

## Standard Operating and Maintenance Procedures

- Operating systems require maintenance
  - Function properly
  - Deliver fast response
- Function to perform
  - Delete unnecessary files
    - Required to properly utilize disk storage resources
    - Help extend life of hard disks
    - Should never be more than 80% full
      - Reduces wear and tear on disk, thrashing
    - Do not run out of disk space
  - Tuning memory
  - Regularly backing up files
  - Defragmenting disks
  - Repairing damaged files
- File Maintenance
  - Basic rules
    - Keep number of directories in root directory manageable
      - UNIX example
        - \bin           system files
        - \dev           device files
        - \etc           configuration files
        - \home          user home directories
        - \mnt           mounting removable devices such as  
CD-ROM
        - \sbin          system files
        - \tmp           temporary files
        - \usr           programs
        - \var           holds files that change frequently
    - Keep operating systems files in directory recommended by the vendor
      - Advantages
        - Easier for others to help
        - Many installations expect OS files to be in default location
      - Windows
        - Windows 3.1, Windows 95 & 98
          - \windows
          - \windows\system
        - Windows NT, Windows 2000
          - \winnt
          - winnt\system32
  - Keep different versions of the software in their own directory
  - Keep data files in directories on basis of the function of those data files
    - Directories for data files

- Directories organized by application
  - Design home directories to match the function of users in an organization
    - Often organized by organizational function
- Finding and deleting files
  - Mac OS
    - Find Utility on File Menu
    - Sherlock utility for complex searches
      - Name
      - Kind of file
      - Creation date
      - Modification date
      - Size
      - Version
      - Folder attribute
    - Files not actually deleted until trash empties
      - Deleted files first go to trash can, from which they can be recovered
  - NetWare
    - Utilities to manage files
      - NetWare administrator
      - Network neighborhood in Windows
      - NDIR
        - Run from Netware DOS prompt
        - Find files by specific criteria
          - Owner
          - Date
        - Also provides information about directory space used
        - Commands
          - /AC BEF to view files that have not been accessed since the date specified
          - /DATE to view information based on the date
          - /DO to view all information on directories
          - /OW view files by owner
          - /REV SORT SI sort files listing largest first
          - /SPA view how directory space is used
          - /SORT SI sort on basis of size

- /SORT OW                    sort files on basis of ownership
    - /VOL                        view information by volume
  - files can be salvaged to they are purged
    - procedures should be implemented to purge files on a regular basis
  - when you create a user in NetWare you can specify restriction on the amount of disk space available to a users
- UNIX
  - ls command
    - -a                        list all files
    - -d                        present files information on the basis of the specified argument
    - -F                        identifies directory contents on the basis of directory, executable files, and symbolic links
    - -i                        displays inode for each files
    - -l                        presents detail listing(permission, size)
    - -n                        displays UID and GID of those who have access to file
    - -r                        sorts files in reverse alphabetic order
    - -s                        displays size of files
    - -t                        displays files on the basis of the date when they were last modified
    - -u                        displays files on the basis of the time when they were last modified
  - deleted using rm command
    - -i                        interactive
    - -r                        recursive, deletes subdirecories
  - find command
    - used to find a file
    - find -name temp\* -mtime -30 -print
      - finds and prints list ot files names that begin with temp that have been modified in the last 30 days
    - -atime                    last accesses
    - -ctime                    last changed time
    - -mtime                    last modification time
    - -name                    filename, including using wildcard
    - -print                    to print the results of the find
    - -size                    for file size in blocks or bytes(c after size value)
  - df command
    - view information on the basis of the file system

- statistics on blocks
        - total number of blocks
        - number used
        - number available
        - percent of capacity used
    - du command
      - displays statistics for a given directory or subdirectory
  - Windows
    - Temporary directories
      - \temp
      - \windows\temp
      - data directory for the application
      - basis of TEMP environmental variable
        - often in autoexec.bat
          - SET TEMP=c:\temp
    - ~ character used to begin temporary files names
    - DIR command
      - Dir \*.tmp
      - /s search all directories and subdirectories on given path
      - /p screen at a time
    - erase or del
      - deleted files on in given directory, does not delete from subdirectories
    - File Manage in Windows 3.1
    - Windows 95, 98, NT
      - Explorer
        - Search capability
      - Retains deleted files in Recycle Bin by default
        - Hold down shift/delete to skip Recycle Bin
        - Empty recycle bin by double clicking on the Recycle Icon
  - Maintaining large and small disks
    - Defragmenting
      - Fragmentation
        - Unused space develops between files and other information written to disk
      - Defragmentation
        - Process of removing empty pockets between files and other information of the disk
        - Windows 95,98,3.1 and Dos have utility that is standard
        - Window NT purchase 3<sup>rd</sup> party utility
        - Mac OS designed to minimize fragmentation
          - Can purchase 3<sup>rd</sup> part utilities(Norton)

- UNIX
    - Some versions come with defrags
      - Can purchase 3<sup>rd</sup> party utilities
- Moving files to spread the load
  - Disk first AID in Mac
    - Verifies files, folders, and mounted disks
    - Need to turn file sharing off before running
  - fsck and p\_fsck in UNIX
    - Check one or more file systems
    - Looks for
      - Files that have no name
      - Bad directory pointers
      - Indoe problems
      - Directories that do not exist
      - Bad links
      - Bad blocks
      - Blocks that are duplicated
      - Pathname problems
    - Opportunity to fix or disregard
    - Fsck follwed by device name or -A(checks all file systems)
  - Chkdsk in DOS, Windows 3.1, Windows 95, Windows 98 and Windows NT
    - Fixes
      - Damage to root directory
      - Problems with root directory structure
      - Disk space that is not allocated
      - Files that share same allocation unit
      - File pointer to an allocation unit that does not exist
      - Files that are assigned more allocation units than are needed
      - Directories that do not exist
      - Damaged directories that cannot be repaired
      - Full root directory
      - Disk sectors that cannot be read
      - Damaged subdirectory entries
      - File allocation table entry problems or a damaged file allocation table
      - Bad file attributes
    - Options
      - /f repair errors without a yes or no interactive request
      - /v display all files as it checks them
      - Windows NT has two additional

- /r look for bad sectors and attempt to relocate information
    - /l:size change size of log files in NTFS
  - Scandisk
    - DOS, Windows 3.1, Windows 95, Windows 98 and Windows NT
    - Disk verification utility
  - Using disk utilities to spread the load between multiple disks
  - Deploying RAID techniques that extend the life of disks and provide disk redundancy
- RAID techniques
  - **Redundancy Array of Inexpensive Drives**
  - Purpose
    - Increase reliability
    - Increase capacity
    - Increase speed
  - Disk stripping
    - Technique for storing data over multiple disk volumes
    - Six levels
      - 0 provides disk stripping only
      - 1 uses two disk that mirror each other
      - 2 provides stripping and all disk contain information to help data recovery
      - 3 same as Level 2 but data recovery on one disk only
      - 4 Level 2 plus checksum verification on one disk
      - 5 Level 4 and checksum is stored on all disks in the array and ability to replace a failed drive and rebuild it without shutting down the system
- Making Backups
  - Techniques
    - Binary backup
      - Backs up disk content in binary format to create an exact image of disk
        - Disadvantage
          - Some version do not allow recovery of individual file
      - Full file-by-file
        - All disk contents are backed up as individual files and directories
      - Differential backup
        - Backups all files that have attribute bit set
        - Does not remove attribute bit

- Incremental backup
    - Backups all files that have attribute bit set
    - Removes(resets) attribute bit
- UNIX
  - volcopy
  - dump
    - full or partial file-by- file backups
    - backup done by
      - all files
      - files that have changed by date
      - files that have changed since previous backup
  - tar
    - tape archival and retrieval
- NetWare
  - Storage management System(SMS)
- Windows NT
  - Options
    - Normal Backup(full file-by- file)
    - Incremental
    - Differential
    - Daily backup for files that have changed on the same day as backup
    - Copy backup that is performed on specified files