

Modems and Other Communications Devices

- Modem
 - **Modulator/Demodulation**
 - Piece of hardware that takes digital signal in computer and translates to an analog signal(Modulates) or takes telephone analog signal and translates to a digital signal(demodulates)
 - Consists of
 - Data pump
 - Performs modulation/demodulation
 - Controller
 - Protocols for modulation
 - V.34
 - Defines 28,800 bit standard
 - V.90
 - Defines 56,000 bit standard
 - Protocols for Error correction
 - MNP-4,V.42
 - Protocols for Compression
 - MNP-4,V.42bis
 - Interpret AT commands
 - Set configuration and operational instructions
 - AT stands for Attention
 - Tell modem to interpret next character as a command instead of data
 - UART
 - Universal Asynchronous Receiver Transmitter
 - Converts data from computer into data sent to serial ports
 - Adds start and stop bits(two), generates an interrupt and feeds the bits to the serial port at a speed that will not overwhelm the modem
 - Asynchronous communications use start and stop bit, not efficient as synchronous but less costly to implement
 - Synchronous sent it blocks that included embedded clock signals or alternatively clock signal over a clock line that is part of the circuitry
 - 8250 UART was standard now 16550 UART
 - External Modems use the computer's UART
 - Internal Modems have their own
 - Internal Modems
 - Built on expansion cards that plug into PCI bus

- External Modems
 - Plugged into serial port or USB port
- Software based modems
 - Winmodems
 - Controllerless modem that retains a data pump(digital signal processor) but implements the controller functions in software,
 - host signal processor(HSP)
 - dispense with controller and data pump entirely
 - Instead of using their own signal processor, the use the CPU with special software
 - Disadvantage
 - Use memory and processor cycles
 - Dependence on OS, each OS needs its own program
 - Advantages
 - Cost saving
 - Easily upgraded
- Hayes AT Command Set
 - Dennis Hayes devised a way to create a general purpose modem that could be configured using a command language he invented
 - Hayes or AT Command Language
 - Commands begin with AT
 - Commands
 - DT
 - dials number that follows
 - ,
 - causes a delay before executing next command
 - W
 - Wait for dial tone
 - +++
 - escape from online mode to command mode
 - H
 - Hangup
 - O
 - Go from command mode to online mode
 - S0=n
 - Answers incoming calls after n rings
 - Ln
 - Set speaker, where n is a relative volume 0 lowest,3 highest
- Digital Modems
 - Data is digital from start to finish
 - Digital devices that use a digital medium
 - ISDN
 - Integrated Services Digital Network

- Uses a digital telephone line for high speed computer communications
 - Around for 20 years, rise of Internet causes it to become more popular
 - Uses standard copper telephone lines with digital equipment on either end to encode and transmit the information
- Bridges
 - Connect or bridge one network to another
- Routers
 - Route network packets to different networks and can route multiple protocols
 - Discuss tracert utility
- Cable Modems
 - Connect to television cable and use one or more channels to transfer data at very high speeds
- DSL Modems
 - Digital Subscriber Line
 - Use standard telephone lines to transfer data at high speeds
 - Digital modems at both end of lines
- Data Communications over phone lines
 - Software flow control
 - Xon-xoff
 - Ascii 19(ctrl/S) stops flow
 - Ascii 17(ctrl/Q) resume flow
 - Receiving modem sends xoff to stop transfer while it processes data in buffer, after processing send xon
 - Disadvantages
 - Data may contain xon or xoff
 - Use bandwidth to pass data about condition of stream
 - Hardware flow control
 - Controls movement of data by changing voltage on specific pins in the serial interface
 - Error correction
 - Parity checking – extra bits sent to verify that what is received is what was sent
 - Discuss even and odd parity
 - Data Compression
 - Modern modems also compress the data