Chapter 11
File and Disk Maintenance

Detecting and Repairing Disk Errors with Check Disk

Physical hard drive problems – wear and tear on hard disk. Minimize problem and conserve power with Power Management and Hibernation.
Head crash – hard disk failure in which a read/write head, normally supported on a cushion of air, comes into contact with platter, damaging the magnetic coating on which the data is recorded. Minimize by placing system where it will not get knocked around.

Software related problems to hard drives.
Viruses – a program that has damaging side effects. It can be intentional/unintentional. It can destroy the computer's hard disk/data.

Causes: Installing infected program. Using a data file that has an embedded virus. Minimize problem by purchasing anti-virus program.

Error causing conditions that may be repairable:

1. Power surges – minimize with surge protector which prevents surges from reaching computer.
2. Power outages – minimize with UPS (Uninterruptible Power Supply) that provides backup power supply.
3. Locked system – keyboard, mouse and program are frozen. Minimize by following shutdown process.

Check Disk comes with WXP:

1. It locates and repairs problems on hard disk.
2. Checks for logical errors in file system. Invalid entries in tables that keep track of file locations. Problems that involve physical disk, lost clusters or cross-linked files.

Lost Clusters – not uncommon. Marked by WXP as being in use but not representing any part of the chain of a file. Fat knows clusters

are occupied by data – does not know to which file clusters belong. Clusters have no directory entry in directory table and do not belong to any file. Lost clusters are debris resulting from incomplete data.

FAT and directory work together to define where and what your files are:

1. Each file has an entry in a directory table which points to a starting cluster in FAT.
2. If the file is longer than one cluster FAT, it has a pointer that leads to next cluster, etc.
3. Pointers chain together all clusters that make up the file.
4. If the pointer is lost – chain is broken.
5. Broken chain = lost cluster.
6. Incorrectly marked by FAT as being in use, unavailable for new data.

Lost clusters:

1. Do not belong to any file.
2. Cannot be retrieved/deleted.
3. Data is useless.
4. Lose disk space.

Reasons for lost clusters: Not exiting program properly and power surge/failures.

Check Disk – fix lost clusters automatically or save them to disk as files.

1. View contents – see if you want data.
2. Files stored in root directory.
3. Have extensions of .chk.

Cross Linked Files – 2 or more files claim same cluster as part of their chain. One file claims same cluster twice. Data in cross-linked file usually is correct for only one file, and may not be correct for any file.

Check Disk -

1. Can check/repair local hard drives, floppy disks, and removable drives.
2. Cannot find/fix error on CD-ROMs or network drives.

3. Only used on actual physical drives connected to system.
4. System must have exclusive access to disk to complete job.
5. Use on a regular basis.
6. **When using – close all open programs.** Dealing with disk structure. Open files/programs can cause data loss/corrupt files, etc..

If disk (volume) formatted as NTFS (New Technology File System), WXP automatically (without running Check Disk):

1. Logs all file transactions.
2. Replaces bad clusters.
3. Stores copies of key information for all files on NTFS volume.

Cleaning Up Your Disk

Hard drive determines computer performance.
All files stored on hard disk.

- Want easy and quick access to files.
- Need disk space for: new files, temporary files that programs create, documents waiting to be printed, cache files, and the recycle bin.

If files/caches not deleted frequently – hard drive runs out of space and the system performance slows down.

Disk Cleanup is a utility tool provided by Windows XP that helps maintain disk space and is intended for hard drives.

Contiguous and Noncontiguous Files

To store and retrieve files (data), disk is divided into sectors (numbered blocks).

1. Sectors are grouped into clusters.
2. Cluster set of contiguous sectors. Number of sectors in cluster on hard disk varies – depends on size of hard drive and how it was installed.

File (usually) larger than one cluster.

- WXP keeps track of location of all file parts.

- File deleted. Only entries in FAT deleted. Space file occupied available.

Writing files to a disk.

- WXP tries to write to adjacent cluster.
- Easier to retrieve/store information when file is contiguous.

Fragmented disk.

- Disk composed of noncontiguous files.
- Takes longer to read as head moves around disk to find all parts of a file.

Optimizing Performance of Disks

Defragger, disk optimization program or disk defragger.

1. Utility program fixes fragmented disk.
2. Moves data around on a disk to make files contiguous.
3. Directory table and FAT rewritten so new locations of files are available.

Before running Disk Defragmenter:

- ♦ Run both Check Disk and Disk Cleanup.
- ♦ Remove all lost or cross-linked clusters/unnecessary files.
- ♦ Close all open programs (including screen savers or virus checking programs.)
- ♦ Allow ample time.
- ♦ Back up disk as program manipulates disk.

Disk Defragmenter used **only** on local drives.
Must have administrator privileges to use this utility program.

Starting Programs Automatically

Task Scheduler can schedule any program to run at any selected time. Make sure program does not need user input. Can exit when task completed. Can be used to schedule tasks such as Disk Cleanup or Backup.

Backing Up Your Data

Critical task that is often neglected.

Backup = duplicate of files on a disk copied to another medium.
Retrieve files by restoring them to original medium.
Advantage of backup vs. copy – backup file can span multiple backup disks.

Working with WXP –

1. Create settings, install/delete programs.
2. Adding/making changes to system Registry. If Registry is corrupt – cannot boot WXP.
3. With backup – restore to what you had previously.

Backup program supplied with WXP supports five methods of backups:

1. **Normal or Full backup:**
   - Copies all files from hard drive to backup medium.
   - Archive bit turned off after files are backed up. (Archive bit OFF – Backup knows file has been copied.)
   - When file edited – archive bit turned ON.
   - Copying file – attribute not altered by copy routine.
   - Archive bit altered by certain programs such as Backup.
2. **Incremental Backup**:
   - Only copies files that have changed or created since last normal or incremental backup.
   - Marks files as having been backed up by clearing archive bit.
3. **Differential Backup**:
   - Copies files that have changed or created since last normal or incremental backup.
   - Does not mark files as having been backed up.
   - Does not clear archive bit.
4. **Daily Backup**:
   - Backs up modified files only on day backup performed.
   - Files not marked as having been backed up.
   - Archive bit is not cleared.
   - Option requires Backup run on daily basis.
5. **Copy Backup**:
   - Backs up selected files.
   - Does not mark files as having been backed up.
   - Archive bit not cleared.

Comparing full backups to incremental backups:

1. Full backups – longer to backup but shorter to restore.
2. Incremental backups – shorter to backup but longer to restore.

Usually use combination of:

1. Full backups and incremental backups -
   - Restore most recent full backup media and all incremental media that have changes on them.
   - Takes lead amount of storage.
   - Quickest method for backing up.
   - Restore takes longer – need all tapes and disks.
2. Full backups and differential backups -
   - More time consuming.
   - Restore faster/easier because backup data stored on fewer disks/tapes.
   - Restore most recent full backup media and all incremental media that have changes on them.
   - Differential backup backs up selected files that have changed since last normal or incremental backup.
   - All files that have archive bit on are backed up.
   - Backup complete – archive bit is left on.

Need regular backup schedule. Determined by computer usage and how often files are edited.

If on network, network administrator takes care of full backup. You take care of data files.

Wise to have more than one copy of backup media. Do not store both copies in one place (fire and theft problems).

To access Backup:

1. Right click a drive/Choose Properties/Tools Tab/and select Backup Now command button.
2. Can also access Backup from Programs submenu.

Backup can be used to:

1. Archive data.
2. Make room on hard disk by copying seldom used files to backup medium.
3. Transfer programs/files to other computers.
4. Make new computer look like old system.

Restore

Backup option/Restore Wizard
Used to copy some/all of the files to original disk/another disk/or directory.
Can choose which backup set to copy from.
To restore: Choose Restore and type of restoration, or
Choose Restore Wizard which will lead you through the process of restoring system.

Automated System Recovery (ASR)

Built in repair system for a catastrophic failure of system.
Repair system relies on creation of an Automated System Recovery (ASR).
Created in Advanced Mode of Backup.
Disk, files stored on media type (other than floppy) used in conjunction with WXP installation CD-ROM to:

1. Fix corrupt Registry.
2. Boot system.
3. Repair corrupted system.

Not substitute for backing up data.
ASR used for system problems.
Restores system, as it was when ASR was made/upgraded.
To repair damaged version of WXP:

1. Boot system from CD (or setup floppy disk).
2. Asked if you want to install WXP or repair damaged version.
3. To Repair, press <F2> and follow directions.

The Registry

WXP is customizable. OS keeps track of Configuration information (system information – i.e. hardware, applications, users.)
Initialization files (used in previous versions of Windows) are files that initialize program/process.

- .INI file extension comes from initialization files.
- Used to store information (users, environmental parameters, and necessary drivers.)

2 types of initialization files:

1. System initialization files -
   - Windows created the system .ini files (WIN.INI and SYSTEM.INI).
   - Configuration files contained info Windows needed to run itself and to run programs installed on specific computer.
2. Private initialization files -
   - Application programs create private .INI files.
   - Kept track of state of application, i.e., screen position or last used files.

Windows had 2 primary initialization files.
To run windows, both files were needed:

1. WIN.INI file -
   - Information on how system behaved.
   - Primary location for software configuration information.
   - Specific system-wide information added by software application.
2. SYSTEM.INI file -
   - Pointed OS to correct hardware and software components such as device drivers.
   - Primary location for computer hardware system information.

Also used REG.DAT file – registration database – information about:

1. How various applications open.
2. How some print file extensions.
3. How OLE objects handled, etc..

Not ASCII file.
Only edited by REGEDIT.

Now, WXP uses single location, called Registry for hardware, system software and application configurations information. Old files available for legacy application programs.

Registry Information comes from:

1. Installation of WXP.
2. Booting of WXP.
3. Applications.
4. System and user interaction.

Every part of Windows uses Registry.
Registry files kept in %SystemRoot%\System32\Config.
Registry files (backed up) kept in %SystemRoot%\Repair\RegBack.
Registry can be restored by:

1. Use ASR disk – choices available to restore Registry by using Recovery Console. Text based command interpreter – allows system administrator to access hard disk and files. Beyond scope of text.
2. "Last Known Good Configuration" option – use arrow to highlight title then press <Enter>
3. Safe Mode – Press <F8> key – loads minimum amount of drivers and functionality that allows WXP to run.

System Restore

Used to undo changes made to computer and restore computer to "Desirable State".
Does the following:

1. Rolls back computer to more stable state.
   - System Restore keeps track of changes made at specific times.
   - Tracks when new software program installed.
   - Above times called restore points.
   - Can create own personal points.
   - Restore points allow you to "roll back" your computer system to a time when everything was working correctly.

2. Saves email messages, browsing history, and so on.
   - Does not save or restore documents.
   - Is for computer system **not** data files.
3. May select which dates you want to restore to (use calendar).
4. Provides several restore points –
   - Creates initial system checkpoint when you upgrade or install WXP.
   - Regular checkpoints created daily and at significant events.
   - Restore points created prior to update if Windows Automatic update is used.
5. All system restores are reversible.
   - If restore point selected not successful – can undo it.

Plug and Play and Device Drivers

Prior to W95, adding hardware was an involved process.

- Physically added hardware. Each component needs access to system resources (IRQ and DMA channels).
- Make software changes. Hardware devices need software support found in driver files that must be installed.
- Need some technical expertise to adjust settings so hardware devices work.

Plug and Play (Plug it in and play it) –

- Industry standard developed by Intel and Microsoft.
- Automates adding new hardware to computer.
- WXP better than W95/W98/2K Professional.
- Process:
  1. Install hardware.
  2. Boot system – WXP – detects hardware device and makes appropriate adjustments to system.

WXP added support for new types of devices.

1. Universal serial bus (USB).
2. USB devices share common connector – do not need to be configured manually.
3. IEEE 1394 – high speed serial bus.

4. Used by devices that need fast data transfer (Scanners/Video cameras).

For Plug and Play to work, need:

1. Computer with Plug and Play compatible BIOS.
2. Device to be installed is Plug and Play compatible.
3. OS is Plug and Play compatible (W2000 is).

Full support in WXP requires:

1. Advanced Configuration and Power Interface (ACPI) compliant system board.
2. BIOS
3. OS – WXP
4. Device to be installed.
5. Drivers for that device.

Legacy hardware – hardware that is not Plug and Play compatible.

WXP solves hardware conflicts with older computer/devices.

- Use Add/Remove Hardware wizard in Control Panel.
- If hardware conflicts occur, use Device Manager to add updated drivers and help identify problems.

The Paging File

Previously called the swap file.
Space on hard drive used as virtual memory when system runs out of physical memory.
Paging file is dynamic (shrinks/grows).
Pros/cons of paging file:

- Slows down performance – using disk vs. memory.
- Gives user more “room” in which to operate.
- Can set place and size of paging file – Microsoft recommends letting Windows manage paging file.
- Reasons for setting place/size of paging file:
  1. Second hard drive free of executable programs.
  2. Large hard drive with little information; increases paging file size.
  3. Place paging file on drive with fastest access time.