



Cramsession™ for Microsoft Windows 98

This study guide will help you to prepare for Microsoft exam 70-098, Implementing and Supporting Microsoft Windows 98. Exam topics include Planning, Installation & Configuration, Configuring & Managing Resource Access, Integration & Interoperability, Monitoring & Optimization, and Troubleshooting.



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Minimum Hardware Requirements for Windows 98

- Intel 486DX, 66MHz processor or higher
- 16 MB RAM
- VGA Video adapter and display
- 225 MB free FAT16 hard disk space or
- 175 MB free FAT32 hard disk space.

Windows 98 requires an Intel-based 486DX/66 processor with 16MB of RAM.

Either FAT16 or FAT32 file systems can be used, but FAT16 must be used for compatibility with almost anything else (including Windows NT). FAT32 has many more features than FAT16, but it is not compatible with Windows NT 4.0 or many other operating systems. You can convert FAT16 to FAT32 without losing your data, but you cannot convert FAT32 to FAT16 without reformatting and losing all your data. If the file system is FAT16, you must have 225MB of free hard-drive space for the installation. If the file system is FAT32, you need only 175MB of free hard-drive space.

MS-DOS before version 3.0	12 bit FAT
MS-DOS 3.0 and up	16 bit FAT
Windows 3.11	16 bit FAT
Windows 95a	16 bit FAT w/32bit VFAT for 32 bit disk access
Windows 95 OSR2	32 bit FAT (supported)
Windows 98	32 bit FAT (supported)

- The FAT options you have available and what they can do for you will be important as you plan for an installation or upgrade.

Features of:	FAT 16	FAT 32
Partition size:	2GB	2TB
Read by Win95:	Yes	OSR2
Read by NT4.0:	Yes	No
Read by MS-DOS:	Yes	No
Read by Win 3.11:	Yes	No
Cluster size on 2GB:	32K	4K
Disk Compression:	Yes	No

Planning a Workgroup

Workgroups are peer-to-peer networks that offer share-level security and do not require a server. Domains are networks built around a server, and they offer user-level security. In order for you to have user level security, you must have a computer running an operating system that can maintain a database of users. Windows 98 can't do this. Windows NT and Novell NetWare are operating systems that can. User level security is much tighter.

Workgroup	Domain
Decentralized security	Centralized security
Decentralized administration	Centralized administration
Decentralized resources	Centralized resources

Setting up System Policies

- To limit what a user can do to the system when he/she logs on to a computer or network, you can use system policies. This actually makes changes to the policy files in the registry. To make changes to the System Policy you would use the System Policy Editor. Here you can also specify how you want them enforced. (User, Group, or Computer) The System Policy Editor edits the

registry so it must not be available to users. It is located on the Windows 98 CD-ROM under:

- \TOOLS\RESKIT\NETADMIN\POLEDIT
- Add the SPE with the Add/Remove Programs applet in the Control Panel. The System Policy Editor only needs to be installed on one machine on the network. It will add a shortcut on the Programs menu under Accessories, but it is a good idea to remove it. You can then access the SPE by choosing START/RUN, typing POLEDIT, and clicking O.K.
- The first time you run the SPE it will ask for a template. These templates give you a policy to start with. Two templates on the Win98 CD; WINDOWS.ADM and COMMON.ADM, have the default settings for Win98. (Nothing is locked down. The user has complete control of the machine.) They are located in the same directory as the SPE. There are also other policy files in the same location. (Windows 95 loaded admin.adm instead of windows.adm or common.adm.
- Once activated the SPE gives you these options:
 - NEW POLICY
 - CREATE POLICY
 - OPEN REGISTRY
- You can edit the registry directly here, or edit the registry of another computer on the network.
- In order for the policy to become enforced you must save it as CONFIG.POL. If you are using share level security you must save the file in the machine's Windows directory for it to be enforced. For user level security, where you need to save it will depend on what type of network your machine is on.
- Ensure user level security is enabled in the Control Panel Network applet – Access Control tab.
Select Client for Microsoft/NetWare Networks and specify Domain or preferred server.
Place CONFIG.POL in one of the following directories:

Windows NT 4.0 Server Primary Domain Controller	\Netlogon directory
Novell NetWare preferred server	sys\public
Novell NetWare NDS-based server	user's home directory

- The policy file will not download automatically if you are using VLM's or NETX instead of the actual Client for NetWare Networks.
- When logging on to a computer when you have a profile, are a member of a group that has it's own policy file, and the computer you're logging on to has its own policy file; Win98 checks for user profiles first, then group policies, then computer name policies.
- When creating group policies, the group must already exist on the security provider. (Server) Also, the file GROUPOPOL.DLL must be installed on each client. (Use Add/Remove programs/windows setup tab/have disk and choose grouppol.inf from the same directory as SPE. If some users are actually members of more than one group you can set a priority list in the Options menu under Group Priority.
- The System Policy Editor must have templates for the choices it presents to you. These templates are ASCII text files with .adm extensions. The two templates loaded into the System Policy Editor by default are common.adm and windows.adm;
- User profiles are stored in user.dat files and hold the configuration information for each user. If the ability to save settings is turned on, each user will have his or her own user.dat file. The user.dat file can be stored locally or on the server. If it is stored on the server, it is called a roaming profile.

File and Printer Sharing

- File and Printer Sharing allows you to share resources with other users. (Peer to peer) File and Printer Sharing does not allow you to share individual files, but it does let you share folders.
- Install Client for Microsoft/NetWare Networks
Click on File and Print Sharing
Check boxes for sharing files and sharing printers.

Implicit and Explicit Permissions

- A new feature in Windows 98 is the ability to have implicit and explicit permissions assigned to a folder. This feature does not exist in any other version of Windows (even NT).
- Implicit Permission – Inherited permissions from a folder higher in the directory tree.
Explicit Permission – When a folder has its permissions changed from the ones it would have inherited.
- You must have USER LEVEL security enabled for this feature. User-level security requires a Domain controller.
- After sharing a folder, if you change the parent folder's permission you will be prompted to:
- Apply changes to inside folders
Do not change inside folders
Display each folder name individually (choose which folders it will be applied to).

Share-Level Access Control

Full, Read Only, Depends on Password (Full or Read Only)

Sharing Resources with other NetWare Clients

Win98 can share files and printers with MS or NetWare Clients but not both at the same time. There are differences between MS and NetWare Clients. NetWare requires you to be in user level security to activate file and printer sharing. Windows NT allows you to be in share level security.

Installations

Unattended Installation

- Windows 98 has the ability to set itself up when provided with a script file. These script files contain information about what settings Windows should use and can be very detailed. Examples:

- Setup Options
 - User Profiles
 - System Policies
 - Network Workgroups users can be members of
- The script files are then saved with the extension .INF. One can be used by typing the name of the script file after the Windows 98 SETUP command. (setup bill.inf)
- Alternative ways of automating the Setup.
- Use a network Login script
 - Email a batch file
 - Microsoft or other SMS tool
- The program used to create scripts is the BATCH98 program (batch.exe). It is located in:
 - TOOLS\RESKIT\BATCH

The New Installation

- Preparing to run Setup
- Collecting information
- Copying the files to the computer
- Rebooting
- Setting up hardware
- If you start Setup from MS-DOS it will run ScanDisk first to check for problems. It will also copy a few files to your HDD and get a small version of Windows up and running. This is done because Setup is actually a Windows based program.

The Upgrade Installation

When you upgrade from Windows 3.x to Windows 98, you'll find that settings in protocol.ini, system.ini, and win.ini are used to create the Windows 98 Registry. (Just like in Windows 95 these files and any files with the .GRP extension are saved for backward compatibility.) When you migrate from Windows NT to Windows 98, you must reinstall all your applications, because the two operating systems' Registries are not compatible with each other.

Uninstall Windows 98

Use the Add/Remove Programs applet in Control Panel to uninstall Windows 98. This will only work provided the following variables are in place:

- You chose to save your previous operating system files during setup.
- WINDUNDO.DAT and WINDUNDO.INI exist in your root directory.
- The partition is not compressed.
- You did not convert to FAT32. (Unless the previous OS was Win95 OSR2)

Dual-Boot Systems

When installing Win98 on a computer with MS-DOS 5.0 or later, a dual boot is created automatically. Some files will be changed when you do this:

Original DOS Name	Changed to
Command.com	Command.dos
Config.sys	Config.dos
Autoexec.bat	Autoexec.dos

When booting to DOS after Win98 is installed, the following files are changed to:

Original Win98 Name	Changed to
Command.com	Command.W40
Config.sys	Config.W40
Autoexec.bat	Autoexec.W40

- On Win3.11 computers you must install Win98 into a separate directory to make it dual bootable.
You cannot dual boot Win95 and Win98 since they both use the same boot sector.
- For a WinNT dual boot configuration, you need to use FAT16.

- If already running WinNT and you want to install Win98, boot to DOS and then install Win98. This causes the machine to boot to a file called BOOTSECT.DOS and any changes Win98 needs to make to the boot sector will be made to this file.
- You cannot dual boot Win98 with OS2.

Network Server Installation

- Windows 98 can use a server-based setup to be installed from a server. This will keep most or all of the files on a server, which your PC will connect to each time you reboot.
- Share server's CD-ROM and run Setup from the client, or copy Win98 folder from the installation CD to the server and share the folder. Windows 95's Netsetup.exe program is absent from Win98.
- Machine Directory – directory on server, which stores computer-specific configuration, and files (system.dat, user.dat, .ini files, etc.) for a PC. Is mandatory to use when the PC does not have a hard drive. Machine directory can be shared for multiple PC's with the same configuration.

Win98 Web Server

A subset of Microsoft's Internet Information Server (IIS, which runs on Windows NT Server) is available for Windows 98, where it is known as Peer Web Server.

- \add-ons\pws\setup.exe
- Minimum, Typical, Custom
- Choose directory for install

Win98 Dial-Up Server

- Supports only one outbound modem at a time. To install:
- Add/Remove programs->Windows Setup tab->Highlight Communications icon->Click details->Check Dial-up Server
- After reboot you must go to Dial-up Networking to the Connections menu and choose Dial-up Server.
- Allow caller access and specify server type.

Map Network Drive

- Browse for resource in Network Neighborhood
Right click and choose Map Network Drive.
Specify drive letter (and check "connect at logon" if desired)

OR

- Right click on My Computer or Network Neighborhood icon and specify path with UNC. (Universal Naming Convention)

Security Hosts

- The following operating systems can act as security hosts for a network.
- Windows NTW 3.5 or later
- Windows NT Server 3.5 or later Novell NetWare 3.x
- Novell NetWare 4.x

Novell NetWare as Security Host

- Must install user-level security and name the security host (NetWare server) in the Access Control tab of the Network applet in the Control Panel.
- Reboot and share a folder as you would in File and Print Sharing. You will obtain a list of users from the security host that you can use to specify which users have which rights.

Browsing Microsoft Networks

- To keep network traffic down to a minimum, a "Browse List" is kept by a computer called the "Browse Master". Any computer running File and Print Sharing has the ability to be a Browse Master. There is one Browse Master per workgroup or Domain. Here is how it works:
- A computer comes online and sends out a broadcast searching for the "Browse Master".
When it finds it, the computer sends it the information (the resources that it can share).
The Browse Master then adds the computer to it's browse list.
- Anytime you attempt to browse using Network Neighborhood, the computer already knows who the browse master is and asks for an updated list.

The Browse Master doesn't become overwhelmed because of the Backup Browsers.

- There will be one Backup Browser for every fifteen computers. This all happens automatically. Which computer is elected to which role:

The election process: (Seniority is King)

- Windows NT Server (Primary Domain Controller)
- Windows NT Server
- Windows NT Workstation
- Windows 98
- Windows 95
- Windows for Workgroups
- If two computers are the same the newer version of the OS wins. If these are the same also, then the one who has been online the longest wins.
- You can also give a computer an edge up in the election process if you have a preference as to who the Browse Master is. This is called the "Preferred Browse Master".
- To make a computer a preferred Browse Master edit the properties for File and Print Sharing for Microsoft Networks. You will see options for "Browse Master and LM Announce."
 - Choose Browse Master
 - Specify "Enabled" (Other options are "Auto" and Disabled")
 - LM Announce is used for older LAN Manager networks. It should be set to "No" unless actually on a LAN Manager network. LM Announce causes a computer to announce itself via broadcast periodically.
- Backup Browsers contact the Browse Master every 15 minutes to alert the Browse Master that they are still online. Whenever a change is made to the Master Browse List the Browse Master notifies the Backup Browsers who in return request updated lists. When a computer is shut down properly on the network it notifies the Browse Master that it can be removed from the Browse List. If a computer is not shut down correctly and does not get removed from the Browse List, it may continue to show up for 15 minutes if it is a Backup Browser, or 45 minutes if just a regular computer on the network.

Logon to Windows NT Domain

Once Client for Microsoft Networks is installed in the Network Components box of the Network Applet in Control Panel, highlight it and click Properties. You will be prompted for the name of the NT domain and whether you want to do a quick logon or restore network connections every time you logon.

- Quick Logon- Windows logs you on the network but network drives are not restored until you use them.
Logon and Restore Network Connections- Windows logs you on and verifies network drives.

Sharing Resources with NetWare clients

NT has permissions NetWare has rights:

NetWare Right	Windows NT Permission
Read	Read Files
Write	Write to Files
Create	Create Files
Erase	Delete Files
Modify	Change File Attributes
File Scan	List Files
Access Control Change	Access Control

Browsing NetWare Networks

- To make other computers aware of its resources on a NetWare Network, a NetWare server uses Server Advertising Protocol. (SAP) All NetWare servers broadcast an SAP packet every 60 seconds.
- NetWare clients using NETX or VLM can only see computers that are SAP enabled.

- In order for a Win98 computer to be seen and browsed in Network Neighborhood it must have SAP enabled also. (UNC can be used to connect to a WIN98 computer without SAP enabled.)
- You can install SAP when setting up File and Printer Sharing for NetWare Networks.
- Remember you can only run one File and Printer Sharing client at a time. (NetWare or NT)
- Workgroup Advertising in the Novell client accomplishes the same as Browse Master does in Microsoft.
- Novell NetWare typically uses the IPX (AKA NWLink) protocol for network communications. Novell
- NetWare 4.11 has TCP/IP capabilities. Frame type describes the format used to encapsulate IPX packets, and must be the same on connecting systems.
- Novell NetWare by default does not support long file names. To enable long file names on your NetWare server, enable OS/2 name space.
- Client for NetWare is needed for connecting to Novell NetWare servers.
- Client for NetWare uses NCP (NetWare Core Protocol) as the redirector.
- ODI is Novell's version of NDIS.
- File and Print sharing for NetWare is needed when sharing files to other NetWare clients. This requires user-level security for pass-through authentication to a NetWare server.
- NetWare servers advertise their services using the Service Advertising Protocol (SAP) to make broadcasts over the network. Routers will maintain a database of available NetWare servers.
- NetWare commands:
 - Syscon - administers accounting, file server, user and group information.
 - Filer - configures volume, file, and directory information.
 - Pconsole - manages NetWare print queues.
 - Netadmin - manages NDS services.

Connecting to NetWare

- Clients you can use to connect Win98 to a NetWare Server:
 - Client for Microsoft Networks, built in, 32 bit
 - Novell NetWare 3.x real mode networking using NETX, not included
 - Novell NetWare 4.x real mode networking using VLM, not included
 - Novell NetWare Client 32, protected mode client w/NDS
 - Microsoft Service for NetWare Directory Services 32 bit, protected, w/NDS
- NetWare servers communicate with NetWare Core Protocol (NCP). The above clients allow Win98 to communicate with computers using NCP. Microsoft Networks use Server Message Blocks (SMB) to communicate.
- NetWare 3.x servers use a bindery to store users and groups. The bindery is server-centric which means you cannot share this information between servers.(If you need a resource from two different servers you must have a user account on each.)
- NetWare 4.x uses NetWare Directory Services (NDS) instead of a bindery. It is not server-centric. Many applications are not NDS aware so NetWare 4.x can emulate a bindery.
- Main reason to use NetWare clients is the support for VLM and NETX functions.
- When choosing a protocol to install, stay with same vendor as client.
- When setting up which frame type to use, use the following standards:

Type of Network	Standard
NetWare 3.11 or earlier	Ethernet 802.3CSMA/CD
NetWare 3.12 or later	Ethernet 802.2LLC

- Windows 98 can be set to choose the frame type it detects on the network checking in this order:
 - Ethernet 802.2
 - Ethernet 802.3
 - Ethernet II

Asynchronous Transfer Mode

Networks designed to run at very high speed; must have a connection established first; they then transfer data in dedicated bandwidth.

ATM Call Manager	Establishes the connection.
ATM LAN Emulation Client	Software provides connectivity to network.
ATM Emulated LAN	Implements Virtual LAN to segment portion of LAN's into smaller LAN's.

Installing PPTP/VPN

- In Network applet choose:
- Add->Adapter->Microsoft->Microsoft VPN Adapter-> Add->OK->Restart
- Create Dial-up Networking connection to ISP if you don't already have one. Create another New Connection this time using the VPN adapter instead of the modem.
- Type in the PPTP Server address.
- Click Finish.
- Now launch the Dial-up connection first. Once connected, launch the VPN connection.

Microsoft DLC (Data Link Control)

Protocol for connecting to mainframes such as IBM AS/400s.

Fast Infrared

Protocol that supports wireless networks. Transfers up to 4Mbps.

Universal Serial Bus

- The Universal Serial Bus (USB) provides plug-and-play compatibility for external devices such as keyboards and mice. You can add up to 127 devices

with simultaneous connections and speeds from 1.5 to 12 Mbps. Developed by Compaq, Digital Equipment, IBM, Intel, Microsoft, NEC and Northern Telecom.

- Features:
 - Plug and Play can detect peripherals as soon as they're attached.
 - No resource conflicts
 - Attach or detach any device without powering down or rebooting.
 - All peripherals will use the same type of connector.
- Data on USB can be transferred in asynchronous or isochronous mode. Isochronous is transferred at a guaranteed rate of 12 Mbps.
- Troubleshooting USB devices:
- Configuration of the hub (Power, number of tiers.)
Wrong firmware version Win98 does not support version 000 of the USB controller.
Plug device into another hub or directly into host.
Remove controller from Device Manager and let Win98 reinstall.

IEEE 1394 Serial Bus (FireWire)

- IEEE 1394 FireWire is similar to USB, but is intended for devices that operate at higher speeds. It provides bus support for high-bandwidth external devices, such as video cameras and DVD's. Data transfer speeds include 100 Mbps, 200 Mbps, and 400 Mbps.
- Asynchronous and Isochronous
- Works like this:
 - A signal is sent across the bus to put all devices in a suspended state.
 - One device becomes the root node.
 - Devices attached to root node are parents.
 - Devices attached to parents are child devices.
 - All nodes select one of 63 unique bus ID's.

- All nodes are removed from suspension.
- Isochronous traffic

Backups

Microsoft Backup Utility is used to create and restore backups. It does not work with QIC-40 tapes. The Backup Wizard can create and view backup jobs, but it can't change them. Differential backups back up all the files added or changed since the last full backup, and leave archived bits unchanged. Incremental backups back up all the files added or changed since the incremental backup and reset the archived bits. Use the Task Scheduler to automate your backups.

TCP/IP

- TCP/IP is an Internet protocol currently used for most networking situations. Each computer using TCP/IP will contain a unique address in a x.x.x.x format (where each x equals a number between 0 and 255) and a subnet mask.
- Subnet mask - A value that is used to distinguish the network ID portion of the IP address from the host ID.
- Default gateway - A TCP/IP address for the host, which you would send packets to be sent elsewhere on the network.
- Common TCP/IP problems are caused by incorrect subnet masks and default gateways.
- Broadcasts - a computer will broadcast the NetBIOS name it is searching for across the network. The machine with the matching NetBIOS name will send a reply to the broadcasting computer with its IP address.
- Win98 uses three methods to resolve NetBIOS names to IP addresses:
- LMHOSTS - a file normally located in the Windows directory which contains a list of frequently used IP addresses and hostnames.
- WINS (Windows Internet Naming Service) - Win98 contacts an NT Server running this service to dynamically resolve NetBIOS names to IP addresses.
- DHCP (Dynamic Host Configuration Protocol) - Win98 contacts an NT Server running this service to automatically obtain an IP address each time it logs onto the network.

Enabling Remote Administration

- On the computer to be administered remotely:
 - Use share or user-level security
 - Password applet of the Control Panel
 - Remote Administration Tab
 - Check "Allow Remote Administration" box
 - Set password (share level security)
 - If you are using user-level security specify users who have permission to administer remotely.
- On NT network, the Domain Admins group automatically receives the right to administer remotely.
On a Novell Network the Supervisor account for NetWare 3.x or the Admin account on NetWare 4.x will also automatically be given the right to administer remotely.
- Once enabled two folders are shared to the Network automatically:
- Admin\$ - gives administration access to the hard disk.
IPC\$ - provides communication channel for computers to communicate.
- Install the Remote Registry Service from Network applet of the Control Panel.
- Add->Service->Add->Have Disk->Browse
\\TOOLS\\RESKIT\\NETADMIN\\REMOTREG
- After this is done you can also use REGEDIT to remotely edit a computer's registry.

Net Watcher and System Monitor

Net Watcher:

- Lets you disconnect users who are accessing the remote computer.
- Close files connected users have open.
- Start or stop sharing a resource.
- View folders being shared to the network and who is accessing them.

System Monitor:

- System Monitor can be used to monitor a remote computer if remote administration has been enabled.
- System Monitor divides the system into categories, and further divides each category into items.
- New to Windows 98, System Monitor allows the creation of log files.
- In System Monitor, the default category and item viewed is Kernel Processor Usage.
- The default interval for chart updates in System Monitor is every five seconds.

Printing

- Image Color Matching - Allows applications to provide closer matches for colors between graphics displayed on the screen and the same graphics when they are printed. Each device's properties are stored in a profile. These profiles were designed by InterColor 3.0 (a number of vendors which included Kodak, Microsoft, Apple, Silicon graphics, etc.).
- Bi-directional printing - Allows two-way communication between the printer and computer. The printer is able to send status and diagnostic information to the computer and its operating system.
 - What is needed for bi-directional printing?
 - A bi-directional printer
 - An IEEE 1284 compliant printer cable
 - A bi-directional printer port on the computer
- Unidrv.dll - Printer driver which is used to print to all non-postscript printers.
- Friendly Names - Allows printer to be named with a "normal" name which is up to 32 characters in length.
- EMF Spooling - Increases performance in the way the computer spools print jobs to the temporary file and allows the application to return to a usable state quicker.
- MS-DOS application printing support

- Windows 3.x and DOS-based files have been known to have printing problems in Windows 98. The problem is that the program will say that it has spooled the print job to the printer, but the printer never receives the job. The problem is being caused by the program's inability to understand the Windows 98 printing system. Windows 98 has included an MS-DOS printing compatibility feature to allow older programs to print to a virtual LPT port. Windows 98 will map an LPT port to the desired print queue, which the older program recognizes.

Printer Icons

- **Every printer has an icon, which refers to how it is used to print:**
 - Printer icon with a hand icon - local printer which is shared
 - Printer icon alone - local printer unshared
 - Printer icon with cable attached to bottom - network printer
 - Printer icon with diskette - printer which is set to print to a file
- Point-and-print - the method of using drag and drop to print a document. For example, you can create a shortcut to a printer on your desktop. Then, you can take an MS Word document and drag it to the printer icon. This will then print the document without the need to start the application.
- IEEE 1284 compliant printers with the appropriate cable can provide unsolicited information to the user, reporting low toner, lack of paper, and so forth.
- Spool data format:
 - EMF, RAW
 - EMF returns control of the application faster than RAW.
- Nibble Mode:
 - Asynchronous identification channel between the printer and the computer.

User Profiles

- Application Data folder (address book, mail, news)
- Cookies folder
- Desktop folder

- Favorites folder
- History folder
- My Documents folder
- Recent folder
- Start Menu folder
- Temporary Internet files folder

Backups

- Full = All
- Differential = New and changed files since full backup (No archive attribute, Slow to do, Fast to restore)
- Incremental = Files that are new or changed since the last incremental backup (Archive attribute, Fast to do, Slow to restore)

Disk Clean-up

Temporary Internet files	Windows\Temporary Internet Files
Downloaded Program Files	Windows\Downloaded Program Files
Recycle Bin	Empties the Recycle Bin
Temporary files	Temp folder

Large Disk Support

- Large-disk support involves using FAT32, the absence of which implies the use of FAT16. By using the FAT32 Drive Converter (cvtl.exe), you can convert FAT16 to FAT32 without losing data. You cannot convert from FAT32 to FAT16 without formatting the drive and losing all data.

Fat32 conversion in Real Mode

- CVT.EXE /CVT32 -Command line utility for fat32 conversion.
/HIB- Checks for hibernation
/Help

- You back up the Registry with the scanregw command and restore it with scanreg /restore. You can compress a disk with the DriveSpace3 utility and the Compression Agent (cmpagent. exe). Compression can be in either UltraPack or HiPack format. Partitioning is done with FDISK.
- Ultrapack- Best compression
Highpack- Best performance
- The Microsoft Family Logon allows users to select their name from a list of recognized users during logon, rather than having to type it in the old-fashioned way.
- Disk Defragmenter uses log files of application access to find out which programs are used most and which files they need to run, then places them contiguously to speed access.
- The Maintenance wizard schedules tasks to run automatically in unattended mode. The Task Scheduler submits for processing those jobs that the Maintenance wizard has chosen and all other unattended jobs. The queue can be viewed from Start|Program Files|Accessories|System Tools|Scheduled Tasks. The Update wizard is used to download patches and drivers.

The System File Checker is used to look for corruption, deletion, or modification to the core files of the Windows 98 operating system. It uses a base file to compare what it finds with what it knows should be there. The System File Checker can be used to restore a file from the media or to update the base file.

Detection Log Files

Windows 98 has several log files generated to detect and troubleshoot problems:

- SETUPLOG.TXT- Used to log installation of Windows98. Will note last utility run prior to a system halt.
- DETCRASH.LOG- Used to log hardware detection during setup. Readable only by setup to determine which module was running when the system halted.
- DETLOG.TXT- Equivalent of DETCRASH.LOG written in a readable format.
- NETLOG.TXT- Logs detected network component information.
- IOS.LOG - Logs error messages from the SCSI drivers.
- PPPLOG.TXT - Logs PPP and dial-up activity.

The ASCII logs created during installation (setuplog.txt and detlog.txt) can give you the first clues to solving installation problems. The detcrash.log is a binary file created during installation for use in rebooting your system after a crash.

The infamous Windows 98 Registry

- The Registry is designed as a database used by OLE to store information on OLE servers. It is used by Windows 98 to store the information typically found in Windows 3.x .INI files and the reg.dat file. The Registry can be used for troubleshooting and enhancing performance in Windows 98. The registry is a hierarchical tree, which contains information about many things in the computer. The following is a list of the Registry subtrees and what they contain:
- The Registry contains three properties: Name, Data Type, and Value. The Data Type can be a binary value (a collection of bits), a string value (a string of readable characters) or a DWORD value (a binary value limited to 4 bytes).

Subtree	Information stored within
HKEY_CLASSES_ROOT	Contains information about OLE servers and file associations. It contains the same information that is typically stored in the reg.dat in Windows 3.x.
HKEY_CURRENT_USER	Contains the preferences of the user who is currently logged in. Receives stored information from the user's subtree located in HKEY_USERS.
HKEY_LOCAL_MACHINE	Contains hardware information and settings for any device ever installed in the computer.
HKEY_USERS	Contains preferences for every user that has ever logged into the computer.
HKEY_CURRENT_CONFIG	Contains settings for all hardware devices currently installed in the computer. Does not contain settings for devices included in HKEY_DYN_DATA.
HKEY_DYN_DATA	Contains dynamically stored data on performance monitoring.

- Version Conflict Manager automatically overwrites newer files with Windows 98 system files. The Microsoft System Information Utility is used to view system information and provide a launch pad for system tools.
 - The System Configuration Utility can be used to change startup files and modes.
 - Connectivity problems can be caused by incorrect protocols or frame types.
 - DOS programs can use printers that are mapped to them by the NET USE commands.
 - ScanDisk looks for and fixes errors on most writable media.
 - ScanReg is the DOS version of the Registry Checker, and ScanRegW is the Windows version of the same tool.
 - You can edit the msdos.sys file to have the workstation always prompt you with a menu if you boot multiple operating systems or want the Startup menu.

Misc

- Intel Memory Protection Architecture:
 - The 386 architecture has four privilege levels designed to protect data from being damaged. Level 0 is the highest, and level 3 is the lowest. Windows 98 only uses levels 0 and 3. It uses level 0 for 98 core components and level 3 for user applications and non-critical components.

Virtual Machines:

- A virtual machine is a virtual environment created by the operating system in memory. Virtual machines run in ring 3 of the Intel architecture. These are designed to allocate resources to programs that might normally be halted by other programs in memory. Each MS-DOS application runs in its own virtual machine, as they are designed to have total and uninterrupted access to all system resources. All other non-MS-DOS based programs run in the System virtual machine.

Windows 98 Core Components

- Windows 98 has three core components: Kernel, User and GDI. All three are .DLL files, which reside in the system as both 16-bit and 32-bit applications to maintain backward compatibility.
- **Kernel** - Responsible for basic O/S functionality, managing virtual memory, task scheduling, and File I/O services.
- **User** - Manages the user interface, including input from devices and interaction with drivers.
- **GDI** - Responsible for all graphics manipulation.

Plug and Play

- Plug and Play - designed for hardware installation to require no intervention from the user.
- A plug and play system needs to consist of the following to be complete:
 - A plug and play operating system
 - A plug and play BIOS
 - Plug and play hardware
- Legacy Cards - Hardware designed prior to Plug and Play which, when installed, will not automatically be setup by the OS and must be setup manually.
- Bus Enumerator - Type of driver based on a specific bus architecture. Used to build the hardware tree in the registry.

Plug and Play Docking

- Docking - The process which a computer uses to establish connection with a docking station.
- There are three types of docking:
 - Hot - Computer can be at full power when it is docked or undocked
 - Warm - Computer can be in sleep mode when it is docked or undocked
 - Cold - Computer must be turned off before being docked or undocked

Disk operations

- IFS (Installable File System) - architecture which allows multiple file systems to coexist on the same computer.
- VFAT - 32-bit virtualized File Allocation Table used in Win98.
- VCache - 32-bit protected mode cache driver, which replaces the real-mode SmartDrive.

Long File Names

- Win98 supports extended file names which can contain up to 255 characters, unlike DOS, which was limited to the 8.3 structure. In Win98, each long file name has a duplicate 8.3 for backward compatibility.

Memory

- Conventional Memory - First 640k of RAM, used for DOS applications and TSR's.
- Upper Memory - 384k RAM located between 640k and 1MB. Used to load MS-DOS device drivers to help increase space available for DOS applications.
- High Memory Area - Region between 1MB and 1088k.
- Extended Memory - Region extending from 1088k to the end of the memory. Was created for DOS applications to be able to access RAM outside of the first 640k.
- Expanded Memory - Uses bank-switching to quickly page data in and out of memory.

Virtual Address Spaces

- Each process is allocated a virtual address space for the process's threads to use. This virtual space appears to be 4GB in size, with 2GB to process for its storage, and 2GB for operating system components.
 - 0-4MB MS-DOS Compatibility Arena -- The lower 4m are reserved for real-mode device drivers, TSRs and 16-bit applications.

- 4MB-2GB 32-Bit Windows Applications (Private Arena) -- This area is reserved for 32-bit Windows applications, which receive their own unique address space.
- 2GB-3GB DLLs and Shared Objects (Shared Arena) -- This area is used to share core system components, shared DLLs, and 16-bit Windows applications.
- GB-4GB Reserved System Area -- Ring 0 components are mapped into this area; this area is not accessible by Ring 3 components.

Threads and Processes

- Thread - The basic entity to which the operating system allocates access to the CPU.
- Process - The code, data and resources which makeup an application. Each process contains at least one thread that executes the process code.
- Thread Priorities - Used to determine which thread will be allowed to run next. Each thread can have a priority number between 0 and 31 with 31 being the highest priority. The ranges of 0-31 are for NT compatibility. The priority values are divided into two sections: 0-15 for variable priority threads, and 16-31 for fixed priority threads.
- Thread Scheduling - there are three states a thread can be in:
 - Ready - Thread is ready to be executed by the scheduler.
 - Waiting - Thread is waiting for an event to occur to come into the ready state.
 - Running - Thread is running; only one thread can be running at one time.
- Primary Scheduler - Responsible for making sure the highest priority thread is running.
Secondary Scheduler - Makes sure no thread hogs the CPU.

Multitasking

- Pre-emptive multitasking - The O/S divides time into slices (20ms for Win98) and distributes them evenly between running applications.

- Cooperative multitasking - Applications are required to give up control of the CPU and let other applications take their turn. Some applications tend to hog the CPU using this method.
- Multithreading - Used by the pre-emptive multitasking in Win98 to allow an application to have multiple paths of execution (threads).

Video

VGA fallback - ensures that an incompatible video driver will not prevent you from accessing the system. For this to work there must be a line in the [boot] section of the system.ini reading DisplayFallback=0. The color depth is measured in bpp (bits per pixel). The following is a chart relative to the relationship between bpp and color depth.

Color Depth / BPP

- 16 Colors/4 bpp
- 256 Colors/8 bpp
- 32k Colors (16-bit)/15 bpp
- 64k Colors (16-bit)/16 bpp
- 16.7 million Colors/24 bpp

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Make sure to visit his site at

<http://members.home.net/broadbandbill>