Output, Input, and Storage Devices

- IO operations handled by OS
  - tasks
    - Handle input from the keyboard, mouse, and other input devices
    - Handle output to the screen, printer, and other output devices
    - Control information storage and retrieval using various forms of disks drives
    - Support communications with remote computers
  - Accomplishes tasks
    - Software – perform actual communications between physical device and OS
      - device drivers within OS
      - supplied by 3rd party
    - Hardware for specific devices – adapters that plug into a slot on mother board
      - Controllers
      - Adepter boards
- Installation of drivers
  - Windows
    - Files are often compressed
      - PKZIP or winzip
      - Self extracting files
  - UNIX
    - Files are in tar format
      - Groups files not compressed
      - Compress often used to compress the tar file
- OS considerations
  - DOS
    - Can require changes to config.sys or autoexec.bat
      - Config,sys
        - Loads first when OS boots
        - Includes commands to low-level drivers and to configure memory
          - Format device=<path>filename
          - See pages 218-219
      - Autoexec.bat
        - Issues DOS command as though they were typed at keyboard
        - Specific to each driver
  - Windows 3.1
    - Use Control Panel to install hardware
      - Found in Main window
        - Icons for
          - Printers

        - Drivers
        - Etc.
    - Need to have diskette or CD-ROM with driver
        - See pages 222-223
- Windows 95, 98
    - Uses Plug and Play
        - Windows looks for new hardware when it boots
        - Tries to find a driver
        - Can use Add Printer button under printers to load driver manually
        - Pages 224-225
- Windows NT 4.0
    - Similar to Windows 98
    - As with 98 can connect to a network printer
        - Ability to share a printer with other users on network
- MAC OS
    - Installation includes drivers for all Apple-brand computers
        - If not check to see if printer compatible with existing drivers
        - May need to re-run part of MAC installer
        - See pages 227-229
- UNIX
    - Drivers loaded into kernel
        - Either
            - Kernel modules
                - Pieces of code that have to linked into kernel
            - Loadable modules
                - Loaded when OS boots
        - Printers
            - Use print queues because UNIX is multitasking
            - Printer configuration
                - Stored in /etc/printcap
                - How to configure
                    - Plain ASCII file, edited in text editor
                    - Or edited with printtool or admintool
                - Can be networked by making an entry in each local machines's printcap file pointing at machine with printer attached

- Printers
    - Types
        - Dot matrix printer
            - Produce character by impacting a group of wires from a rectangle grid onto a ribbon and then the paper to produce characters

        - Noisy
        - Quality low compared to ink-jet or laser
    - Ink-jet
        - Creates characters form dots by squirting tiny droplets of ink directly onto a page
            - Up to 1,400 dots per inch
            - Can be color
    - Laser printer
        - Use imaging technology similar to copiers
        - Contains own cpu and memory
        - Pages produced electronically within printer
    - Specialized prnters
        - Line printers
            - Impact printer that prints whole line at a time
        - Thermal-wax transfer
            - types
                - Rolls of plastic coated with color wax, which is melted onto the page, one primary color at a time
                - Phase change
                    - Melts wax in individual colored sticks and spray the molten, colored wax onto the page
        - Dye sublimation
            - Atomizing waxy colors onto paper a step
            - Spray pigments onto paper by vaporize them
            - Color gas penetrates surface of paper to create an image
        - Imagesetter
            - Produce master pages for offset printing
- Printer connections
    - Initially connected to a serial port
        - Serial port manages communications between computer and printer in a one bit after the other, asynchronous) stream
    - Parallel port
        - Data flows on parallel streams
        - Often called Centonics interface
            - Named after printer mfg that made in popular
            - Originally 36 pin, now 25 pin
    - Connect directly to network
        - Built in Ethernet NIC
    - USB
        - Universal Serial Bus
    - Apple
        - Apple Desktop Bus(ADB)
            - Used for

        - Keyboard
        - Mouse
        - Printer
    - Latest DIN8m
- Display adapters
    - Technology
        - Display adapter card
            - Part of all systems
        - Pixel
            - Picture element
                - Small dot of light
                - Screen sizes - resolution
                    - 640 X 480
                    - 800 X 600
                    - 1024 X 768
                    - 1280 X 1024
                    - 1600 x 1280
        - resolution
            - amount of memory onboard the adapter
            - type of video processor
        - dpi for monitors mostly 72 dpi versus some printers 600dpi, 1200dpi, etc
        - color rendition capability
            - 16 colors
            - 256
    - installing adapters
        - shut down machine
        - install in a slot
        - see page 236
- Sound cards
    - Automatic support on most machines
    - Types
        - Bus
        - Hardware integrated on mother board
- Input Devices
    - Mouse and keyboard divers
        - Standard and part of OS
        - Use serial ports
        - Universal standardization
    - Mouse
        - Ball that rotates as you move it
            - Moves two potentionmeters(variable resistors) positioned at 90 degree angles
                - OS records
                    - Direction of movement
                    - Distance moved

        - Speed of movement
    - Micro-switches
        - Buttons that are pressed close switches
    - OS drivers capture the above
    - Wheel mice
        - By default replaces vertical scroll bar
        - Need special drivers to use
- Digital Tablets
    - Als0 called digital pad
    - Used to draw, alternative to mouse
    - Uses serial port or USB
    - Need custom drivers
- Scanners
    - Convert paper into digital image
        - Image saved in variety of formats
            - JPEG, TIFF, etc
        - Older scanners used SCSI – Small Computer System Interface
            - Need custom drivers
        - Now USB or parallel
- Joystick
    - Used mostly for games
    - Like mouse, uses a mechanical device to rotate one or more potentionmeters
    - Used for three dimensional movement
    - Button to simulate firing, boxing,etc
- Digital Sound Input
    - Most computer now have sound cards for input and output
    - Cards Plug into PCI bus, some now use USB
- Digital Picture and Video Input

- Computer storage
    - Hard Drives
        - Most popular Intel PC is IDE
            - Integrated Drive Electronics
            - Often built into main board
            - Support two devices
                - Master and slave
                    - Master has two connectors
                        - One goes into IDE
                        - Other can go two second device
            - Newest standard EIDE – Extended Integrated Drive Electronics
                - Support transfer up to 33 megabits per second
            - New systems have dual IDE
                - One for boot device
                - Second often used for CD-ROM

- SCSI
  - Small Computer System Interface
  - Many different SCSI designs
  - 50 pins cables
  - one device is controller, others can be disks
  - connected by single cable – limit 18 feet
    - SCSI-1
      - 8-bit wide bus
      - 10 MHZ
    - SCSI-2
      - 16 bit wide
      - 20 MHZ
    - SCSI-3
      - 32 bit wide
      - 20 MHZ
- RAID arrays
  - Redundant Array of Inexpensive Drives
  - Introduced by University of California at Berkley
  - Purpose
    - Increase reliability
    - Increase storage capacity
    - Increase storage speed
  - Combination of hardware and software
- CD-ROM
  - Compact disc read-only memory
  - Uses a big spiral that starts at inside of the disc and winds its way toward the outside
  - Rotated by precision motor
  - Optical pickup by laser light being emitted and reflected off disc
    - Surface of disc has indents, which shifts position of reflected light
    - Depending on size of indent and 0 or 1 is stored
  - Capacity 650MB
  - Single sided
  - Speed 150KB per second
  - Seek time on average of 150 milliseconds
  - Rotational speed 2X to 48X
  - Use hard disk interface
  - IDE or SCSI
- DVD
  - Digital Versatile Disc
    - Can have two sides
    - Can have two layers per side

        - Second layer read by using light at different angle
        - Second layer a spiral written from outside to inside
    - Store up to 5.4 GB per layer
        - Total per DVD 22GB
    - Speed 2X to 4X
    - Read only
    - Use hard disk interface
    - IDE or SCSI
- Removable
    - Flexible magnetic
        - Zip Disks and higher capacity JAZ
        - Zip
            - 100 or 200 MB
            - connection
                - Internal – IDE or SCSI
                - Parallel
                - USB
            - Cartridge that contains a magnetic disks
        - JAZ
            - Cartridge slightly larger
            - Heads in continuous contact with disk as data read or written
            - 1GB or 2 GB
    - Rigid Cartridges
        - Made of solid material
        - Head not in contact like a Hard Disk
            - Advantages over soft media
                - Head last longer
            - Disadvantage
                - Not easy to have a head float
        - Types
            - Bernoulli
                - Semi-rigid removable base on Bernoulli aerodynamic principle
            - SyQuest
                - Similar to Bernoulli
                    - Principle of an air cushion and positive air pressure not used
                    - Distance between disk and heads slightly greater