The Digital Access Issue

- The PSTN network is optimized for voice
  - The voice network is based on circuit switching, expecting call durations of 3-5 minutes
  - Data network access calls last much longer, but activity occurs in small bursts (packets)
- Efficient data access needs “always on” shared facilities

Access Alternatives

- Circuit Switched
  - Modems
  - ISDN
- Packet-Friendly
  - Cable Modems
  - LMDS
  - xDSL (Digital Subscriber Line)

Cable Modems

- Cable plant has high bandwidth available (6MHz per cable channel, 45MHz “upstream”)
- Cable TV acts like a LAN, the capacity must be shared
- There is no circuit switching, the connection is “always on”
LMDS

- Designed as “Wireless Cable”, based on the same idea as cellular telephony
- Large capacity available (1.15GHz in Block A, 150MHz in Block B)

xDLS

- Started due to a desire to run T1/E1 without repeaters at every mile.
  - Uses sophisticated coding – like modern dial-up modems – on a much larger frequency range
  - Uses the available frequencies above the 4kHz voice band
  - Has to divide the remaining bandwidth into “upstream” and “downstream”

ADSL

- 16 to 640kbps subscriber to CO
- Up to 8Mbps CO to subscriber
- Limit 18000 feet under good conditions
- Impaired by
  - Wire gauge changes
  - Bridge Taps
  - Loading Coils

ADSL Structure

- DLSAM - Digital Subscriber Line Access Module
- Voice Switch
Some Structural Questions

- How is the Internet connection accomplished
  - For ISDN
  - For ADSL
  - For Cable Modems