Communication Networks (Contd.)

Asynchronous Transfer Mode (ATM)

- Also known as cell relay
- Operates at high data rates
- Resembles packet switching
  - Involves transfer of data in discrete chunks, like packet switching
  - Allows multiple logical connections to be multiplexed over a single physical interface
- Minimal error and flow control capabilities reduces overhead processing and size
- Fixed-size cells simplify processing at ATM nodes

ATM Terminology

- Virtual channel connection (VCC)
  - Logical connection in ATM
  - Basic unit of switching in ATM network
  - Analogous to a virtual circuit in packet switching networks
  - Exchanges variable-rate, full-duplex flow of fixed-size cells
- Virtual path connection (VPC)
  - Bundle of VCCs that have the same end points

Advantages of Virtual Paths

- Simplified network architecture
- Increased network performance and reliability
- Reduced processing and short connection setup time
- Enhanced network services

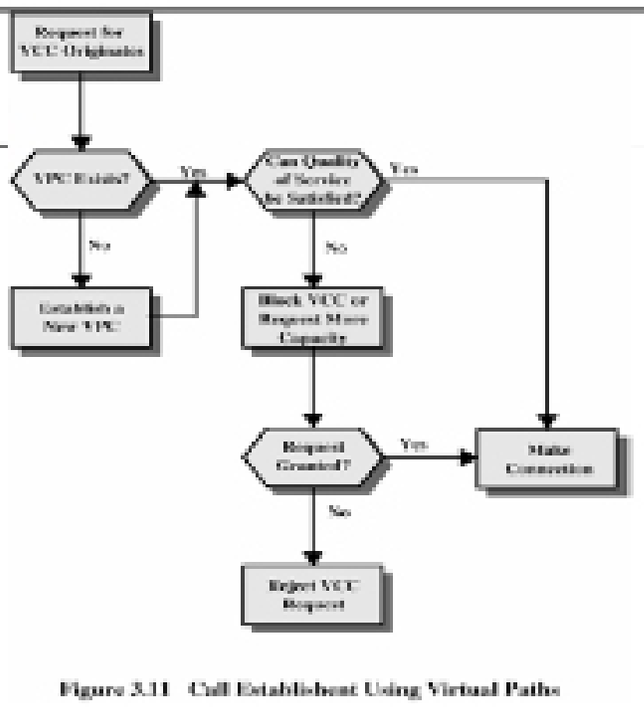

Figure 3.11 Call Establishment Using Virtual Paths

Virtual Channel Connection Uses

- Between end users
  - Can carry end-to-end user data or control signaling between two users
- Between an end user and a network entity
  - Used for user-to-network control signaling
- Between two network entities
  - Used for network traffic management and routing functions

Virtual Path/Virtual Channel Characteristics

- Quality of service
  - Specified by parameters such as cell loss ratio and cell delay variation
- Switched and semi-permanent virtual channel connections
- Cell sequence integrity
- Traffic parameter negotiation and usage monitoring
- Virtual channel identifier restriction within a VPC

ATM Cell Header Format

- Generic flow control (GFC) – 4 bits, used only in user-network interface
  - Used to alleviate short-term overload conditions in network
- Virtual path identifier (VPI) – 8 bits at the user-network interface, 12 bits at network-network interface
  - Routing field
- Virtual channel identifier (VCI) – 8 bits
  - Used for routing to and from end user

ATM Cell Header Format

- Payload type (PT) – 3 bits
  - Indicates type of information in information field
- Cell loss priority (CLP) – 1 bit
  - Provides guidance to network in the event of congestion
- Header error control (HEC) – 8 bit
  - Error code

ATM Service Categories

- Real-time service
  - Constant bit rate (CBR)
  - Real-time variable bit rate (rt-VBR)
- Non-real-time service
  - Non-real-time variable bit rate (nrt-VBR)
  - Available bit rate (ABR)
  - Unspecified bit rate (UBR)

Examples of CBR Applications

- Videoconferencing
- Interactive audio (e.g., telephony)
- Audio/video distribution (e.g., television, distance learning, pay-per-view)
- Audio/video retrieval (e.g., video-on-demand, audio library)

Examples of UBR applications

- Text/data/image transfer, messaging, distribution, retrieval
- Remote terminal (e.g., telecommuting)