

# CIS 100: Module 5

Storage

# Next Week

- Next week is a work week on Thursday and a presentation on Monday (or vice versa).
- Two assignments
  - Install Windows XP or Vista (try) using the keys provided.
  - Be sure and only use half – 3/4 the hard drive.
  - Use the internet to develop a white paper on Linux Distributions and which one you might want to use and why.

# Old Media

- Floppy Disks (FDD)
  - These have had many manifestations but the current is a 3.5 inch 1.44 MB device.
  - The only typical use of these today is bios flashes or very small file storage. I would replace them with flash drives ASAP but having one is still handy at times.
  - Installation:
    - Has a separate port on the MOBO
    - Cable is tricky
    - If light remains on, usually means the cable is upside down.
    - Small 4 pin molex for 12v.

# IDE

- IDE is an old technology for communicating with “external” devices. These are typically only external to the MOBO and are inside the case. The most common IDE devices today are Hard Drives and CD/DVD drives.

# Types of IDE

- EIDE - very old stuff drives and CD ROMS
- Ultra-DMA (ATA-33) was newer but is already years out of date (33MB/s)
- ATA – 66 not very common (66MB/s)
- ATA 100 – few years old (100MB/s)
- ATA 133 – Current (133MB/s)
- 39 pin ribbon cable (usually but can be round).

# What do the numbers mean

- 133 is 133MBytes per second
- These drives are also called PATA drives.
- They are increasingly becoming scarce.

# PATA drive



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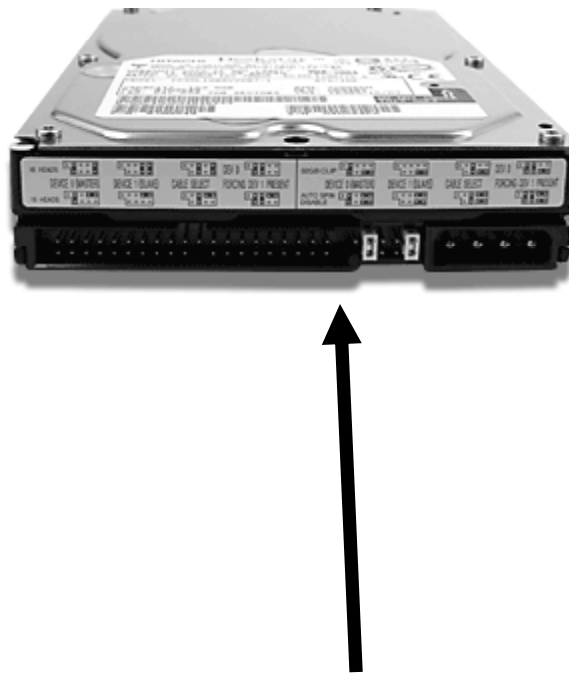
# Pata Drive Setup

- Drive has two cables
  - Power molex and IDE cable (39 pins). Most drives only allow cables to attach correctly
- Drive has a jumper that is set to Cable Select, Master, or Slave.
- If you are lucky, the config info is printed on the drive somewhere.
- Typically, use Cable Select as this is simplest.

# The Master Slave Problem

- Each IDE device has three jumper positions available:
  - Master
  - Slave
  - Cable Select (C/S, CSEL, or other)

# IDE Jumpers



# Jumpers

- Cable Select will usually work if you don't have any other information. Some drives have maps of jumper settings either on the drive back (like in the picture) or embossed on the top of the drive.
- Other drives can be looked up online.
- Most new drives are simple with only one jumper and three different settings.

# Why Cable Select is Problematic

- Some cables don't support it.
- Things can get weird if you switch the devices around.
- Use Definitive Jumpering if at all possible.
- This doesn't matter very much with the HDD and CD setup or with a single device on a channel.

# Master and Slave CSEL

- The middle connector is the Master and the end of the cable is the slave connector.

# SATA Drives

- This is serial ATA standard. Typically 150MB/s.
- This is the current hot topic especially about speeds.
- New SATA 3.0 supposedly 300MB/s

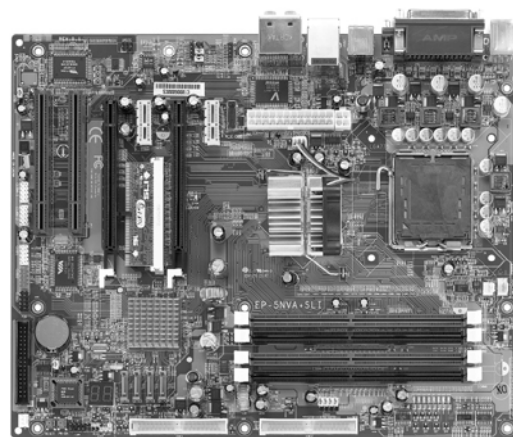
# SATA



# SATA

- Different cable that is a pain to keep connected. Very poor in machines that are subject to vibration and movement.
- Different mox for 12v (can adapt)
- MOBO must support
- Be careful about Hardware RAID connectors and read the MOBO manual to see which connectors to use. One device per mox so don't assume you can channel two into one like in IDE.

# SATA MOBO



# Typical Sata Problems

- Cables fall off
- Can't boot since the MOBO driver is not available.

# Newer Media

- CD-ROM
  - These run using ATAPI as a protocol but are IDE /EIDE devices.
  - They may also be SCSI devices on some machines.
    - SCSI is a different technology that has a variety of manifestations (wide, ultrawide, etc) and requires special cards, MOBOS and cables to function.
  - Usually set up as a SLAVE device on an IDE channel.
  - Biggest issue is:
    - Make sure the cable is long enough to reach.
    - Typically installed as the top of the stack.

# More Removable Media

- CD holds 673Mb (typically)
- Very slow device.
- CD-R is a write ONCE device (used to be called a WORM for write once read many).
- Once you save files to the disk, the disk can never be written to again even if there is still plenty of space.

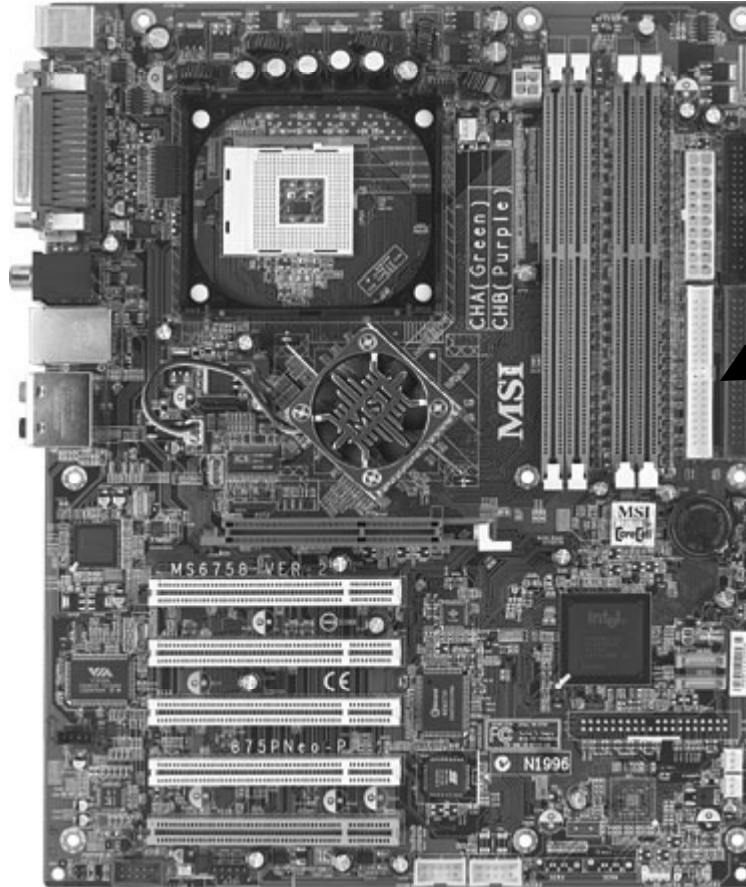
# More Removable Media

- CD-RW is a re-writable disk. CD-RW drives allow rewrites only on CD-RW media, you can use CD-R but the CD-R rules still apply.
- DVD/R et.al. 5 – 17 Gb of storage space.

# Connecting these devices

- Each device needs to be on a channel. There are typically 1-2 IDE channels on most MOBOs.
- These channels are large molexes on the mobo and usually one is a bright color like blue or yellow indicating the primary channel (channel 0)

# IDE connectors



# How to tell what is setup

- In the BIOS boot you will see the drives and where they are configured.

# What is RAID

- A way to configure disks that can represent both internal and external, hardware and software configurations or all of the above.
- RAID is usually more trouble than it is worth in desktops and I would avoid it unless you really really have a reason to use it.

# RAID

- RAID is Redundant Array of Inexpensive Disks
- Can also be independent disks today
- RAID is a way of managing multiple hard drives.
- You should be familiar with the following Raids
  - RAID 0
  - RAID 1
  - RAID 0+1
  - RAID 5

# RAID 0

- Striping
- Requires at least 2 disks.
- Performance Oriented.
- Has no fault tolerance
- Data is broken into blocks and written to different disks.  
This allows for faster reading and writing. Like writing with both hands at once.

# RAID 1

- Mirroring
- Requires at least two disks
- Fault Tolerance Oriented
- Data is duplicated across disks.
- This means read intensive tasks are improved (like web sites)
- If a disk fails, just rebuild from the other disk.
- NOT a substitute for backups except as a fault tolerance measure. If data is corrupted it will corrupt across all drives!

# RAID 0+1

- Mirroring and Striping
- Requires 4 drives minimum
- The stripe sets (RAID 1) are mirrored so you have two RAID 0s and each has a RAID 1 inside it.
- Very expensive due to all the disks but can create high performance fault tolerant setups.

# RAID 5

- This is striping with parity setup
- Requires at least 3 disks.
- Great Read mediocre write performance
- Parity stripes across all disks so any two disks can be used to recreate the other disk. This is hot swappable which means a failure is quickly fixed by plugging in a new drive.
- Capacity is Disk Capacity \* 2 essentially.

# RAID Req

- Must be built into the MOBO or you must provide a third party driver for it to work.
- Usually enabled in the BIOS.
- Even low end MOBOs often support 0 and 1 RAIDs today.
- I personally like RAID 5 if you can afford it.

# Why you still need backups

- RAID and other fault tolerant approaches are just that, for faults of hardware.
- If data is corrupted and then mirrored, all data is corrupted.

# Backups

- DVD backup is a nice approach
- TAPE backup
- Doug's Push Mirror approach
  - A protected server is the real data
  - This server pushes data onto the public server and no one outside can access the push server.
  - If the public server is compromised, so what, it will re mirror with valid data.

# Backup Rotation

- One backup per business cycle (usually a day or shift). These can be incremental (only changed files are updated) backups.
- One backup per week.
- One backup when the books close. (or monthly)
- Store weekly or critical cycle backups off-site, preferably in a SAFE location.

# Drive Formats

- NTFS
  - Windows Standard and the best approach for formatting Win systems
- FAT 32 and older – These are not recommended unless you are trying to run older OS.
- EXT2 and 3 – LINUX, quite robust. Windows won't recognize.

# Partitions

- HD is a physical drive. You may have one or more physical drives.
- HD can be broken into logical drives.
- This is done by a partitions

# All drives have at least one partition

- Boot partition
- Data Partitions
- Using multiple formats (NTFS, EXT3).
- A common approach
  - Boot partition (contains boot loaders and drivers, very small)
  - NTFS partition for Windows
  - EXT3 Partition for Linux
  - NTFS data partition to be shared by both OS.

# Partition Information

- Split the disk into 2/3 and 1/3 when windows asks you to setup the disk
- The 1/3 is for Linux.
- Install Windows First
- Defaults are fine but you will need your MSDNAA keys.
- If you want to go ahead and install linux from the DVD, go right ahead it's not hard. You don't need any server technologies. ©