Digital Subscriber Line “Cable Modem” Access
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)
xDSL

• 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

Customer LAN → ADSL Modem → Splitter or Filter → Local Loop → Voice Devices

Internet → DSLAM

CO

Voice Switch

DSLAM - Digital Subscriber Line Access Module
Some Structural Questions

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