A+ Unit Five: Storage

Student Name		Member of Team		Team Lead		AM/PM
A+ Test	Essentials 701					

A+ Certification Objectives Covered

- 1.1 Categorize storage devices and backup media
  - FDD
  - HDD
    - Solid state vs. magnetic
  - Removable storage
    - Tape drive
    - Solid state (e.g. thumb drive, flash, SD cards, USB)
    - External CD-RW and hard drive
- 1.2 Explain motherboard components, types and features
  - PATA
    - IDE
    - EIDE
  - SATA, eSATA
- 1.9 Summarize the function and types of adapter cards
  - I/O
    - SCSI
    - USB
- 3.3 Explain the process and steps to install and configure the Windows OS
  - File systems
    - FAT32 vs. NTFS
  - Directory structures
  - Files
    - Extensions
    - Attributes
    - Permissions
- 3.3 Explain the process and steps to install and configure the Windows OS
  - Directory structures
    - Create folders
    - Navigate directory structures
  - Files
    - Creation
    - Extensions
    - Attributes
    - Permissions

Turn Over

Turn in for this unit	**Time Allotted**	**8 Days**
Labs	Team Lead Check Off	Lab Report Included
Lab 5-1: Configuring Removable Media		
Lab 5-2 Using Diagnostic Software		
Lab 5-3 Creating a portable office using a USB drive		
Lab 5-4: Create a Recovery Drive in Windows 8		
Lab 5-5 Creating a Virtual Hard Disk in DOS		
Lab 5-6 Using FDISK		
Lab 5-7 Installing a Second Hard Drive		
LAB 5-8 Test hard drive performance using SANDRA		
Lab 5-9 Changing the File System Type		
Lab 5-10 Disk Utilities Built in to your OS		

Unit Project (one per group)	
✓ Customer Overview	
✓ List of current needs	
✓ List of future needs	
✓ List of questions asked of customer	
✓ **Written (at least 2 full page, double spaced) proposal that describes, in clear English, your solution.**	
✓ Diagram of computer components	
✓ Worksheet from lab	
✓ Printout of spreadsheet showing complete cost of ALL computers and hardware and software	

Floppy Drives

- **Connected to the _____ card or motherboard by a ribbon cable with _____pins and 2 connections.**
- **Powered by a small _____that connects to the power supply.**
- **Data is written via a _____/_____head that is housed on an _____arm.**
- **The arm moves freely across the disk.***
- **The _____has one read/write head _____the disk and _____.**
- **The heads move _____across the disk as the disk spins either 300 or 360 rpm**
- **The heads do _____touch the disk. If they do it causes a true crash and the disk is toast.***
- **As data is written, _____heads on either side of the r/w head clean up so there is no data bleed.**
- **This ensures each track is _____in size.**
- **Disk turns on a _____**

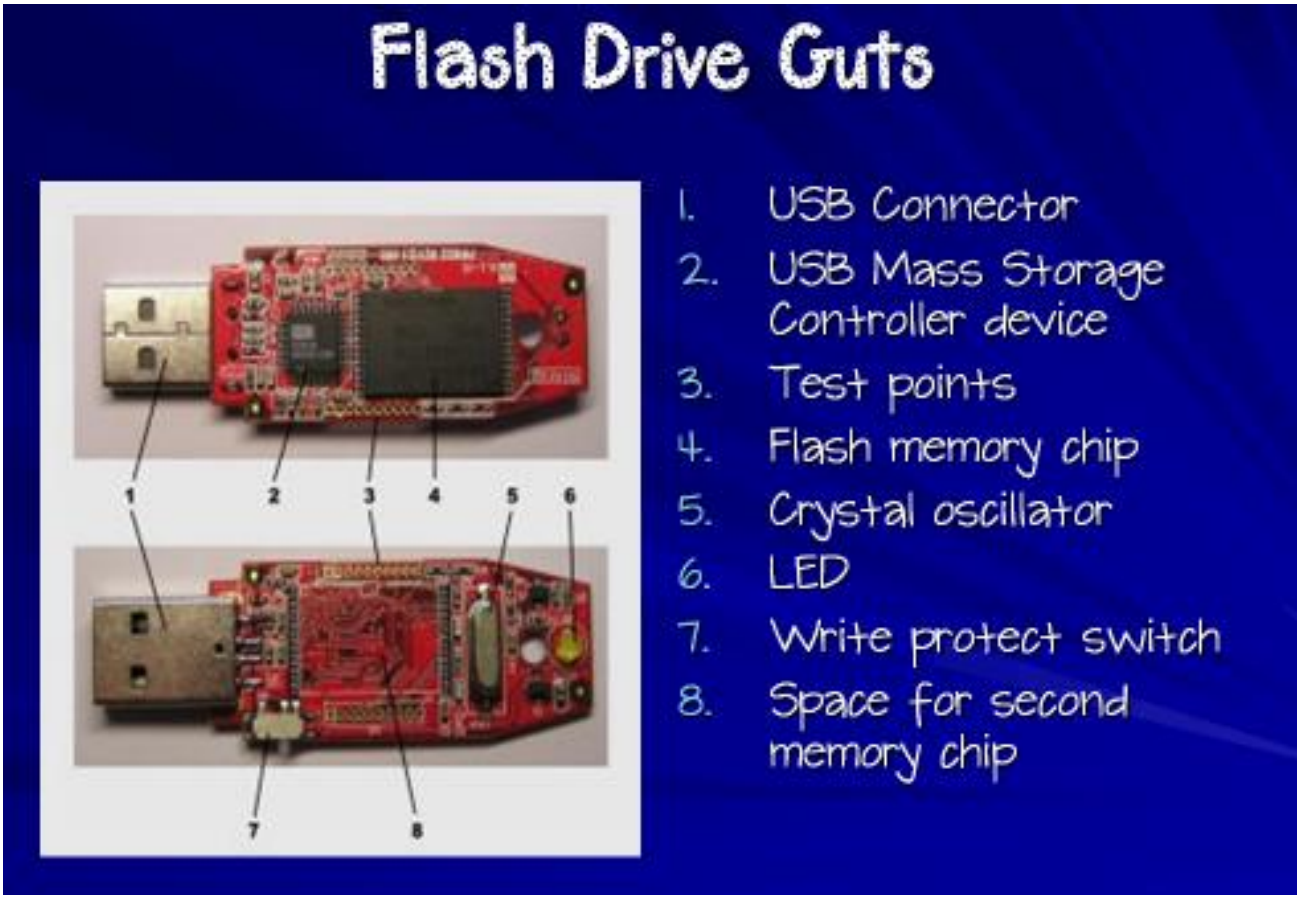
Flash Memory

- **Flash memory is _____memory that can be electrically erased and _____. It is a technology that is primarily used in memory cards.**
- **Unlike _____, it is erased and programmed in blocks consisting of multiple locations (in early flash the entire chip had to be erased at once).**
- **Flash memory costs less than standard EEPROM and has become the _____technology wherever a significant amount of non-**

_____, solid-state storage is needed.

Flash Memory

- **Examples of applications include _____audio players, digital cameras and _____phones.**
- **Flash memory is also used in USB _____drives**
- **It has also gained some popularity in the gaming market, where it is often used instead of EEPROMs or _____-powered SRAM for game save data. ***



How Data is Stored to a Flash Drive

- **Flash memory is made up of a _____**
- **At each intersection are two _____**

- _____**Gate**
- _____**Gate**

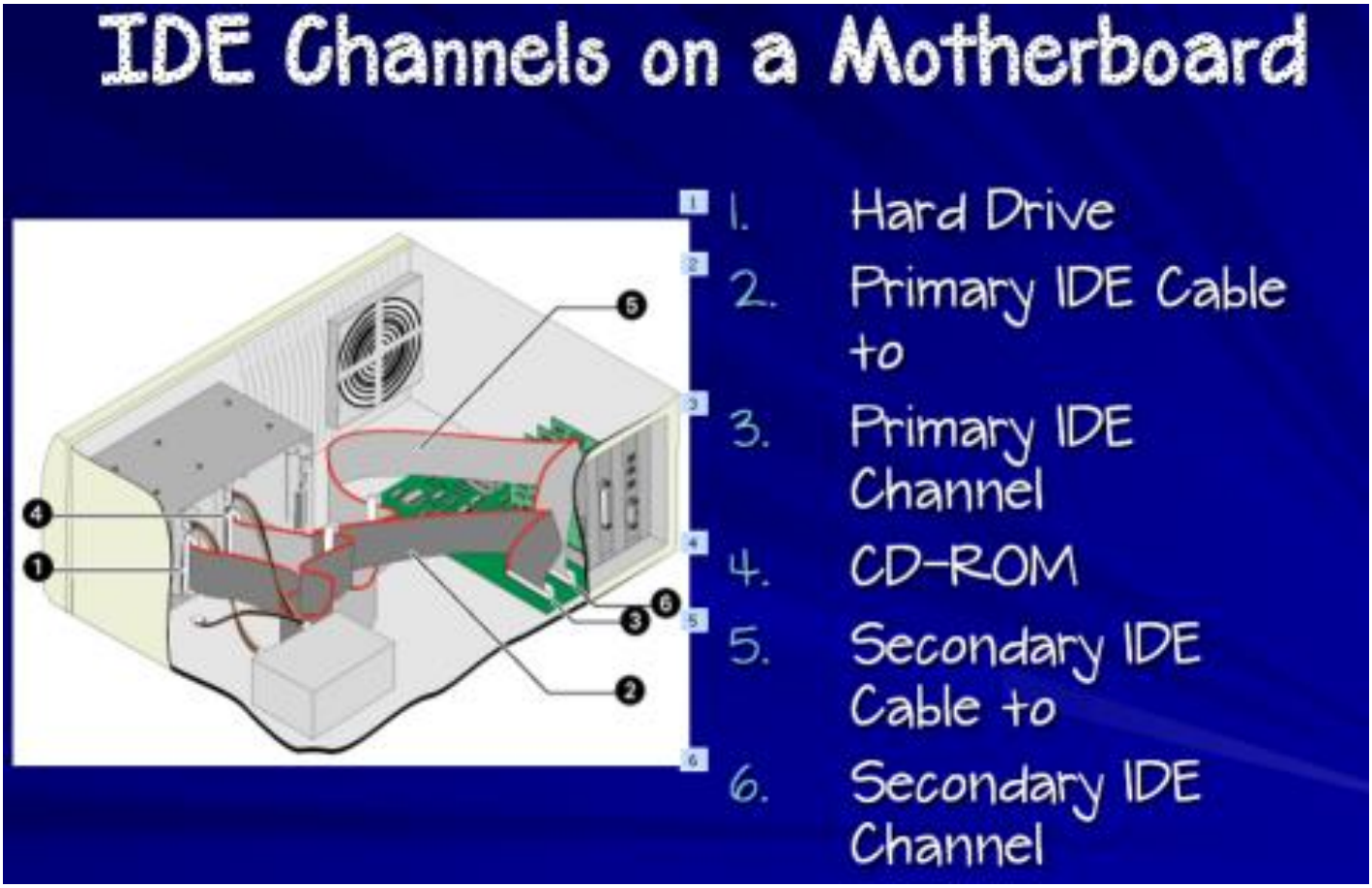
- **Connecting the two transistors is a thin layer of iron _____that can pass power through (_____) the gates**
- **If the two transistors are "_____" through a charge the value of the cell is _____**
- **If not, the value is _____**
- **The floating get gets charged**
- **Electrons travel down a "_____" to the control gate**
- **The charge _____to the ground, like normal**
- **But as it forces its way through the control gate, the cell _____reads the charge**
  - **Above _____% and it stays a 1**
  - **When it drops _____, it goes to 0**

Types of Hard Drive Interfaces

- **IDE and _____standards (AKA PATA)**
- **Other interface standards**
  - _____
  - _____**1394**
  - _____**B**

- _____**Channel**

- _____*



IDE Cable

- **Ensure that the pin 1, indicated by a _____line on the cable, is connected to pin one on the hard drive.**

Parallel vs Serial Communications

- **PATA (Parallel _____Technology _____aka IDE) communicates using _____communications.**

  - **Parallel devices communicate by sending data in _____vs bits.**

A parallel device can send _____or two bytes of data down a bus at a time.

- **Both the sending and _____devices must _____the transfer**
- **Originally parallel communications were more _____**
- **Parallel devices must take turns _____***

Parallel vs Serial Communications

- **SATA (_____Advanced Technology Attachment)**
  - **Serial devices communicate one _____at a time, however communications are _____and more reliable**
  - **Can go up to _____ Gbps (whew)**
    - ***SATA 1—1.5 Gbps***
    - ***SATA 2—3 Gbps***

Parallel vs Serial Communications

- ***SATA 3—6 Gbps***
  - **SATA does advanced error checking, resulting in more reliable communications**
  - **Serial devices can communicate in tandem with other serial devices**
  - **Serial devices operate at a lower voltage**
  - **eSATA—used for external devices**
  - **eSATAp—Power over eSATA***

Vertical Drives

- ✉ **Traditionally, bits are arranged in a flat, _____manner**
- ✉ **To increase size of the disk, the size of the bits have been _____, however we're reaching the limits at about _____**
- ✉ **Laying the bits _____frees up a lot of real estate, allowing the bits to be closer together and increasing the size of drives.**
- ✉ **Also known as _____recording**

Solid State Drives

- ✉ **A solid state drive is a _____device with a storage capacity similar to a small hard drive. Solid state drives are used as _____for hard disk drives for storing operating system, application, and data files. Some _____of solid state drives:**
- ✉ **They are faster than _____drives**
- ✉ **They have no _____parts so they last longer**
- ✉ **Lower power consumption than _____drives (good for laptops)**
- ✉ **They are less _____to physical damage (from dropping) and immune from magnetic fields**
- ✉ **They are smaller and _____than hard drives**
- ✉ **main disadvantage is _____--they are several times more expensive than comparable hard drives.**

Hybrid Hard Drives

- ✉ **a hard drive that contains a flash memory chip that stores _____and applications.**

- **_____can retrieve data from flash, the drive--which spins constantly in an ordinary _____--can stay asleep most of the time.**
- **Speeds up _____and takes out issue of hard drive being the _____of the system, depending on the amount of flash memory.**
- **Improves speed, power _____, and reliability of hard drives (less wear and tear on platters).**

How Hard Drives Work

- **Platter(s) are stacked together and spin in _____**
- **Read/write heads are controlled by an _____and move in unison across disk surfaces as disks rotate on a spindle**
- **Require hard drive _____for _____***

How Data is Written

- **Data is written from the _____in towards the center.**
- **As the heads get closer to the center they must _____for the smaller sectors**
  - **_____: Speeds up writing of tracks on smaller sectors.**
  - **Reduced write _____: A reduced current is used towards the center of the platter on the smaller sectors.***

Tape Drives

- ✉ **Also called _____linear tape or DLT drives**
- ✉ **Store data on _____tapes,**
- ✉ **Most commonly used for _____backups**
- ✉ **Advantages of tape drives:**

Tape Drives

- **store _____amounts of data.**
- **relatively _____and small enough for long-term storage.**

✉ **disadvantages:**

- **Access is typically _____than reading or writing**
- **Data must be read from tape _____.**

SCSI Basics

- ✉ **SCSI = _____Computer _____Interface**
- ✉ **Acts like a small _____inside of the computer**
- ✉ **Bus can contain/be used by up to _____ or _____devices**
- ✉ **Bus controller can be either:**
  - **An _____card (host adapter)**
  - **_____on motherboard**
- ✉ **Faster, more expensive, more difficult to install than similar**

_____devices*

The SCSI Subsystem

- **Host adapter**
  - **Card inserted onto _____slot on mother board**
  - **Manages all devices on _____bus**
  - **Supports _____and external SCSI devices**
  - **Forms a single _____chain with devices**
- **Device drivers**
  - **Enable OS to _____with a host adapter***

Termination

- **Prevents _____echo**
- **Required at both ends. If the card is first either place a _____on it or use software or a _____to turn it on/off***

Comparing IDE and SCSI

- **IDE supports only _____internal devices; SCSI supports both _____and _____devices and allows you to add more devices to a system.**
- **SCSI devices are generally of higher quality than IDE devices and more**

_____.*

Comparing IDE and SCSI

- ✉ **IDE devices require a separate _____for each device; SCSI requires only _____for the entire chain.**
- ✉ **Both IDE and SCSI are generally _____-compatible, in that most faster hardware can work with slower devices.***

How System BIOS Helps Manage Data Transfer

- ✉ **Provides _____handler for software interrupts**
- ✉ **Automatically _____/_____hard drive**
- ✉ **Helps manage data transfer over I/O bus between hard drive and memory**
  - **Using _____mode, CPU is in charge**
  - **Using _____with DMA controller in charge (no CPU involvement)**
  - **With bus mastering using DMA, hard drive _____controls data transfer***

How a Hard Drive Is Logically Organized to Hold Data

- ✉ **Requirements to boot from hard drive and get to a command prompt:**
  - **Drive must have _____and _____markings written on it**
  - **A _____system must be installed**

- **Files needed to boot the PC must be copied to _____directory of drive***

How a Hard Drive Is Logically Organized to Hold Data

✉ **Steps for preparing a hard drive to hold files (after physical installation)**

- **_____-level format**
- **_____hard drive**
- **_____-level format***

Hard Drive Partitions and Logical Drives

✉ **Partitions**

- **_____-level divisions**

✉ **_____drives (volumes)**

- **Further division of partitions**
- **Have letters or name (in XP/Vista) assigned to them**
- **Each has its own file _____ (eg, FAT16, FAT32, NTFS)***

When to Partition a Drive

✉ **When installing a _____ hard drive**

✉ **If existing hard drive is giving _____**

✉ **If you suspect a _____ has attacked the drive**

- ✉ **To _____ hard drive clean and _____ new OS**
- ✉ **To use the large drives more efficiently.***

What Happens During Formatting

- ✉ **OS format for each logical drive creates these file system items at beginning of each logical drive:**
  - **OS _____record**
  - **_____**
  - **_____directory***

Choosing a File System

- ✉ **File system defines how _____is stored on a disk, and what operating systems can use it.**
- ✉ **Parts of a _____system**
  - **_____—Logical division on a hard drive**
  - **Volume**
  - **A single _____storage area on a hard drive.**
  - **Can be one or more _____, or across one or more _____.**
  - **Defined by a _____letter**

- ✉ _____**—aka "folder" is a container that can hold files, programs, folders**
- ✉ _____**—One dimensional stream of bits**

FAT32 vs NTFS

- ✉ **When you partition your drive, you choose a file system.**
- ✉ _____**—most security options**
- ✉ _____**—more accessible by other Oses**
- ✉ **Always use _____in a network**

File systems

Fat32

- ✉ **Partition size: _____TB (but Windows can only handle 32 GB)**
- ✉ _____**long file names**
- ✉ **File size: _____ GB**
- ✉ **268,435,437 _____files**
- ✉ _____**TB largest volume size**
- ✉ **Limited _____**
- ✉ **Can be _____by older OSes**

NTFS

- ✉ _____**TB**
- ✉ _____**long file names**
- ✉ **16 _____file size**
- ✉ **4,294,967,295 _____files**

- ✉ **_____TB largest volume size (woot)**
- ✉ **Smaller _____sizes**
- ✉ **Ability to _____files**
- ✉ **Compression**
- ✉ **Use disk _____**
- ✉ **Use _____mount points**
- ✉ **_____are WAY advanced**

Managing and Troubleshooting Hard Drives

- ✉ **Error messages**
- ✉ **Tools for troubleshooting and maintaining hard drive**
- ✉ **Solving common hard drive problems**
- ✉ **General troubleshooting guidelines**

An Ounce of Prevention

- ✉ **Make _____and keep them current**
- ✉ **Run _____software regularly**
- ✉ **_____files; scan hard drive occasionally**
- ✉ **Don't _____around the hard drive**
- ✉ **Don't _____PC turned off for weeks/months at a time**
- ✉ **High _____can be dangerous for hard drives**
- ✉ **Be _____with a hard drive**

LAB 5-1: CONFIGURING REMOVABLE MEDIA

Objectives

- ☐ Locate CMOS screen for configuring floppy, USB devices, and changing boot order.
- ☐ Configure the computer to boot in various scenarios

Note: If your computer does not have a floppy, work with a partner.

1. Enter the CMOS settings on your lab computer. You can use your DELL for this since all you're doing is disabling the floppy and you will re-enable it.
2. Locate the floppy disk controller area.
3. Disable the floppy disk controller.
4. Restart.
5. Put a floppy into the drive.
6. From the run command, type A: and hit enter.
7. What happens?

8. Why?

9. Go back in and re-enable the controller.

One purpose for disabling an FDC is to allow a kiosk computer to be available for use, but not allow users to access the floppy drive and potentially walk away with data. The controller can be re-enabled when an administrator needs it for some reason.

Repeat the steps above, only this time disable (from the CMOS) the USB controller. **Before you hit save in your CMOS answer the following!**

1. What are the steps you took to disable the USB ports?

2. Is your keyboard or mouse USB?

3. If so, what will happen if you save and continue?

4. Yeah, that would not be cool, would it?

5. Don't save the settings unless you LIKE reinstalling your lab system! I mean if you do, by all means knock yourself out!

LAB 5-2 USING DIAGNOSTIC SOFTWARE

Installing Data Doctor Removable Media Recovery

1. Go into the //192.168.1.71/software folder and locate labfiles.
2. Install Removable Media Recovery Tool.
3. Insert a Flash drive (borrow one if you don't have your own).
4. Open the program.
5. What information does it give you about your media?

Physical Disk Number	
Model	
Media type	
Cylinder	
Head	
SectorsPerTrack	
Disk Size	

6. Go into My computer and right click on your drive. Write down the file system (it'll be FAT, FAT16, FAT32, or NTFS).
7. Go back to the program. Click on your drive and select "Standard Search"
8. Click next.
9. Read the directions. If it doesn't like standard mode, go back to advanced.
10. Select Partition Type

11. Let it do its thing.
12. Were you able to find anything to recover? What?

13. Try this program on a floppy. Does it work?

LAB 5-3 CREATING A PORTABLE OFFICE USING A USB DRIVE

1. Get a USB drive and clean it off.
2. Go to this website: http://www.maximumpc.com/article/features/build_ultimate_usb_toolbox
3. Create either:
    a. A portable office drive that has all you need to run portal OpenOffice.org, et al on it.
    b. A portable media drive that allows you to play music, movies, and modify files.
4. Demonstrate that it works by using the programs installed.
5. Answer the questions below:

A. I created a portable _____ drive.
B. I put the following programs on this drive.

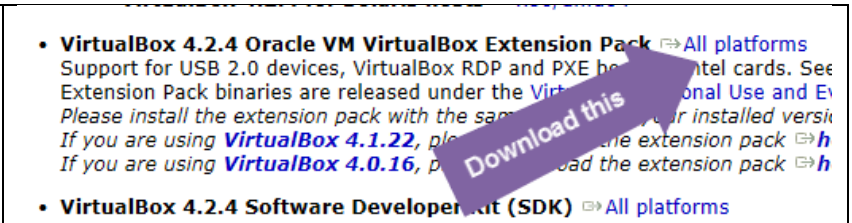
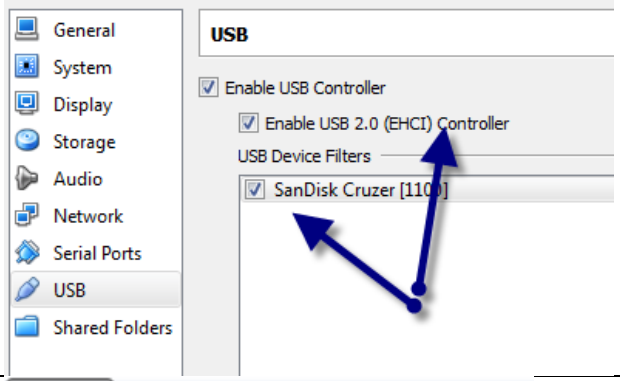
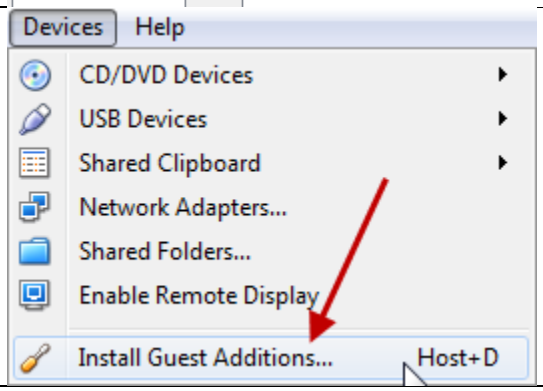
C. How are the versions of the programs you used different from the full programs?

D. Where would a drive such as this come in handy?

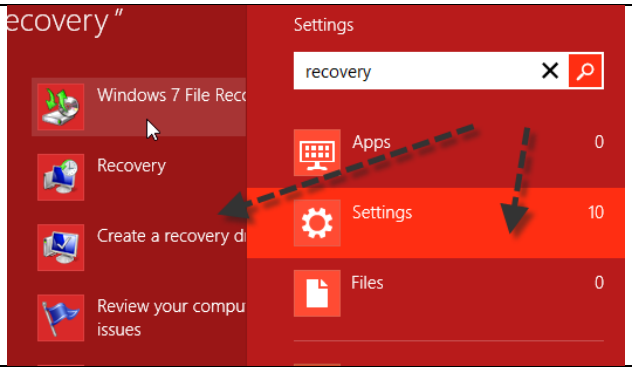
LAB 5-4: CREATE A RECOVERY DRIVE IN WINDOWS 8

One of the first things you should do when you install an operating system is to create a recovery drive. Note, you will need to do this in Virtual Box, so if you installed Windows 8 into Virtual PC (which does not "see" thumb drives), import it into Virtual Box.

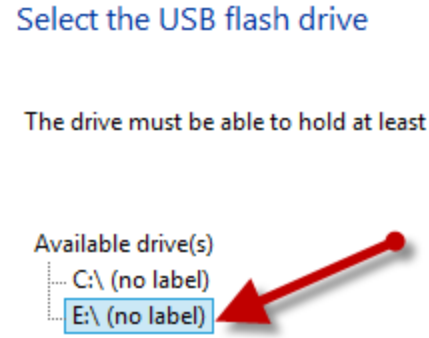
www.virtualbox.org is the site to get Virtual Box.

1. If you have not already installed VirtualBox extensions, you need to do this first. 2. Go to www.virtualbox.org 3. Go to Downloads 4. Download the VM VirtualBox Extension Pack. 5. Double click to install. Without it, you can't access USB devices.	
6. Now go back to Virtual Box. Click on Windows 8 (just once) and click settings. 7. Go down to USB devices. Put your Thumb drive into the computer. 8. When that drive shows up, click on it. 9. Also click "Enable USB Controller" and then "Enable USB 2.0 (EHCI) Controller	
10. Start Windows 8 11. In the actual Virtual Box menu pane (not Win 8) select Devices→Install Guest Additions. 12. It might take awhile before it starts. I thought it wasn't working when I did it. 13. It'll reboot (or ask you if you want to) say yes.	

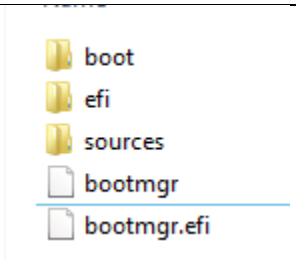
14. Once Windows 8 is open again, from the start page type *recovery*.
15. Click “settings”
16. Find where it says Create a Recovery Drive.
17. Click that.
18. The UAC will pop up and ask you if you want to run the Media Recovery Center.
19. Say yes.



20. It is going to ask you if you want to copy your recovery partition. We don’t have one, but if you buy a computer with Windows 8 already installed, it will have a recovery partition. You can put that on a DVD or thumb drive and that way if your hard drive physically dies, you can still recover.
21. Put your thumb drive in. NOTE: EVERYTHING ON THAT DRIVE WILL BE DELETED.
22. Answer the following question: Do you have anything on your thumb drive that is important?
23. If the answer is YES, save that stuff to a hard drive or get another thumb drive.
24. If the answer is NO, proceed.
25. When it comes up you should see C:\ and maybe D:\ or E:\. Choose the one that represents your Thumb Drive.

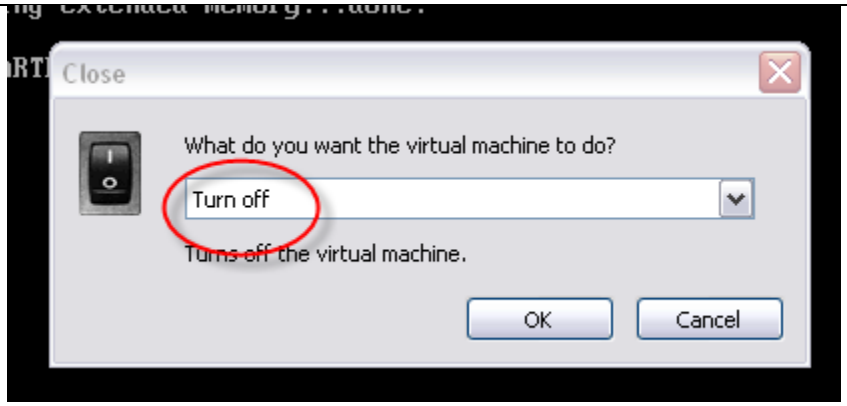
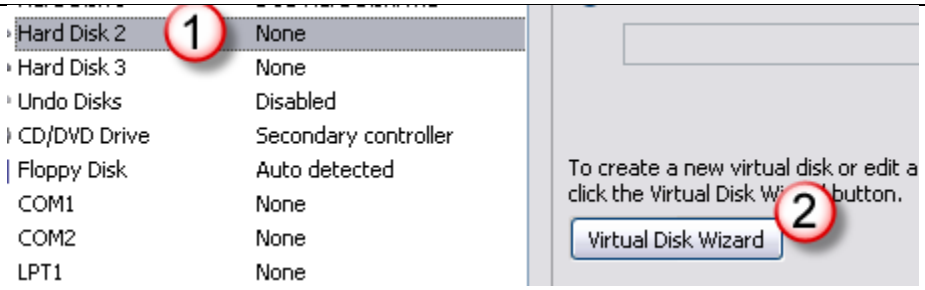
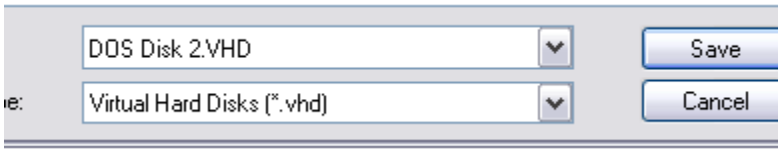
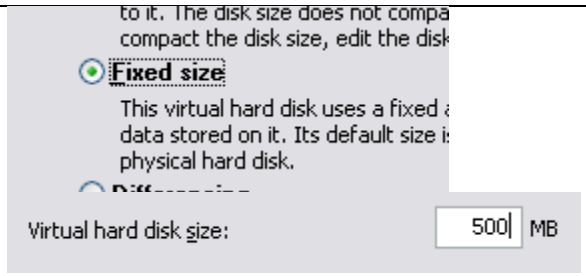
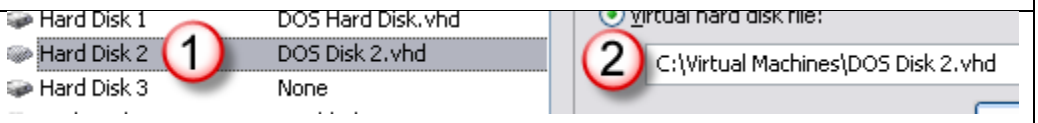


26. Click next.
27. It will warn you that everything on your drive will be deleted. If you’re cool with that, click Create.
28. It’ll take a little bit and then it will tell you it is done.
29. To test to see if it’s done, go into My Computer (I type explorer and select files) and look in your thumb drive.
30. You should see that→



Test by restarting your computer, go into BIOS and set it to boot from USB (or hit F12 and select USB). Does it boot?

LAB 5-5 CREATING A VIRTUAL HARD DISK IN DOS

1. Open Virtual PC. 2. Close DOS so that the state is not saved. 3. Click the DOS install and click the settings button in Virtual PC.	
4. Click Hard Disk 2 (it currently says None because you only have one virtual hard disk). 5. Now click Virtual Disk Wizard	
6. Click next, create a new virtual hard disk, browse to where your other DOS disk is. 7. Name this disk DOS Disk 2.VHD	
8. Create a Fixed Size disk. 9. Make it 500 MB. We don't need a big disk. 10. Click Okay.	
11. Quit DOS, turn off (not save state). 12. Click DOS 13. Click settings. 14. NOW you're going to put in a second hard drive (the one you just created).	
Reboot into DOS.	

Questions

1. What is a virtual hard disk?

2. What can you do with this disk you just created?

3. What are you going to need to do before you can use it? (Don't do that, just tell me. The next lab has you doing stuff to it.)

4. How many hard disks can you have in a virtual machine?

5. How many network cards?

6. Pretty cool, huh?

LAB 5-6 USING FDISK

Objective

Low level formatting is done using the format command. Low level formatting divides the disk in tracks and divides the tracks into sectors. This must happen before high level formatting when the disk is new, and can also be done when a disk is exhibiting a lot of unrecoverable errors. Generally this is done at the manufacturer. You will rarely perform your own low-level format. The steps to preparing a hard drive are as follows:

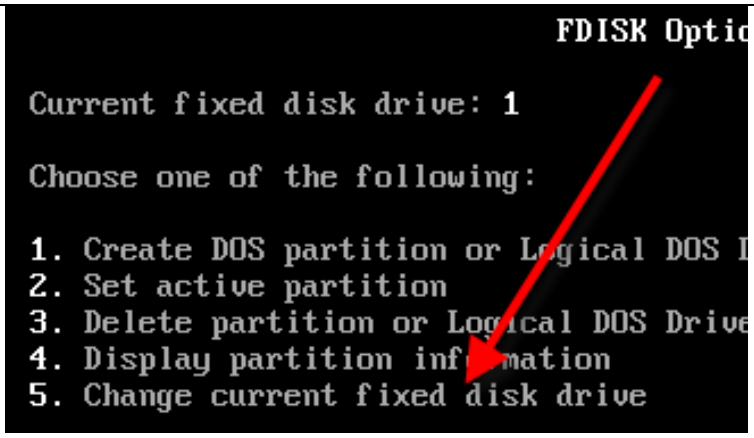
- ☐ Perform a low level format
- ☐ Partition the drive
- ☐ Format the drive with a high level format

You'll do the last two, only.

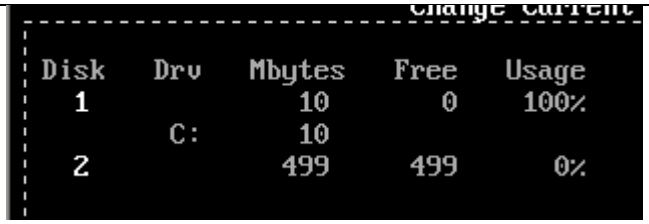
Viewing the current hard drive configuration

1. Reboot into your DOS Virtual Machine.
2. At the C prompt, type **FDISK**. Your screen should resemble this:
3. From the FDISK menu, select option 4 by typing **4** and then pressing **Enter**.
4. Observe your current hard drive configuration. In particular, note the volume label. **Write down what you see below:**

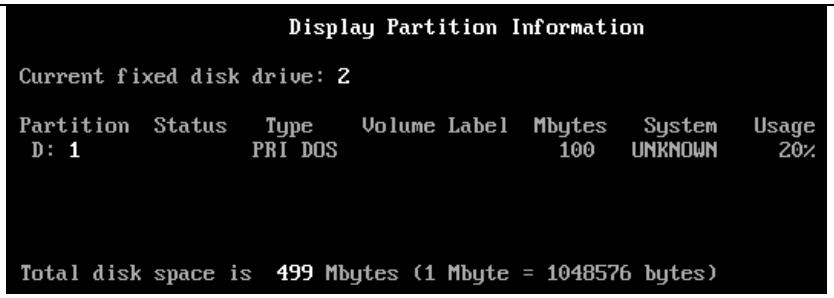
5. You are going to change your current disk drive (remember, you created a new disk in the last lab).
6. Hit escape to get back to the main menu.
7. If you do not see 5, that means you didn't complete the lab 6-2 so go back and do that.
8. Hit 5.



9. You should see something like shown to the right. You haven't done anything to your 2nd drive yet. It's pristine, clean, and ready to be
10. FDISKed!



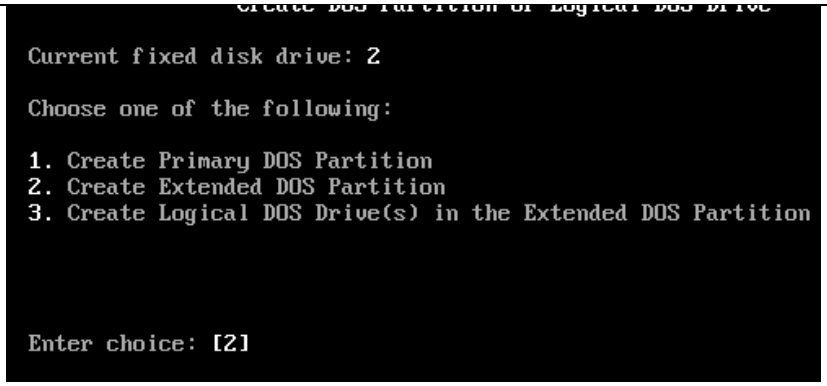
11. At the FDISK Main Menu, select option **1** and press **Enter**.
12. Type **1** and press **Enter**.
13. When the FDISK utility asks if you want to use all the available space for the primary partition and set it as active, select No by typing **N** and pressing **Enter**.
14. When FDISK prompts you to enter the amount of drive space you want to use, type **100** and press **Enter**.
15. Press **Esc** to return to the FDISK Main Menu.
16. Hit **4** to display partition information and you should see 1 partition, set as primary DOS, 100 MB in size, which is using 20% of your drive.

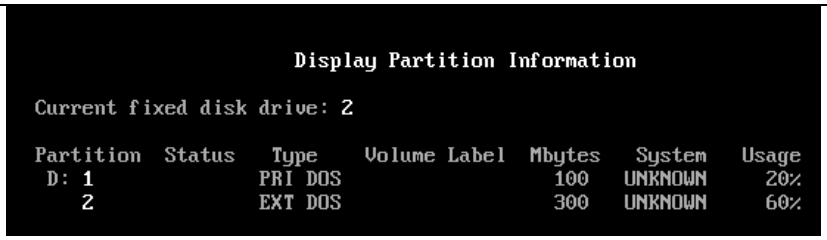
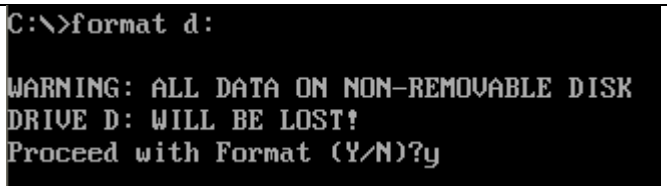


Primary, extended and DOS partitions.

- There are a maximum of four partitions that can be placed on any DOS or Windows 9x hard drive.
- These would be primary partitions. However, you can create extended partitions and put logical partitions inside extended partitions. Confused? Good.
- This allows you to get around the 4 partition limit.
- You can have only ONE extended DOS partition, but it can be split into lots of logical partitions.
- Only one partition can be active. The active partition is the one that is used for booting the system.
- **Primary**—A partition that can be named active and can hold boot files. There can be up to four. If you need four use:
- **Extended**—Used to hold logical partitions. There can be only ONE.
- **Logical**—used when you need more than four partitions. Logical partitions may ONLY be created within the extended partition.
- Why? Because I said so. (No, because that's how DOS works. No one thought they'd need more than two partitions, four max!)

17. So let's create an extended partition. Go back to the FDISk menu.
18. Select **1** to create a new partition.
19. Select **3** to create logical DOS drives in the extended DOS partition.
20. D'oh! You can't do that! You need to create an extended partition first!
21. Select **2** to create an extended DOS partition. Make it 300 MB.
22. It's going to immediately tell you that you have to create a logical drive. Why? Because you can't do anything to an extended drive unless it has logical drives. Create THREE logical drives of 100, 100, and 99 MB each (just follow the onscreen prompts).



23. When you are done display partition information. It should look like this:	
24. Go ahead and display the logical partitions. What drive letters have been assigned?	Write answer here
25. Exit out of FDISK. Because you created new partitions, you have to restart. 26. Test that your partitions are there. Type **d:** and hit enter. 27. It's giving you an error? What is the error and why are you getting it?	Write answer here
28. You have to format it so back at the C:\ prompt type **format d:** 29. Format away! Whee! Formatting is fun! 30. Label it **OLDWOMAN**	
31. What is happening as you format the drive?	Write the answer here, be specific.
32. Go into your D: drive and type **dir**. What do you see? 33. Why does it say "File not found?"	Write the answer here.
34. Create a text file within OLDWOMAN named fly.txt. Now do a DIR. 35. What do you see?	Write the answer here.
36. Format e: name it spider 37. Format f: name it bird 38. Format g: name cat	Take a screen shot of these partitions named (go into FDISK) and staple it to your lab report.
Delete a Partition	

39. Head into FDISK again. 40. Select **3** to delete a partition. 41. Select **2** to delete an extended partition. 42. You get an error? What is the error and why did you get it?	Write the answer here
43. Let's just delete ONE logical partition. 44. Do that (figure it out) 45. You'll have to reboot after you delete the partition.	

Setting an active partition

1. Select option **2** from the FDISK Main Menu.
2. Choose the primary partition that you created by typing **1** and pressing **Enter**.
3. Press **Esc** to return to the main menu.
4. Press **Esc** to exit FDISK and press any key. Your workstation will restart.
5. Note: If you already have DOS installed, the installer creates a single partition and sets it to active, so it will just tell you that it's already set to active.

Define the following terms:

Term	Definition
Active Partition	
Partition	
Extended partition	
Logical drive	
FDISK	
MBR	

Circle True or False.

1. When a partition's size is changed using the FDISK utility, the data contained on the partition is lost. True / False
2. The FDISK utility is used to partition and format hard drives. True / False
3. Extended partitions are always placed within logical drives. True / False

4. List three functions of the FDISK utility.

   a. _____ _____
   _____ _____

b. _____ _____
_____ _____
_____ _____
_____ _____
_____ _____

c. _____ _____
_____ _____
_____ _____
_____ _____

5. You are the desktop PC support technician for the Good Job Corporation. John, one of your customers, suspects that his hard drive is not partitioned to use its full capacity. Describe how you would use the FDISK utility to show John his current hard drive configuration.

6. Describe the relationship between a logical drive and an extended partition.

7. What is the difference between a physical drive and a logical drive?

LAB 5-7 INSTALLING A SECOND HARD DRIVE

Objective

You must format a hard drive to install a file system. In this lab exercise you will learn how to properly install and optimize the FAT file system.

After completing this lab, you will be able to:

- Format a partition.
- Use the SCANDISK utility to optimize performance.
- Use the DEFRAG utility to optimize performance.

Materials Required

- Operating system: Windows of some flavor
- Lab workgroup size: 2 students
- You MUST do this on your LAB computer (not the classroom DELLs. We never open those.)

Lab Setup & Safety Tips

- Each workstation's hard drive should contain one unformatted primary partition that has been set as active during lab 6-1.
- Be sure that the data stored on your lab workstation has been backed up before you proceed with this lab exercise.

1. Power off your lab workstation.
2. Install a second hard drive that does **not have anyone else's OS on it! You want a plain drive. Get it from me.**
3. Be sure that second drive is mounting in your CMOS.
4. Show me _____ _____
5. Go into your host OS and right click on My Computer and select manage.
6. Go to Disk Management. You should see your new blank hard drive.
    a. Right click on your computer
    b. Select "Manage"
    c. Click Disk Management
    d. You should see Disk 0 (your boot disk) and Disk 1 (as well as your CD ROM) If you do not see two disks plus CD, shut down and make sure everything is attached.
    e. Right click on the disk 1 and format it. Format as a Standard Disk.
    f. Go into "my computer" and look to see if it is there. Show me so I can check it off on the checkoff sheet.
    g. Once you have done that, shut down, ground yourself and remove that hard disk and check it back into me.

Do this next section using the VIRTUAL hard disk you created.

7. Go into DOS on your virtual PC.
8. Power on your lab workstation and allow it to boot from your DOS boot disk.
9. At the A prompt, type **FORMAT driveletterofnewdrive (probably D:/ or E:/)**
10. When asked to confirm before proceeding, type **Y** and press **Enter**. The format command begins to format drive C.
11. When formatting is completed, type a volume label of **DRIVE 1**.

Making drive bootable

You can use many different commands to make a drive bootable. Following are two examples of command sequences:

Using the SYS command

1. Power off your lab workstation.
2. Insert the boot disk into drive A.
3. Power on your lab workstation and allow it to boot from your DOS boot disk.
4. At the A prompt, type **SYS A: driveletter:** and press **Enter**.

Using the Format command

The /S switch tells DOS to add system information to the drive after it has been formatted. Use the /? option to view other FORMAT switches.

1. Power off your lab workstation.

2. Insert the boot disk into drive A.
3. Power on your lab workstation and allow it to boot from your DOS boot disk.
4. At the A prompt, type **FORMAT driveletter: /S**.
5. When asked to confirm before proceeding, type **Y** and press **Enter**.
6. When formatting is completed, type a volume label of **DRIVE 1**.

Go into your Windows 7 and make sure you can see the virtual hard disk you created.

1. Locate the drive in My Computer.
2. Right click on the drive.
3. Click properties→Tools.
4. Under Error-Checking click “check now”.
5. This runs the Scandisk tool.

Using the DEFRAG utility

1. In your start menu find the command prompt.
2. Right click and run as administrator. Defrag requires you to have admin access.
3. At the prompt, type **DEFRAG** and press **Enter**.
4. Write down the switches that work with defrag

5. Run “analyze only”.
6. Allow DEFRAG to reorganize the hard drive (this should happen quickly if the drive was formatted recently).
7. When the defragmentation is completed, exit the DEFRAG utility AFTER having me check it off.

1. Right click on your computer→Manage→Disk Management
2. Right click on one of the hard drives
3. Defragment
4. Show me

You will be required to do all of these things on your lab test. ALL OF THEM!

Review Questions

Circle True or False.

1. Using the SCANDISK utility will delete all files less than 512 K in size. True / False
2. The DEFRAG utility places file clusters in consecutive order. True / False
3. You should run the SCANDISK utility only once every three months. True / False

4. Describe the functionality of the DEFRAG utility.

5. You are currently employed as a PC desktop support technician at My World. One of your customers, Jamie, calls to tell you that her computer is running more slowly than it did last month. List two utilities that Jamie might use to improve the performance of her computer.

6. John is currently running DEFRAG, and it is taking a long time. John called you to ask what the DEFRAG program does, and why it seems to be so slow. Over the last year John has never run the DEFRAG utility. Describe to John both the purpose of the DEFRAG utility and explain why it is taking so long to run.

LAB 5-8 TEST HARD DRIVE PERFORMANCE USING SANDRA

Objectives

The goal of this lab is to help you use SANDRA to compare the performance of your system's drives against similar drives. After completing this lab, you will be able to:

➢ Use SANDRA to test your drive's performance

➢ Use SANDRA to compare your system's drives with similar drives

Materials Required

This lab will require the following:

➢ Windows 9x operating system

➢ SiSoft SANDRA 2011

Download and Install SANDRA

1. Go to www.sisoftware.com or the pub folder and download Sandra 2011 Lite. (Note: The Techspot server worked for me on December 6, 2010.
2. Log into your Windows XP.
3. Install SANDRA. Do not install the PDA versions.

SANDRA Lite can be used to run all sorts of tests on your hard drive. It should give you a nice indication of how your drive is running. We're going to use SANDRA to test our hard drives. **SANDRA is actually updated quite often, so if you use it at a tech you'd want to check for the newest version.**

1. Start SANDRA.
2. Click the hardware tab.
3. Click physical drives to analyze your hard drive and fill in the information below.

Type (SCSI, ATA, SATA)	
Interface	
Cache size	
Total sectors	
Number of ECC Bytes	
Bytes per sector	
Capacity	
Partition information	
Temperature	
ECC Corrected count	
List four features of your drive	

Space used	

4. What are two performance tips the program gives you to speed up the drive?

5. Click on the Benchmarks tab and click Physical Disks.
6. How fast is your drive? _____ MB/S (Megabytes per second)
7. What four drives does the program compare your drive with?
    a. _____ _____
    _____ _____ _____
    b. _____ _____
    _____ _____ _____
    c. _____ _____
    _____ _____ _____
    d. _____ _____
    _____ _____ _____
    e. Which ones are faster?
    f. Slower?
8. What could you do with this information?

9. Scroll down to benchmark breakdown. Fill out the following information.

What was the drive index speed?	
What was the random access time?	

Is index speed good or bad?	
Buffered write	
Look at detailed benchmark results	
Which position shows the fastest speed?	
Slowest?	

Review Questions

1. Why might you want to test your drive with SANDRA?

2. Based on the drive ratings information from SANDRA, do you think a drive performs better if it spins faster or slower?

3. Based on the drive ratings information from SANDRA, do you think a drive performs better if it reads data randomly or sequentially?

4. What does this tell you about a fragmented hard drive?

Lab 5-9 Changing the File System Type

Objective

Sometimes you have a hard drive that is formatted FAT but you want the security of NTFS. You would think you'd have to format it all over again and lose your data, right?

Wrong! There is a little utility that will allow you to change the way the drive is formatted from FAT to NTFS.

Note: You cannot convert from NTFS to FAT because of how the vector table is stored in NTFS. Think of it the same way you can use an old device in a newer port (say you can use a SATA 1.5 drive with a SATA 2.0 port) but you can't use the new stuff in the old port.

Materials Required

- One small partition on your drive that is formatted in FAT
- DOS boot floppy with FDISK on it

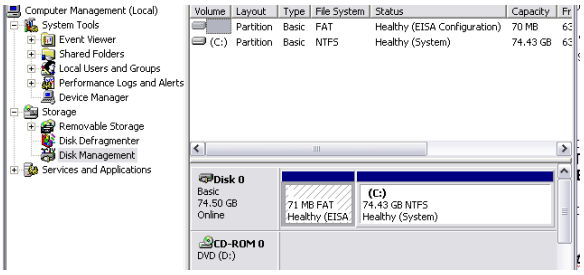
Lab Setup & Safety Tips

- Each workstation's hard drive should contain one unformatted primary partition that has been set as active during lab 6-1.
- You should have completed lab 6-2 to ensure your hard drive is defragmented and has been checked for errors.

Here we go

1. Boot into Windows XP.
2. Ensure that you have one small formatted partition on your drive and that it is formatted FAT.
3. What drive letter is assigned to your small partition? (It should be probably E or F.)

4. At the command prompt type **convert *driveletter*: /FS:NTFS**
    a. What you're saying is:
    b. **Convert** the drive at this letter
    c. From **FS** FAT to
    d. NTFS
5. Give the drive a volume label of **mydrive**.
6. Press enter and it will tell you if you can do this or not.
7. If you were to install XP on a FAT32 on a single hard drive and you converted, the conversion would take place next time you rebooted your computer. If you looked in computer management, it would still say it was FAT.



8. If you convert a partition on a drive that contains multiple partitions, the conversion takes place right away. Check it out.
    a. Open computer management
    b. Look in Disk management
    c. Take a screen shot and print it. Attach it to your *lab report*.

Review Questions

Circle True or False.

1. You can convert an NTFS partition to FAT without losing data? *True or false*
2. You can convert a FAT32 partition to FAT16 without losing data? *True or false*
3. What is the benefit of FAT16 over FAT32?

4. What is the benefit of FAT32 over NTFS?

5. What is the benefit of NTFS over FAT?

LAB 5-10 DISK UTILITIES BUILT IN TO YOUR OS

The following disk utilities are built into your operating system:

1. Chkdsk
2. Scandisk
3. Device manager
4. MSConfig.exe (not really a disk utility but helpful in troubleshooting)
5. NTBackup

Learn what each of these utilities does and describe them below.

Utility name	What it does

Perform the following tasks:

1. Use Chkdsk on your lab computer's hard drive. What is the outcome? (Describe what it found below.)
2. Use Scandisk on your lab computer's hard drive. What is the outcome? (Describe below.)
3. Go into device manager and identify the following (do this on XP)
    a. IRQ used

    b. I/O Ranges used (yes, all of them)

UNIT PROJECT

Module: Storage

Description of Problem
A customer comes into your shop. He has a small Real Estate franchise. He would like to purchase some form of removable storage that could be used to make things easier in his business. The files he's using are too big for floppies. They can use USB, but they want something more reliably secure. USB drives have been left around by employees, and even lost. The data is too sensitive to risk that happening.
Current Needs
• Fixed storage that can be used to store large files, work with both MAC and PC operating systems, will work in laptops, cameras, and video cameras. • A new server with a backup solution using RAID • Removable media that can work with different computer systems and cameras, video cameras, etc. • They will DEFINITELY need more than one type of storage to handle this.
Interviews with employees
After you have completed the jargon and list of questions you need to have answered, see me and I'll give you the rest of this information.
Expansion plans/Future needs
The company plans to expand. The interviews will help you understand what they need.
Your Requirements
Task One: Develop a list of terms/jargon to be defined for the customer. Define the jargon.
Task Two: Develop a list of questions that must be answered before you can begin your research.
Task Three: Develop a list of current customer needs.
Task Four: Develop a list of future customer needs.
Task Five: Research solutions to the problems and develop a solution to present to the customer.
Task Six: Keep a list of resources consulted as you go. It will be part of your portfolio.
Task Seven: Create a spreadsheet of prices to the solution.
Task Eight: Present the solution. Be sure to include pictures of the items you have chosen.
Deliverables
❍ Customer Overview
❍ Jargon list
❍ Questions
❍ Current needs
❍ Future needs
❍ Solution, including graphics and drawings as necessary
❍ Resource list
❍ Presentation of solution.

PROJECT RUBRIC

Criteria	Outstanding	Good	Needs Work	Poor	0
Customer Overview	20	17	13	8	
Definitions of jargon/terms used in project	20	17	13	8	
Developed a list of questions that should be answered before beginning.	20	17	13	8	
Customer current needs identified.	40	34	26	15	
Customer future needs identified	40	34	26	15	
Media can be read in cameras	40	34	26	15	
Media can be read on all different computers	40	34	26	15	
Media can be read in video camera	40	34	26	15	
Backup solution	40	34	26	15	
Solution is completely priced out	20	17	13	8	
Media is clearly defined	40	34	26	15	
Entire team participates in project	20	17	13	8	
List of resources used	20	17	13	8	
Project portfolio is put together and is complete	20	17	13	8	
Total Points on Project					

REVIEW QUESTIONS FOR REMOVABLE MEDIA MODULE

1. How many sectors per track are there on a 3 ½ “high-density floppy disk?
2. What two cables are connected to a floppy drive inside a computer?
3. What symbol is written to a disk to indicate that the track is formatted and data can be written to it?
4. What is the difference between a sector and a cluster?
5. What is another name for a cluster?
6. What is the purpose of the master boot record on a disk?
7. If a file is fragmented, describe how the entries in the FAT will look.
8. What cluster information for a file is found in the directory entry for the file?
9. Which bit in the file attribute byte tells if the file is a hidden file?
10. What is the difference between an external DOS command and an internal DOS command?
11. How can you make an exact copy of a disk if you only have one floppy drive on your computer?
12. List the steps to create an emergency startup disk using Windows 9x.
13. Why is it helpful to have EDIT.COM on the startup disk?
14. If a floppy drive is not working, why is it better to replace the drive than to repair it?
15. What might cause the error, “General failure reading drive A”?
16. How can you look at a 3 ½ -inch floppy disk and tell if it is a high-density or double-density disk?
17. What do you check if you get the error, “Write protect error writing drive A:”?

18. List the steps that you would follow to install a new floppy drive as drive B.

19. How does the computer distinguish drive A from drive B?

20. Which holds more data, a Zip drive or a Jaz drive?

21. What are the names of the three upcoming storage technologies?

22. List the description and maximum capacity of the following storage technologies.

Type	Description	Capacity
SDC		
USB flash drive		
Microdrive digital		
Magnetic ZIP drive		
Magnetic portable USB drive		
CompactFlash		
SmartMedia		
PocketZip		
Micro-optical		
Memory stick		
Flash drives		
QIC		
DAT		
DLT		