* Core layer
  + Multinode core
* Connecting media
  + Fiber
  + Wireless
  + Microwave
  + Satellite
* Control signaling
  + Packet switching
    - Line efficiency is greater because a single node link can be dynamically share by many packets over time
    - Two stations of different data rates can exchange packets because each connects to its node at its proper data rate
    - Priorities can be used
* WAN Protocols
  + Frame Relay
    - X.25 protocol between user and network
      * Call control packets for setting up and terminating virtual circuits are carried on the same channel and same virtual circuit as data packets
      * Multiplexing of virtual circuits takes place at layer 3
    - Eliminate much of the overhead the X.25 imposes on end-user systems and on the packet switching network
    - Utilizes:
      * Call control signal is carried on a separate logical connection from user data
      * advantage of the reliability of data communications networks to minimize the error checking done by the network nodes. This provides a packet-switching protocol similar to, but much faster than, X.25.
      * Multiplexing takes place at layer 2 instead of layer 3, eliminating an entire layer of the process
      * There is no hop-by-hop flow control and error control
    - Data frame is sent directly from source to destination
      * Acknowledgement sent back in a response frame
    - Multiple connections over a single link
      * Each link has a locally unique DLCI
    - Data transfer involves 2 stages
      * Establish a logical connection between two endpoints and assign a unique DLCI to the connection
      * Exchange information in the data frames
      * Release the connection
  + X.25
  + Integrated Services Digital Network
  + Point-to-point
  + Layers 2 and 3 include flow control and error control mechanisms
    - Considerable overhead
    - Not suitable for modern digital communication facilities with very low link error rates
* Real-time services
  + Constant bit rate
    - Fixed data rate that is continuously available during the connection lifetime and a relatively tight upper bound on transfer delay
      * Audio/video
* Non-real time services
  + Variable bit rate
  + End system specifies peak cell rate, sustainable cell rate, measure of how bursty/clumped the cells may be
  + Network allocates resources to provide low delay and minimal cell loss
  + Data transfers that have critical response times
* WAN protocols