

1.2: Identify ways to navigate the operating system and how to get to needed technical information.

- MS-DOS:
 - Commands are executed at the Command prompt.
 - MSD is a DOS utility which shows PC hardware information in DOS.
 - CHKDSK shows disk space information, and with the /F option can recover lost allocation units.
 - Files are stored in directories.
- Windows 3.x:
 - The Program Manager is the main interface, and contains all Windows Program Groups.
 - Icons are stored in Program Groups. Any icon can be in any group any number of times.
 - System settings are viewed and adjusted through Control Panel.
 - System resources: from Accessories program group; click System set up to verify system setting
- Windows 95:
 - The Windows Explorer is the main user interface, most commonly in the form of the Start menu.
 - System settings are adjusted through Control Panel.
 - The Device Manager allows the user to view and/or change hardware settings.
 - The Add New Hardware applet on the Control Panel detects and installs new components.

1.3: Identify basic concepts and procedures for creating, viewing and managing files and directories, including procedures for changing file attributes and the ramifications of those changes (for example, security issues).

- MS-DOS:
 - The CD command changes directories, and MD creates directories.
 - DIR shows a directory listing, and with the /S switch shows the contents of all subdirectories.
 - The ATTRIB command changes file attributes. Attributes include READ-ONLY (r) (cannot be modified, deleted), HIDDEN (h) (not displayed on DIR command), SYSTEM (s) (system files for IO.SYS and MSDOS.SYS) and ARCHIVE (a) (backup software). Attributes are turned on and off with the + and - switches, for instance "ATTRIB -r COMMAND.COM" turns off the READ-ONLY attribute for COMMAND.COM.
- Windows 3.x:
 - File manager (Winfile.exe) is used to manage files and directories.
 - File manager can associate programs with file extensions, through File > Associate.
- Windows 95:
 - The Windows Explorer is used to manage files and directories.
 - To change a file's attributes in Win 95, go to the file's Properties sheet.

1.4: Identify the procedures for basic disk management.

- MS-DOS / Windows 3.x:

- SCANDISK can diagnose and repair most disk-related problems.
 - SCANDISK and CHKDSK /F can recover lost allocation units.
 - FDISK is the program which can create, delete, and/or view partition information.
 - MS-DOS and Windows 3.x use the FAT16 file system.
 - The DEFRAG command defragments disk data. Defragmenting stores data contiguously rather than broken up, speeding up access time.
 - Smartdrive provides disk caching services.
- Windows 95:
 - Windows 95 uses the FAT 32 file system.
 - VFAT: Virtual File Allocation Table used in Windows 95.
 - VCACHE: 32-bit disk caching which replaces Smartdrive.

DOMAIN2
Memory Management
Weight: 10%

2.1: Differentiate between types of memory.

Error! Bookmark not defined.	Conventional Memory	1k - 640k	Used for DOS applications and TSRs. Used to load drivers, TSRs & running programs
	Upper memory	640k - 1024k	Memory for DOS device drivers, to free up conventional memory. Contains ROM-BIOS & UMB
	High Memory Area	1024k – 1088k	Upper memory manager à EMM386.EXE Reserved memory used by one application or utility. High Memory is the first 64 KB of extended memory (1024 - 1088 KB) HIMEM.SYS controls access to HMA
	Extended memory	1024k - End	Memory area for DOS programs requiring more than conventional memory. Memory above 1 MB is called extended memory. Managed by HIMEM.SYS
XMS	Expanded memory	Uses extended memory	EMM386 converts extended memory to expanded as needed. Expanded memory allows faster access. Expanded memory resides in the UMA area 641 KB to 1024 (1 MB) and is addressed in 64 KB page frames (made of four 16 KB pages). To work around DOS and CPU limitations
EMS			

- Virtual memory is a swap file on a disk which acts as additional RAM.

2.2: Identify typical memory conflict problems and how to optimize memory use.

- Memory optimization:
 - HIMEM.SYS enables and manages the High Memory. (HIMEM.sys is the extended memory manager)
 - EMM386.EXE enables and manages extended/expanded memory, and must have HIMEM.SYS loaded to function. EMM386.sys is the expanded memory manager and utilizes extended memory to simulate expanded memory
 - MEM allows the user to view memory usage in DOS, and the /C switch lists loaded TSRs, in the order they were loaded.
 - MEMMAKER optimizes memory usage in MS-DOS.
 - DOS=UMB in CONFIG.SYS allows DOS drivers to be loaded in Upper memory. (ability to manage allocation of UMB)
 - DOS=HIGH in CONFIG.SYS loads DOS in the High memory area.

- The /U switch usually unloads a TSR.
- The System Monitor and System Resource Meter allow the user to view memory use in Windows.
- *.sys files go in config.sys and *.com/bat files go in autoexec.bat
- You must load HIMEM.sys before you can specify DOS=HIGH. You must load HIMEM.sys and EMM386.sys before you can specify DOS=UMB
- Upper memory manager à EMM386.EXE
- HIMEM.SYS controls access to HMA (High Memory Area)
- DEVICEHIGH places a driver into upper memory / LOADHIGH places DOS into upper memory.
- **Himem.sys cannot be loaded high**
- EMM386 : if needed to use specific regions of mem : INCLUDE & EXCLUDE
- Mem.exe à gives various reports on memory usage
 - LIM memory specification renamed conventional memory (Lotus, Intel, Micr.)
- MEMMAKE: maximize free conventional memory
 - Load programs in upper memory space: LH in autoexec.bat
 - Micro. Developed DPMI for XMS management (before was VCPI by Phar Lap (Lotus now))
- Memory which is paged out à virtual memory
 - Emm386.exe à manages upper memory blocks (UMB)
- system recognizes 2 types of interrupts: hardware and software
- DOS kernel à io.sys and msdos.sys
- reserved memory: it is 384K; address range A0000h to FFFFFh; device drivers can sometime load into reserved memory
- expanded memory : enables applications to use more than 640K; line needed in config.sys (

DEVICE=EMM386.EXE/RAM) OR device=emm386.exe
- 2 lines in config.sys to load a portion of DOS into the HMA:
 1. DEVICE=HIMEM.SYS
 2. EMM386.exe has to be loaded
 3. DOS=HIGH or UMB : upper memory blocks
- system can have more than 1 UMB; unused memory addresses in the reserved area; to load device drivers in UMB à

DEVICEHIGH= & LOADHIGH & LH
- DOS / WIN31:
 - Memory Related
 - 0-640KB Conventional Memory
 - 640KB-768KB Video RAM
 - 768-960KB BIOS and RAM buffers
 - 960-1024KB Motherboard BIOS
 - Expanded memory has no direct memory address. It resides on an add-in card and is swapped in and out of memory space based on the control of the expanded memory manager. Extended memory actually has addresses associated with it, because the new CPUs have more address lines. WIN95 users

flat memory, which is obviously better.

- Files:

- VMM32.EXE loads immediately after WIN.COM executes.
- HIMEM.SYS creates and manages the Extended High Memory Area. DOS programs need a contiguous memory space, but it does not have to be in conventional memory.
- EMM386.EXE provides the operating system with a mechanism to see extended memory, on a 386+ computer system, as if it were expanded memory. The memory space that EMM386.EXE controls is upper memory.
- DOS has an imposed memory limitation of 640KB and a programming structure that is based on segmented memory. Most people are no longer interested in dealing with its limitations.
- EMM386.EXE options : frame= & x= & I= & NOEMS

- Memory conflicts:

- A General Protection Fault (GPF) is caused by a program invading the Windows kernel memory space.
- An Illegal Operation and Invalid Page Fault are caused by memory conflicts.

DOMAIN3

Installation, Configuration and Upgrading

Weight: 30%

WINDOWS 3.X

first 5 versions of W:

1. windows 3.0
2. windows 3.1
3. windows for workgroups 3.1
4. windows 3.11
5. windows for workgroups 3.11

Windows 3.x can run in 8086 mode (real mode); 286 protected mode (standard mode) and 386 protected mode (386 enhanced mode).

An Intel compatible processor has three modes of operation: Real, Protected, and Enhanced.

- Real mode places the processor in an 8088-emulation mode. This mode is slow and is limited to 1MB of address space.
- Protected Mode of the CPU allows the use of up to 16MB of RAM. DOS won't run in protected mode, but Windows will and some other operating systems.

Virtual Mode allows the processor to pretend that it is a multiple of 8086 or 8088 processors. Each has the same restrictions as its counterpart mode.

real mode: the DOS mode; can access 1MB of RAM; not supported by W 3.1

reserved memory	1Meg
windows app	640 K
Windows	
DOS	0 K

standard mode: break out of the DOS 1MB barrier; could address up to 16MB RAM

Can have multiple W applications at the same time

	16 Meg
Windows app	
Windows app	
Windows	1 Meg
DOS apps	
DOS	0K

inability to return easily to real mode

for W to operate in standard mode or 386 enhanced mode, the CONFIG.SYS file should the HIMEM.SYS device driver loaded (only required driver). Himem.sys must be loaded before loading emm386.exe

386 enhanced mode (protected mode)

- address up to 4 GB of memory, supports virtual memory, allows multiple DOS and W programs to run at the same time
- minimum memory needed: 2048 K
- DOS applications can be run in window as if it were a W application

	4 Gig
Windows App	
Virtual DOS	
Windows	1 Meg
DOS Apps	
DOS	0 K

- The W 3.x core consists of 3 files : KRNL386.exe; USER.exe and GDI.exe
- Allocate and keep track of memory
- KRNL.exe à how programs use memory
- USER.exe à handles user interface devices and how they affect W
- GDI.exe à graphics device interface, monitors and controls the position of graphics on the screen
 - KERNEL32 handles memory management, file I/O operations, and application execution. This is the heart of the OS.
 - GDI.EXE (Graphical Device Interface) and GDI32.DLL file(s) control and creates the GUI interface and also handle printing. GDI.EXE is a set of text and graphics display routines that Windows programs call when needed for graphical screen output. This set of routines is called a library. Programs do not need to do special graphics programs because the display routines are already available. It is responsible for drawing windows and scroll bars.
 - USER.EXE is the Windows input and output manager. The types of input managed include keyboard, mouse, and communications, such as ports. The output managed includes sound and communications hardware. Also manages user windows and profiles.
- SWAP FILES
 - virtual memory manifests itself thru hidden swap file , which is the part of the HD which thinks it is RAM. The swap file is like a temporary storage box. W uses the swap file to remove running programs temporarily from RAM so other programs can be loaded and run. Only used when run out of RAM. If delete 386SPART.PAR , deletes the swap file
 - Permanent swap files are created by Windows the first time it is started. It consists of 2 files: SPART.PAR and 386SPART.PAR. SPART.PAR points to the location of the actual swap file. Temporary swap files are created every time you start windows. It is named WIN386.SWP Permanent swap files are more efficient because they use contiguous disk space and cannot be on a compressed drive.
 - W3.X Change swap files: control panel, 386 enhanced, virtual memory (not set automatically)
 - W95: performance tab in system properties; alternate click My computer/Properties/Properties/virtual memory (set automatically)
- INITIALIZATION FILES : INI
 - to initialize : windows, device drivers, applications

- CONTROL.INI à set colors and background patterns
- MOUSE.INI à mouse hardware settings
- PROGMAN.INI à what groups are in the program manager
- PROTOCOL.INI à details for the PC exist on network
- SYSTEM.INI à the config.sys of Windows, ressources are intialized here, global settings for rescues . Contains hardware information. Only need this .ini file to run W3.1 Group settings : boot; boot.description - keyboard -386enh-nonwindowsapp -vcahce -mci - drivers -network -32 bitdislaccess=on/off --- comXirq=number --- EMMExclude --- EMMIInclude ---MaxBps=768. Only file needed to run W3.X
- WIN.INI à like the autoexec.bat, defines personnalization of W. win.ini : controls desktop appearance in 3.X (screen saver, colors, wallpaper, as well for printer settings). 2 settings : load= and run= that automatically start programs
- INI FILES: all text files, can be edited; categorized in groups
 - WIN.INI contains personalized settings, and various programs use settings within it also.
 - In .INI files, LOAD=xxxxxxx.xxx will start minimized; RUN= will start as regular full screen.
 - PROGMAN.INI, CONTROL.INI, and COMMAND.COM cannot be edited with sysedit.
 - Same as REM is; for win.ini and system.ini editing
 - In .INI files [Example] is called sections, and under them are called entries. Entries have two parts- an entry name and a value.
 - The most important system initialization files are win.ini and system.ini (control.ini, progman.ini, & winfile.ini are the other 3)
 - To run W3.X only need system.ini

● TEMP FILES

- always end in .tmp; print spoolers always use tmp; always placed into one directory, and a line in autoexec.bat files sets up that directory

● PIF (program information file)

- helps DOS applications by limiting swapping to the disk and reserving keystrokes; is a binary file; directs amount of memory ressource given to DOS application if no PIF file, W3.1 uses: _default.pif

● GPF : general protection faults

1. memory management problems (krnl386.exe errors)
2. graphical device interface heap overflows
3. application specific problems

● RAM DRIVE

- a ram drive uses part of the system's RAM to act like the HD
- a drive letter is assigned to RAM drive
- a RAM drive takes up extended memory

● WINDOWS 95

- w95 IS A dpmi (dos PROTECTED MODE INTERFACE) AND A PROTECTED MODE gui
 - previous io.sys and msdos.sys combined into IO.SYS; hidden read-only text file, no longer the DOS kernel
- Options group of W95: bootconfig; disablelog; systemreg; bootsafe; drvspace or dblspace; bootwin; bootwarn; bootkey; bootgui; network; bootmenu; bootmenudefault; doublebuffer; bootmulti; logo; loadtop; bootdelay;

uninstalldir; windir; winbootdir; hostwinbootdrv

win 95 & win3.X Apps
win95 core kernel, GDI and User
VMM (virtual memory manager)
device drivers real and protected

DOS Apps

IFS (installable file system)

● REGISTRY

- composed of 2 binary files : system.dat and user.dat
- contains all info about PC, hardware, network , user preferences, file types
- backups of R created every time system boots (da0 files)
- replaces config.sys; autoexec.bat and ini files , W95 still reads those files
- to copy it: ATTRIB -s -h -r [registry file]
- W95: registry files are located : /windows
 - SYSTEM.DAT & USER.DAT are the two W95 registry files. SYSTEM.DAT contains system settings and application settings. USER.DAT has settings for individual users. The back-up of these files are SYSTEM.DA0 and USER.DA0.
 - Exporting a registry file: .reg

● MISC:

Registry

- HKEY_CLASSES_ROOT- file extension associations
- HKEY_CURRENT_USER- profile information and preferences.
- HKEY_LOCAL_MACHINE- settings and information for hardware.
- HKEY_USERS- default user and current user profile.
- HKEY_CURRENT_CONFIG- current hardware configuration.
- HKEY_DYN_DATA- dynamic settings for Plug N' Play devices.

REG.DAT is the W31 registry file.

● COMPONENTS:

1. hkey_classes_root : defines the standard class objects used by W95. A class object is a named group of functions
2. hkey_users & hkey_current_user: personnalization info of users
3. hkey_local_machine: the data for a system's non-user specific configs. (all devices in the PC)
4. hkey_current_config: if values in hkey_local_machine that have more than one option, it will be here (ex: 2 monitors)
5. hkey_dyn_data: snapshot of all hardware, stored in RAM to speed up system configuration

● WINDOWS 95 FILE STRUCTURE

- long filenames, limit 255 characters, saved in 8.3 though
- FAT 32: is optional in W95; reduces the cluster size over FAT 16
- DISK CACHE: can be changed in the device manager/performance tab/file system buttons, : changing the typical role of button and changing the read-ahead optimization slide tab to "full"

3.1: Identify the procedures for installing DOS, Windows 3.x, and Windows 95, and for bringing the software to a basic operational level.

- A disk must be partitioned and formatted before installing the operating system.
- SETUP.EXE installs DOS, Windows 3.x and Windows 95, even when upgrading.
 - Minimum hardware requirements:
W3.1 286 2 MB RAM
W3.11 386 4 MB RAM
WNT4 486/SX 12 MB RAM
- Minimum hardware requirements for Windows 3.x:
 - 286 processor (386 required for 386 Enhanced mode)
 - MS-DOS 5.0
 - FAT partition with 5MB space for new installation, 2MB for upgrade
 - Mouse or other pointing device
 - 256k extended memory (1024 extended needed for Enhanced mode)
 - Video card with Windows driver
- Minimum hardware requirements for Windows 95:
 - Intel 20MHz 386DX
 - 4MB Memory
 - DOS 3.2 minimum
 - VGA video adapter and monitor
 - Mouse or other pointing device
 - FAT partition with 20MB space
- Windows 95 Setup options:
 - Typical: Recommended setup, includes minimum user interaction
 - Compact: Bare minimum install, conserves disk space
 - Portable: Includes utilities for remote computing
 - Custom: Manually set most Setup options and installed features
- Windows 95 Setup logs:
 - SETUPLOG.TXT: Installation log. It will note the utility which was being run if the system halts during setup.
 - DETCRASH.LOG: Logs hardware detection process. Readable only by Setup.
 - DETLOG.TXT: User-readable version of DETCRASH.LOG.
 - NETLOG.TXT: Logs detected network components.
 - What file is very useful in troubleshooting modem problems - modemlog.txt
 - Bootlog.txt has loadsuccess= line (when choosing logged mode, bootlog.txt will appear). Good during problems of BOOT process.

3.2: Identify steps to perform an operating system upgrade.

- Install Windows 95 upgrade in the existing Windows directory to conserve Windows 3.x groups.

3.3: Identify the basic system boot sequences, and alternative ways to boot the system software, including the steps to create an emergency boot disk with utilities installed.

- MS-DOS boot sequence:

- IO.SYS
- MSDOS.SYS
- CONFIG.SYS*
- COMMAND.COM
- AUTOEXEC.BAT* (*: not required)
- MS-DOS keys pressed on bootup:
 - F5: Bypass Config.sys and Autoexec.bat (clean boot)
 - F8: Step-by-step progression through Config.sys and Autoexec.bat
- Windows 95:
 - F4: Boot to older version of MS-DOS
 - F5: Boot directly to Safe Mode
 - F8: Display bootup menu; step by step through boot process; go to SAFE mode
 - Message: systems needs to be reconfigured: F1
 - Terminate set-up : F3
- Control boot process MS-DOS 6.2: F5,F8,CTRL-F5, CTRL-F8
- Prevent startup folder from booting: press left SHIFT KEY
 - CTRL-F8: to go line by line in config.sys and autoexec.bat (double space not loaded)
- An emergency boot disk is created in Windows 95 through Control Panel > Add/Remove Programs on the Windows Setup tab. It includes the following files, among others:
 - ATTRIB.EXE
 - COMMAND.COM
 - DEBUG.EXE
 - FDISK
 - FORMAT.COM
 - IO.SYS
 - MSDOS.SYS
 - SCANDISK.EXE
 - SYS.COM

3.4: Identify procedures for loading /adding device drivers and the necessary software for certain devices.

- In MS-DOS/Windows 3.x run the installation program for the device from the driver diskette, usually SETUP.EXE or INSTALL.EXE.
- Windows 95:
 - Plug-and-play (PnP): Automatic device detection/installation. Requires PnP BIOS, device, and operating system to detect.
 - Add New Hardware: Use this Control Panel applet to install devices which are not automatically installed.
 - Device Manager: Drivers can be updated through Device Manager under the device's Properties sheet, on the Update Driver tab.

3.5: Identify the procedures for changing options, configuring, and using the Windows printing subsystem.

- In Windows 95, the printer are installed and configured under My Computer > Printers.

3.6: Identify the procedures for installing and launching typical Windows and non-Windows applications.

- In MS-DOS programs are launched from the command line.
- In Windows 3.x, programs are launched from an icon, or through Program Manager > File > Run.
- In Win95, programs are launched by a shortcut, the Start menu, and/or via Start > Run.
- A PIF (Program Information File) launches a DOS application from Windows.

DOMAIN4 :Diagnosing and Troubleshooting

4.1: Recognize and interpret the meaning of common error codes and startup messages from the boot sequence, and identify steps to correct the problems.

- Safe Mode is the bare minimum boot for Win95, and is useful for diagnosing problems which will not allow the user into Normal Mode.
- Errors:

Error! Bookmark not defined."Incorrect DOS version"	Run the DOS "SETVER" command to set the DOS version for that application.
"No operating system found"	The boot partition is not set to Active, or Command.com is missing.
"Error in CONFIG.SYS line XX"	There is an unrecognized command in CONFIG.SYS, possibly a valid command which refers to a missing file.
"Bad or missing Command Interpreter"	Command.com is missing or corrupted, and a new copy will be required. Deleted W by mistake or win.com, or copied over command.com with different DOS version
"Himem.sys not loaded"	HIMEM.SYS was not loaded in Config.sys on bootup, possible because the file is missing.
Floppy drive light always on	Floppy cable upside down
W95 damaged core files	Run W set up, select verify option in safe recovery
Invalid system disk	Floppy in drive
Invalid drive specification	BIOS cannot find HD
Non system disk	Command.com missing
Cannot open .inf file	Remove emm386.exe
General failure reading A	CMOS
Fixed disk error	Caused by incorrect CMOS settings
Current drive is no longer valid	Autoexec.bat tries access a drive that is not valid
Wrong media type	Format HD
Missing win.com	Boot up from start disk
Missing operating system	MBR is bad
Random dots on monitor	Video card problem
Floppy drive light stays on	FDD cable is reversed
Light then dark print	Erratic ribbon advancement
Dot matrix: patchy, faint, uneven, intermittent print	Replace ribbon
Wobbly display	Electronic device near by
DLL not working	Reboot and start W and re-run program set up
"A device referenced in SYSTEM.INI could not be found"	There is an unrecognized command in SYSTEM.INI, possibly a valid command which refers to a missing file.