Broad-Band Access

ITS 214
Definition

• Broadband Internet Access
  • Anything that substantially exceeds the speed of dial-up modems (56kbits/sec)

• Several Possible Implementations
  • Use the existing twisted pair local loop
  • Use the Cable TV plant
  • Use Wireless (3G, WiMax, etc.)
  • Install new cables (Fiber to the ...)
  • Use existing power lines
Dial-Up

• Designed to work over voice lines
  • Take digital data from the computer
  • Convert to analog signal
    • 300 to 3300 Hz
  • Receiving modem reconstructs digital information
ISDN-BRI

- Integrated Services Digital Network - Basic Rate Interface
  - Recognize that the rest of the net is digital, why not the local loop?
  - ISDN BRI uses the existing wires
    - Transmits at 128kbits/sec
    - Faster than dial-up, but not by much
    - Voice takes up 64kbps
Cable TV Network

• Good News
  • High capacity (800MHz)
  • Digital Fiber and Coax Hybrid
    • So Cable “modems” are not really modems

• Bad News
  • All the capacity is shared among users (viewers) for broadcast
  • Originally all data was flowing one way (out)
Cable Modems

- Cable Network Redesign
  - Two way (asymmetric)
  - Split the network
    - Not too many users have to share
    - Use fiber
- Cable box gets an upgrade (and an Ethernet port)
- Voice over IP completes the “triple play”
DSL

- Telephone Companies
- Need to use existing copper local loops
  - ISDN is too slow
  - New encoding scheme:
  - Digital Subscriber Line (DSL)
    - Many versions
    - Mostly asymmetric
    - Speeds are very dependent on distance
DSL

• Uses full bandwidth available on the wire
  • Longer distances, less bandwidth
  • Leaves the 0-4kHz voice band alone

• Local Loops vary in quality
  • Loading Coils
    • Used to improve voice quality, impairs DSL
    • Other impairments (taps, partial repairs, etc.)
      • OK for voice, not for DSL
DSL Components

• Customer side
  • Splitter or Filter
    • Separate voice and data
  • DSL “modem” (really a data adapter)

• Central Office
  • DSLAM - Digital Subscriber Line Access Module
    • Send voice to the central office switch
    • Route packets to an Internet Service Provider
DSL Service

• Telephone Company
  • Can provide ISP services or route to a 3rd party
  • Voice is bundled with most DSL services
    • Some telephone companies will sell data-only DSL
  • Can’t get to “triple play” with DSL
    • Video is missing
    • Replacing local loop with Fiber fills this in
    • Example: Verizon FIOS
      • Expensive to install - high population areas only
Wireless

• 3G cell service
  • “Tethering” of laptops to smart phones
  • Data only adapters

• Stationary receivers
  • Wide area wireless LAN service
  • WiMAX
    • Wireless data service designed for many different frequency bands

• Coverage depends very much on terrain