR>        0  MMOS2
30/01/21  5:17p      <DIR>        0  MPTN
30/01/21  5:18p      <DIR>        0  MUGLIB
30/01/21  5:16p      <DIR>        0  netscape
30/01/21  4:58p      <DIR>        0  OS2
30/01/21  5:25p      <DIR>        0  os2tk45
30/01/21  5:12p      564           0  POPUPLOG.OS2
30/01/21  4:58p      <DIR>        0  PSFONTS
7/11/01   11:18p      13276         0  RAS
30/10/01  7:39a      24536         0  README.ADD
30/10/01  7:39a      66727         0  README.TXT
30/01/21  4:59p      <DIR>        0  SPOOL
30/01/21  5:24p      67            0  startup.cmd
30/01/21  5:22p      <DIR>        0  TCPIP
2/11/01   11:48a      261292        0  TECHNOTE.HTM
2/11/01   11:48a      214878        0  TECHNOTE.TXT
      38 file(s)    602246 bytes used
                  1782602 K bytes free

[C:\]
```

-----THANKYOU-----