

# Lecture 08

## Advanced Operating Systems

CT4005NI - Computer Hardware and Software Architectures

## 8. Introduction

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The *installation, configuration, and optimization* of operating systems (OS) are **examined** in greater detail.

### Objectives

- **Select** the **appropriate** operating system based on customer needs.
- *Install, configure, and optimize* an operating system.
- Describe how to *upgrade* operating systems.
- Describe *preventive maintenance* procedures for operating systems.
- *Troubleshoot* operating systems.



## 8.1 Select the appropriate operating system

There are *many* operating systems to choose from, each with features that should be considered when consulting with a customer.

Features	Home	Pro	Enterprise	Education
Device Encryption	✓	✓	✓	✓
Domain Join		✓	✓	✓
Group Policy Management	✓	✓	✓	✓
BitLocker <sup>2</sup>	✓	✓	✓	✓
Enterprise Mode Internet Explorer® (EMIE)	✓	✓	✓	✓
Assigned Access 8.1	✓	✓	✓	✓
Remote Desktop	✓	✓	✓	✓
Direct Access		✓	✓	✓
Windows To Go Creator	✓	✓	✓	✓
AppLocker		✓	✓	✓
SmartCache	✓	✓	✓	✓
Start Screen Control with Group Policy	✓		✓	✓

## 8.1.1 Operating System Description

Operating systems have *minimum requirements* for hardware.

Hardware	Windows 10	Mac OS (Sierra)	Linux(Red hat)
CPU	1 Ghz or faster	Compatible Macs: MacBook (Late 2009 or newer), MacBook Pro (Mid 2010 or newer), MacBook Air (Late 2010 or newer), Mac mini (Mid 2010 or newer), iMac (Late 2009 or newer), Mac Pro (Mid 2010 or newer)	Pentium 4 or higher; 2 GHz or higher
RAM	1GB (32 bit) or 2 GB(64-bit)	2GB	1 GB minimum
Free Hard disk Space	16 GB(32 bit) 20GB (64 - bit)	8.8 GB	3.5 GB
Display	800 X 600		
Graphics Card	Microsoft DirectX 9 graphics		

## 8.1.2 Network OS Description

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- A NOS is an operating system that contains additional features to increase functionality and manageability in a networked environment. **Examples:** Windows 2016 Server, Linux, Unix, Novel NetWare and so forth.

### NOS provides network resources to clients

- Server applications, such as shared databases
- Centralized data storage
- Directory services that provide a centralized repository of user accounts and resources on the network, such as Active Directory.
- Network print queue
- Network access and security
- Redundant storage systems, such as RAID and backups

## 8.1.2 Network OS Description

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Network operating systems provide several protocols designed to perform network functions.

- **HTTP:** defines how files are exchanged on the web.
- **FTP :** Provides services for file transfer and manipulation.
- **POP :** Retrieves e-mail message from a e-mail server.
- **DNS :** Resolves URL to IP addresses.
- **DHCP:** Automates assignment of IP addresses.
- **SMTP:** SMTP is used to send and receive email.

## 8.1.3 Windows OS Directory Structures

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During installation, the Windows setup program creates **directories** that have specific purposes.

### User Files Locations

- By default, Windows stores most of the files created by the user in the folder.

#### **Location:**

- C:\Users\User\_name\My Documents
- All users of a single computer have their own My Documents folder containing each user's favorites, cookies, and desktop items.

## 8.1.3 Windows OS Directory Structures

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### System File Locations

- All of the files that are used to run the computer are located in the folder.

### **Location:**

- C:\Windows\system32 for Windows XP , Windows Vista, Window7 and windows 10

### Fonts

- The Fonts folder contains all of the fonts that have been installed in the computer.
- Font formats: TrueType, OpenType, Composite, and PostScript.
- All of the installed fonts are located in C:\Windows\Fonts.

## 8.1.3 Windows OS Directory Structures

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### Temporary Files

The Temporary Files folder contains files created by the operating system and programs that are needed for a short period of time.

- For Examples: During program installation
- C:\Documents and Settings\User\_name\Local Settings\Temp.
- C:\Users\User\_name\AppData\Local\Temp

### Program Files

- The Program Files folder is used by most application installation programs to install software.
- C:\Program Files.

## 8.1.3 Windows OS Directory Structures

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### Offline Files and Folders

- Offline Files and Folders allows you to select shared **files** and **folders** from the **network** to be stored on your computer.
  - These files are available after the computer is disconnected from the network.
  - When you reconnect to the network, the changes that you have made offline are automatically applied to the original files on the network.
- Window XP and others - C:\Windows\CSC

## 8.2 Install, Configure, and Optimize OS

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### 1. Default Installation vs Custom Installation

- Default installation is sufficient for computers in SOHO network.
- Custom Installation is typically used in *large network computers*.
- Default Installation requires minimal user interaction.
- In Windows XP Custom installation is similar to default, as only two screens are there for custom selection.
- Regional Settings and Network Settings.

## 8.2 Install, Configure, and Optimize OS

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### 8.2.2 Installing Windows - Custom Installation

Following are different types of custom installation,

- An Unattended installation from a network distribution point uses an **answer file**.
- An Image-based installation using a disk-imaging program copies an image of the operating system directly to the hard drive with no user intervention.
- A Remote installation using Remote Installation Services (RIS) downloads the installation across the network.
- An OS Deployment Feature Pack using Microsoft System Management dramatically simplifies deployment of an operating system across the organization.

## 8.2 Install, Configure, and Optimize OS

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### Unattended Installation

#### WindowsXP

- The unattended installation using an **unattend.txt** answer file is the easiest custom installation method to perform on a network.
- An answer file can be created using an application called **setupmgr.exe** located within the *deploy.cab file* on the Windows XP media.

#### WindowsVista

- The System Image Manager (SIM) is used to create the setup answer file.
- The Windows SIM is part of the Windows Automated Installation Kit (AIK) and can be downloaded from the Microsoft website.
- In **Window7** different tools like AIK, vlite, nlite are available to create answer file.

## 8.2 Install, Configure, and Optimize OS

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### Image-based Installation

- It begins by completely configuring one computer to an operational state.
- Next, run Sysprep to prepare the system for imaging.
- A third-party drive imaging application prepares an image of the completed computer, which can be burned onto a CD or DVD.

## 8.2 Install, Configure, and Optimize OS

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### Remote Installation

- We can use RIS to remotely setup new Microsoft Windows computers.
- They uses RIS network shared folder as the source of the windows OS files.
- User computers that are connected to the network can be started by using a remote boot disk or network adapter capable of booting the computer.
- RIS is designed to be used in a relatively small network, **whereas** Microsoft SMS OS Deployment Feature allows the installation of a large number of client computers across an entire network concurrently.

## 8.2.3 Managing Disks, Directories, and Files

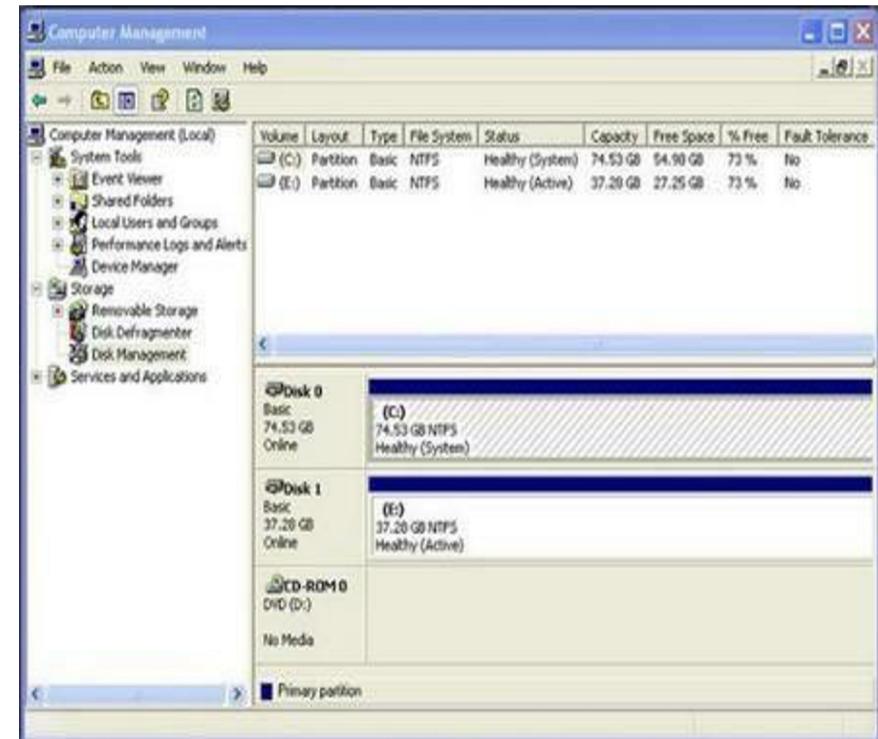
### Disk Structure

- A hard disk is divided into specific areas called *partitions*.
- The Disk Management utility displays information and performs services such as partitioning and formatting disks in Windows.

Partition types: Primary, Active, Extended.

### Ways to Access:

- Select Start > right-click My Computer > Manage > Disk Management.
- Select Start > Settings > Control Panel > Administrative Tools > Computer Management > Disk Management.
- Open Run > **diskmgmt.msc**



## 8.2.3 Managing Disks, Directories, and Files

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### Disk Structure

- In Windows, letters are used to name the drives.
- A Windows computer can have up to 26 physical and logical drives because there are 26 letters in the English alphabet.
- Drive A and B are reserved for Floppy drive and C is reserved for primary partition.

### Mounted Drive

- With the NTFS file system, a drive can be mapped to an empty folder on a volume and is referred to as a mounted drive.

## 8.2.3 Managing Disks, Directories, and Files

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### Mounted Drive

Mounted drives are assigned drive paths instead of letters and are displayed as a drive icon.

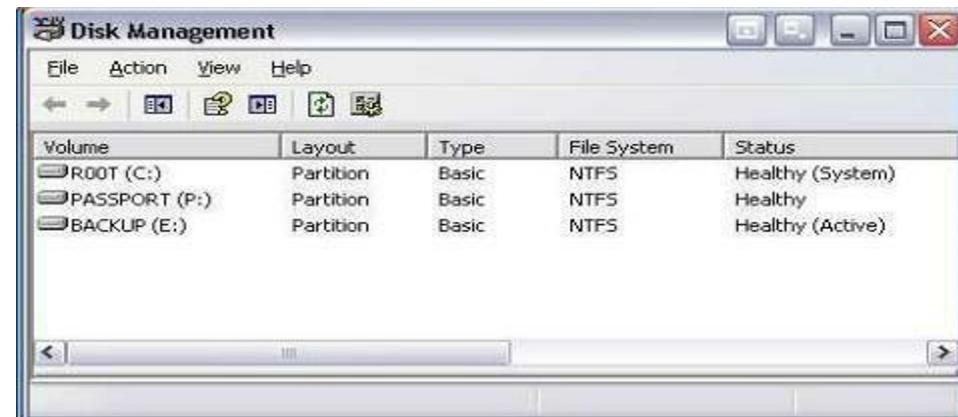
- Open Disk Management.
- Right-click the partition or volume to be mounted.
- Click Change Drive Letter and Paths.
- Click Add.
- Click Mount in the following empty NTFS folder.
- Create an empty folder, type the path to an empty folder, or browse to an empty folder on an NTFS volume and click OK.
- Close Computer Management.



## 8.2.3 Managing Disks, Directories, and Files

### Drive Status

The Disk Management utility displays the **status** of each disk.



Volume	Layout	Type	File System	Status
R00T (C:)	Partition	Basic	NTFS	Healthy (System)
PASSPORT (P:)	Partition	Basic	NTFS	Healthy
BACKUP (E:)	Partition	Basic	NTFS	Healthy (Active)

- Foreign – A disk that has been moved to a computer from another computer
- Healthy – A volume that is functioning properly
- Initializing – A basic disk that is being converted into a dynamic disk
- Missing – A dynamic disk that is corrupted, turned off, or disconnected
- Not Initialized – A disk that does not contain a valid signature
- Unreadable – A basic or dynamic disk that has experienced hardware failure, corruption, or I/O errors

## 8.2.3 Managing Disks, Directories, and Files

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### Drive Status

#### Other Drive Status

- Audio CD – An audio CD that is in the optical drive
- No Media – An optical or removable drive that is empty

## 8.2.3 Managing Disks, Directories, and Files

### File System

- Partitions are formatted with a file system.
- The file systems available in Windows are FAT (FAT16), FAT32, and NTFS.
- NTFS has greater stability and security features.

FEATURE	FAT32	NTFS
Max. Partition Size	2TB	2TB
Max. File Name	8.3 Characters	255 Characters
Max. File Size	4GB	16TB
File/Folder Encryption	No	Yes
Fault Tolerance	No	Auto Repair
Security	Only Network	Local and Network
Compression	No	Yes
Conversion	Possible	Not Allowed
Compatibility	Win 95/98/2K/2K3/XP	Win NT/2K/XP/Vista/7

## 8.2.4 Optimizing Performance of OS

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Several procedures and tools are available to optimize the performance of an operating system.

### Disk Error-Checking Tool

- The Windows operating system uses CHKDSK from, within the GUI or at the command line to detect and repair disk errors.
- Steps for using the GUI
  - Double-click My Computer.
  - Right-click the drive that you want to check.
  - On the Tools tab, under Error-checking, click Check Now.
  - Under Check disk options, select the Scan for and attempt recovery of bad sectors check box.

## 8.2.4 Optimizing Performance of OS

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### Disk Error-Checking Tool

Steps for using the CLI

- chkdsk – Displays a status report of the drive
- chkdsk /f – Fixes errors on the disk
- chkdsk /r – Recovers readable information from bad sectors
- chkdsk /x – Dismounts the volume if necessary

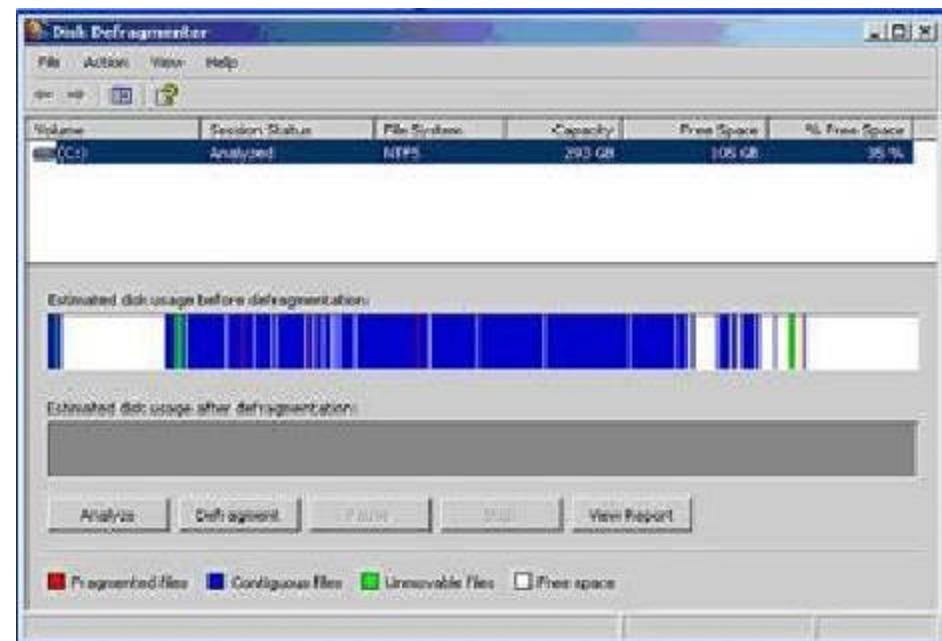
## 8.2.4 Optimizing Performance of OS

### Disk Defragmenter

- To help optimize the files on the hard drive.
- It can consolidate files for faster access.

### Defragmentation Steps:

- Double-click My Computer.
- Right-click the drive that you want to optimize.
- Choose Properties.
- In Tools tab, click Defragment Now.



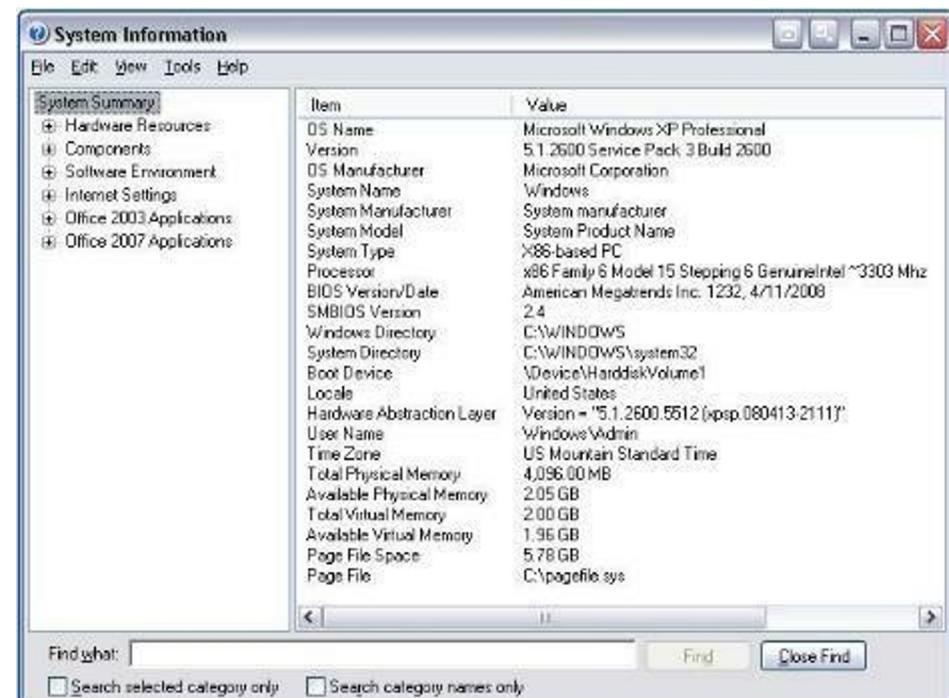
## 8.2.4 Optimizing Performance of OS

### System Information

- Administrators can use the System Information tool to collect and display information about local and remote computers.
- Finds information about software, drivers, hardware configurations, and computer components.

Steps to Access: Open Run > msinfo32

- To export a System Information file, click File > Export
- To view the information from a remote computer choose View>Remote Computer.



The screenshot shows the Windows System Information window. On the left, there's a tree view under 'System Summary' with categories like Hardware Resources, Components, Software Environment, Internet Settings, Office 2003 Applications, and Office 2007 Applications. The main pane displays a table of system configuration details:

Item	Value
OS Name	Microsoft Windows XP Professional
Version	5.1.2600 Service Pack 3 Build 2600
OS Manufacturer	Microsoft Corporation
System Name	Windows
System Manufacturer	System manufacturer
System Model	System Product Name
System Type	X86-based PC
Processor	x86 Family 6 Model 15 Stepping 6 GenuineIntel ~3303 Mhz
BIOS Version/Date	American Megatrends Inc. 1232, 4/11/2008
SMBIOS Version	2.4
Windows Directory	C:\WINDOWS
System Directory	C:\WINDOWS\system32
Boot Device	\Device\HarddiskVolume1
Locale	United States
Hardware Abstraction Layer	Version = '5.1.2600.5512 (xp0.080413-2111)'
User Name	Windows\Amin
Time Zone	US Mountain Standard Time
Total Physical Memory	4,096.00 MB
Available Physical Memory	2.05 GB
Total Virtual Memory	2.00 GB
Available Virtual Memory	1.96 GB
Page File Space	5.78 GB
Page File	C:\pagefile.sys

## 8.2.4 Optimizing Performance of OS

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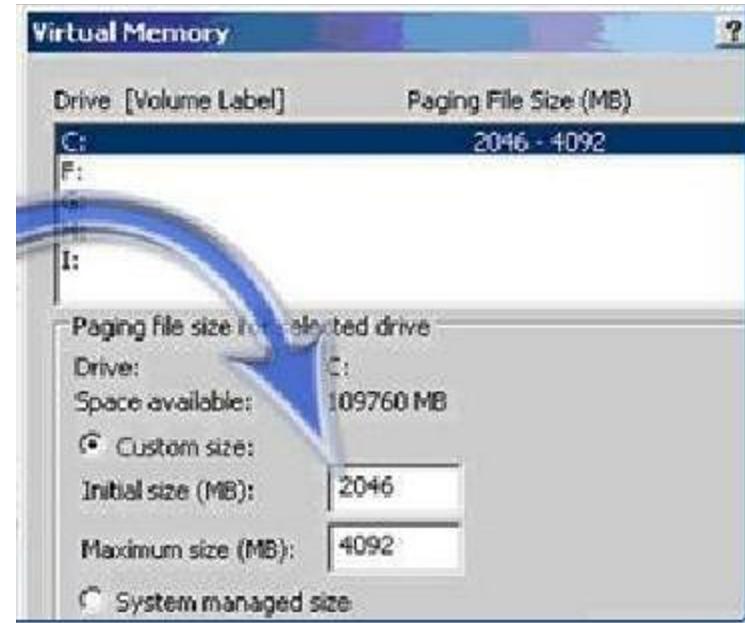
### Remote Desktop Protocol

- The Remote Desktop Protocol allows you to use an application such as Remote Desktop or Remote Assistance to connect to another computer.
- These applications allow you to view the screen and control the computer's mouse and keyboard as though you were local to that computer.
- The Remote Desktop Protocol is also used to operate computers that are connected to the network but do not have a monitor, mouse, or keyboard.
- In XP/Win7 : **Start > All Programs > Accessories >Remote Desktop Connection**
- Remote Assistance uses the Remote Desktop Protocol to allow another user to connect to your computer, see your computer screen, and chat over a network.

## 8.2.4 Optimizing Performance of OS

### Virtual Memory

- Virtual memory allows the CPU to address more memory than is installed in the computer.
- Virtual memory is a swap or page file that is constantly read in and out of RAM.
- Typically, one should let Windows manage the size of the swap file.
- In XP/Win7 : **Start > Control Panel > System > Advanced tab > Performance, click Settings button > Advanced tab**



## 8.2.4 Optimizing Performance of OS

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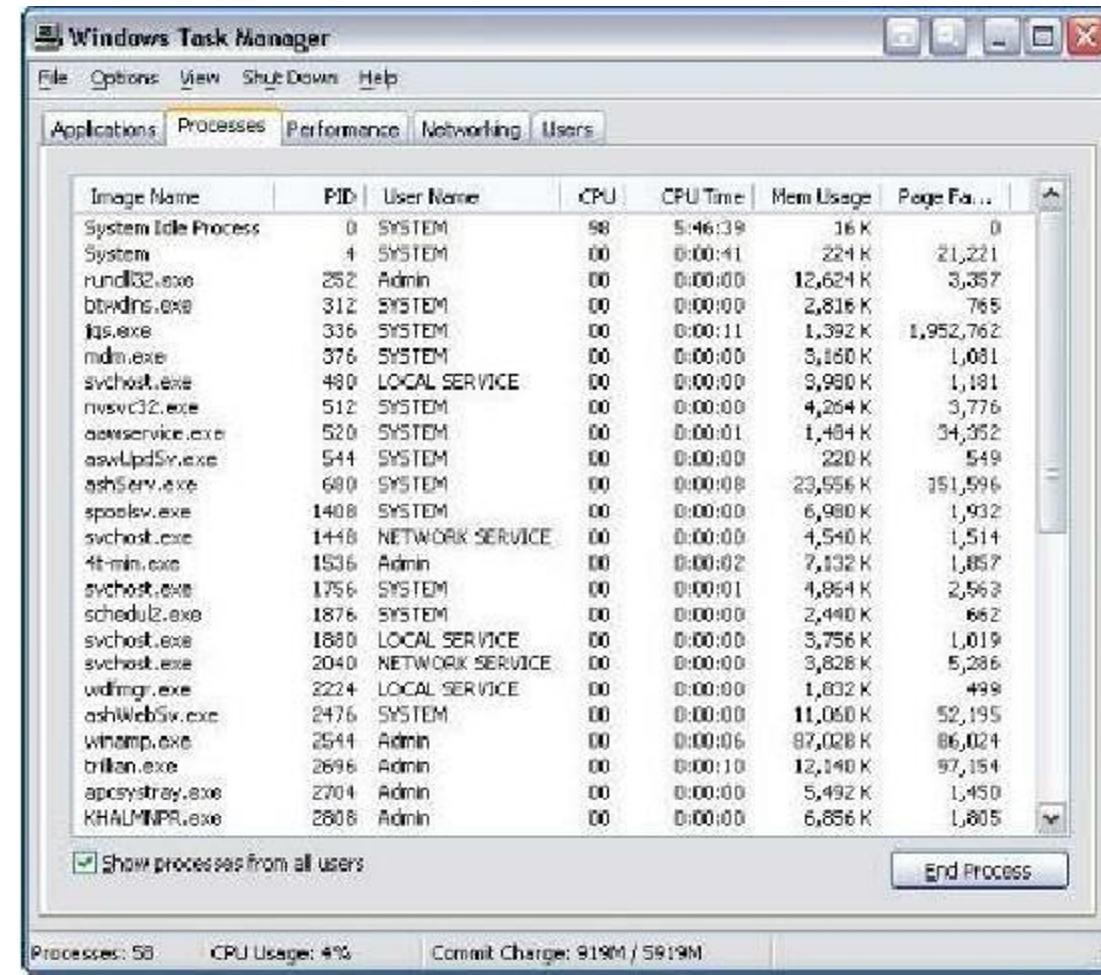
### Administrative Tools

- Computer Management – This tool allows you to access administrative areas such as System Tools, Storage, and Services and Applications.
- Event Viewer – This tool logs a history of events regarding applications, security, and the system.
- Services – This tool allows you to manage all of the services on local and remote computers.
- Performance Monitor – This tool displays and logs real-time information about the processors, disks, memory, and network usage for the computer.

## 8.2.4 Optimizing Performance of OS

### Task Manager

The Task Manager allows you to view information about applications that are currently running.



The screenshot shows the Windows Task Manager window with the 'Processes' tab selected. The window lists various system processes and services, including System Idle Process, System, rundll32.exe, btrwdns.exe, fgs.exe, mdm.exe, svchost.exe, nssvc32.exe, aerservice.exe, avilUpdSrv.exe, ashServ.exe, sposlsv.exe, svchost.exe, 4t-min.exe, svchost.exe, schedul2.exe, svchost.exe, svchost.exe, wdfmg.exe, ashWebSv.exe, whamp.exe, trillian.exe, apcsystray.exe, and KHALMINPR.exe. The table includes columns for Image Name, PID, User Name, CPU, CPU Time, Mem Usage, and Page Faults.

Image Name	PID	User Name	CPU	CPU Time	Mem Usage	Page Faults
System Idle Process	0	SYSTEM	00	5:46:39	16 K	0
System	4	SYSTEM	00	0:00:41	224 K	21,221
rundll32.exe	252	Admin	00	0:00:00	12,624 K	3,357
btrwdns.exe	312	SYSTEM	00	0:00:00	2,816 K	765
fgs.exe	336	SYSTEM	00	0:00:11	1,392 K	1,952,762
mdm.exe	376	SYSTEM	00	0:00:00	5,160 K	1,081
svchost.exe	480	LOCAL SERVICE	00	0:00:00	3,980 K	1,181
nssvc32.exe	512	SYSTEM	00	0:00:00	4,264 K	3,776
aerservice.exe	520	SYSTEM	00	0:00:01	1,484 K	34,352
avilUpdSrv.exe	544	SYSTEM	00	0:00:00	220 K	549
ashServ.exe	680	SYSTEM	00	0:00:08	23,556 K	151,596
sposlsv.exe	1408	SYSTEM	00	0:00:00	6,980 K	1,932
svchost.exe	1448	NETWORK SERVICE	00	0:00:00	4,540 K	1,514
4t-min.exe	1536	Admin	00	0:00:02	7,132 K	1,857
svchost.exe	1756	SYSTEM	00	0:00:01	4,864 K	2,562
schedul2.exe	1876	SYSTEM	00	0:00:00	2,440 K	662
svchost.exe	1880	LOCAL SERVICE	00	0:00:00	5,756 K	1,019
svchost.exe	2040	NETWORK SERVICE	00	0:00:00	3,826 K	5,286
wdfmg.exe	2224	LOCAL SERVICE	00	0:00:00	1,032 K	499
ashWebSv.exe	2476	SYSTEM	00	0:00:00	11,060 K	52,195
whamp.exe	2544	Admin	00	0:00:06	97,028 K	86,021
trillian.exe	2696	Admin	00	0:00:10	12,140 K	97,154
apcsystray.exe	2704	Admin	00	0:00:00	5,492 K	1,450
KHALMINPR.exe	2808	Admin	00	0:00:00	6,856 K	1,805

## 8.2.4 Optimizing Performance of OS

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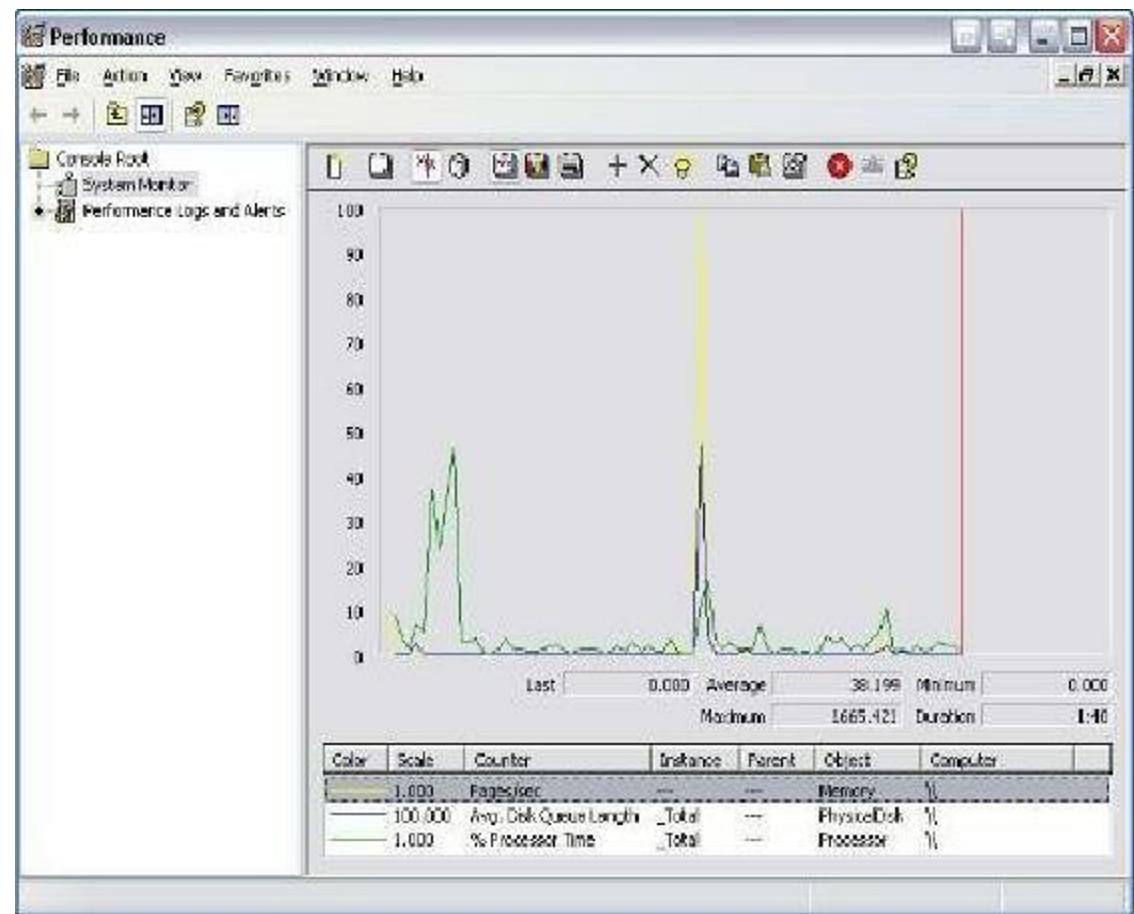
### Task Manager

- There are five tabs within the Task Manager
- Applications – This tab shows all of the applications that are running.
- Processes – This tab shows all of the processes that are running.
- Performance – This tab shows the CPU and page file usage of the computer.
- Networking – This tab shows the usage of all network adapters in the computer.
- Users – This tab shows all users that are logged on the computer.

## 8.2.4 Optimizing Performance of OS

### System Monitor

- The System Monitor is part of the Performance Console and displays real-time information about the processors, disks, memory, and network usage of the computer.
- You can easily summarize these activities through histograms, graphs, and reports.



## 8.2.4 Optimizing Performance of OS

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### Temporary Files

- Almost every program uses temporary files, which are usually automatically deleted when the application or the operating system is finished using them.
- However, some of the temporary files must be deleted manually.

### Location:

#### Windows

- C:\Windows\Temp
- C:\Users%\USERPROFILE%\AppData\Local\Temp

## 8.2.5 Optimizing Browsers Performance

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The Microsoft browser, Internet Explorer (IE), has general settings for changing the homepage and browser appearance settings.

- Additional settings allow you to view or delete the information saved by the browser:
  - History
  - Temporary files
  - Cookies
  - Passwords
  - Web-form information
- Cookies are information transmitted between a web browser and a web server with the purpose of tracking user information.
- Caching, or storing, Internet files is a feature of the web browser that is used to speed up the process of accessing previously visited websites.

## 8.2.6 Configuring E-mail Software

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- Outlook Express is an e-mail tool that is a component of the Microsoft Windows operating system.
- You should have the following information available when installing e-mail accounts into the e-mail client software:
  - Display name
  - E-mail address
  - Type of incoming mail server
  - Incoming mail server name
  - Outgoing mail server name
  - Username
  - Account password
- The Protocols used in email contains - POP3, IMAP, SMTP, MIME.

## 8.2.7 Select Screen Resolution and Update Video Driver

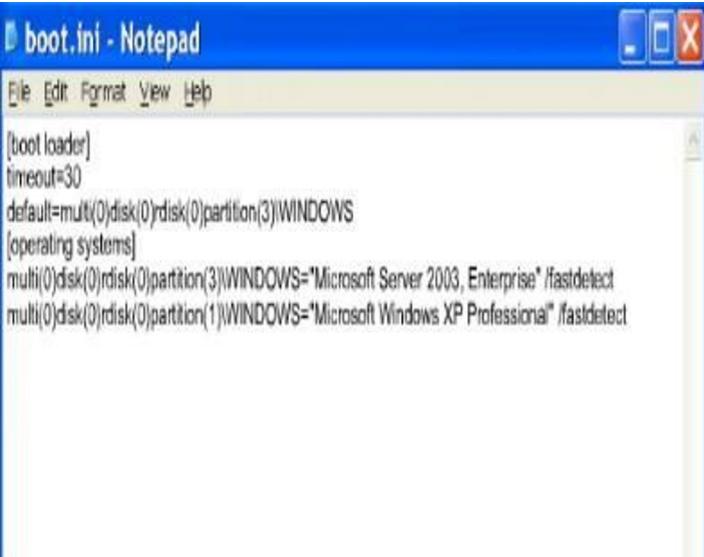
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- After the operating system is installed, you can set the screen resolution to meet the requirements of your customer.
- You can change the screen settings in Windows in the Settings tab of the Display Properties control panel applet:

- **Screen resolution** – This setting determines the number of pixels.
- **Refresh rate** – This setting determines how often the image in the screen is redrawn.
- **Display colors** – This setting determines the number of colors visible on the screen at once.

## 8.2.8 Installing Second OS

- To create a dual-boot system in Microsoft Windows, you typically must have more than one hard drive, or the hard drive must contain more than one partition.
- You should install the oldest operating system on the primary partition or the hard drive marked as the active partition first.
- You should then install the second operating system on the second partition or hard drive.

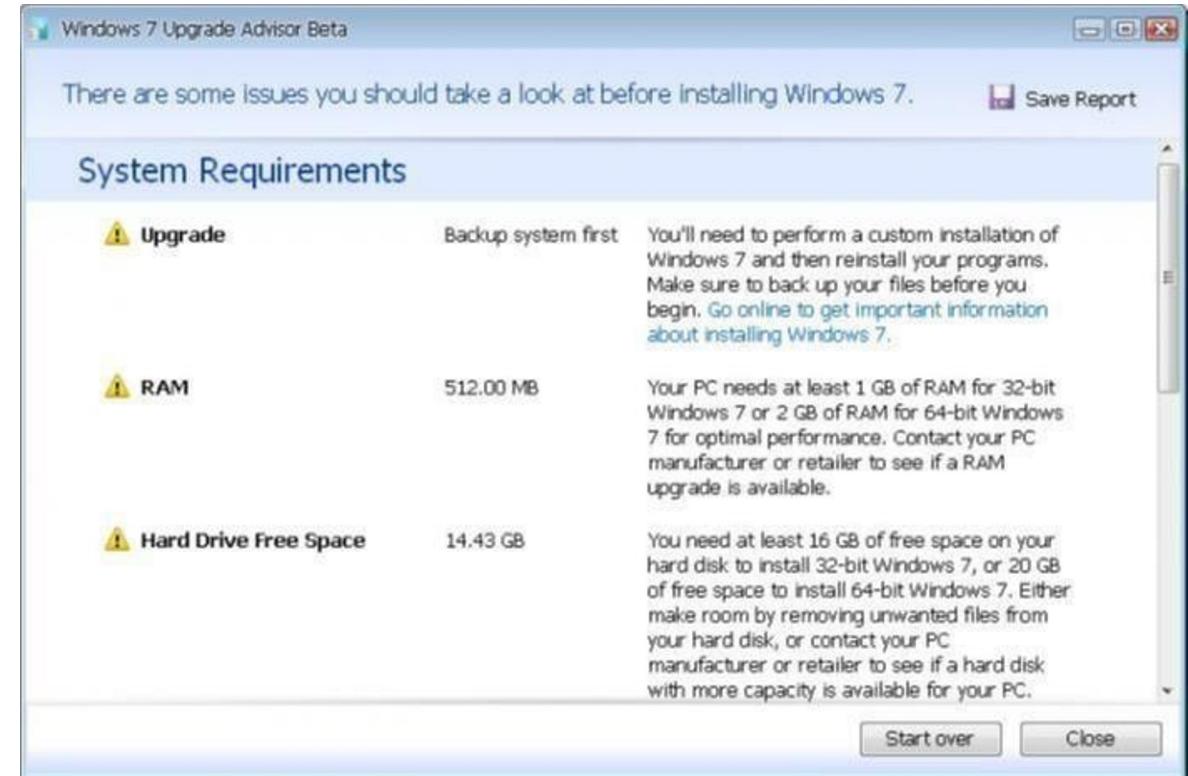


### The boot.ini File

- During the installation, the boot.ini file is created on the active partition to allow the selection of the operating system to boot on startup.
- The boot.ini file can be edited to change the order of the operating systems.

## 8.3 Upgrading OS

- An operating system must be upgraded periodically to remain compatible with the latest hardware and software.
- Microsoft provides a utility called the Upgrade Advisor to scan the system for incompatibility issues.
- You can download the Upgrade Advisor from the Microsoft Windows website free of charge.



# End of Lecture 8