Fast Networking Technologies

Asynchronous Transfer Mode
or cell relay

similar to frame relay in many respects except:

- data transmitted in *fixed size cells*
  - small cells reduce delay for priority cells
  - fixed length allows efficient hardware switching
- even more streamlined
- faster - data rates include 155.52Mbit/s and 622.08Mbit/s

ATM (cont)

Two layers:
- ATM layer
- ATM Adaptation Layer (AAL)

Several adaptation layer protocols defined:
- 1 constant bit rate services
- 2 variable bit rate services - strict timing constraints
- 3/4 variable bit rate service
- 5 variable bit rate - the Simple and Efficient Adaptation Layer (SEAL). Used for LANs where higher level protocol manages connection.

**See "Internetworking with ATM WANs"
By J. Cavanaugh & T.Salo. for tech details.
with these notes on the web**

ATM Logical Connections

- Logical connections known as Virtual Channel Connections (VCC's)
  - variable rate
  - full duplex
  - fixed size cells

- Virtual Path Connections (VPC)
  - a group of VCCs
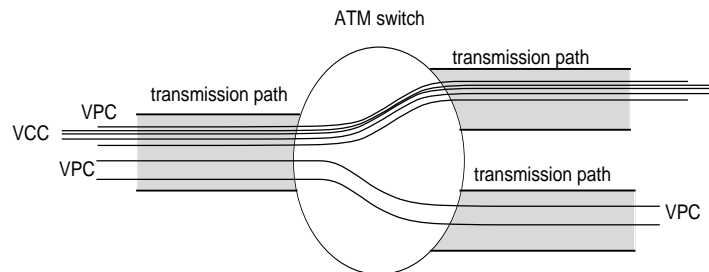
VCC/VPC characteristics

- Quality of Service
- Switched and semi permanent connections
- Cell sequence integrity
- Traffic negotiation and monitoring
- Virtual Channel Identifier restriction

- A call control signalling channel is required so as to be able to set up a VCC (or VPC)
- A permanent channel is thus required to do this, the *meta-signalling* channel.

ATM cells

- header 5 octet
- payload 48 octet

Virtual Path Identifier	12 bits (8 bits at UNI)
Virtual Channel Identifier	12 bits
Payload type	3 bits
Cell Loss Priority	1 bit
Header Error Control	1 octet
Information	
	48 octets

Transmission

- No framing (ie. flags)
  - synchronisation by bit by bit checking of for correct Header Error Control (HUNT)
  - a number of additional consecutive cells are checked before synchronisation achieved (PRESYNC)
  - once SYNC is achieved error detection and correction can be performed. Several failures indicate synchronisation is lost.

ATM Congestion

More problematic than for packet switching or frame relay

- traffic not amenable to flow control
- wide range of applications few kbit/s to 100's Mbit/s
- Many different traffic patterns (constant <--> bursty variable)
- different service requirements eg. delay sensitive & loss sensitive
- very high speeds make situations volatile - reaction causes waste and possibly oscillation

research currently being carried out in this area

SMDS
(Switched Multi-megabit Data Services)

- Introduced in US by Bellcore 1989
- Adapted to Connectionless Broadband Data Service (CBDS) by ETSI.
- Trials in Europe 1993
- Wide area, packet data service
- Offered by the PTOs
- Designed to bridge gap between LAN and leased lines.
- Compliments ATM and FDDI
- Data rates from 1.5Mbit/s-34Mbit/s
- Data only service. Primary target - LAN interconnect

SMDS service

- Switched Service - no need to create virtual channels etc.
- Based on IEEE 802.6 MAN standard
  - 53 octet cells
  - E.164 addressing (international scheme)
- Supports Multicast
- Can implement popular protocols through its Subscriber Network Interface (SNI) eg. TCP/IP, Appletalk, DECnet etc
- Supports a set of operation, administration and maintenance functions for network management using a SNMP agent.

SMDS in more detail

- Variable length packets (to 9188 bytes)
- No virtual circuits - individually addressed SMDS packets.
- Segmentation And Reassembly performed for transport over ATM networks.
- whole (36 octet) SMDS header fits into one cell allowing pipelining.
- Pipelining - network can start forwarding cells before the whole packet has arrived.

SMDS Access Classes

- Average rate of transfer of user information known as Sustained Information Rate (SIR)

- Several SMDS access classes available providing the following SIR characteristics:
  - Class 1 = 4Mbit/s
  - Class 2 = 10Mbit/s
  - Class 3 = 16Mbit/s
  - Class 4 = 25Mbit/s

- Enforced using a "credit manager"

SMDS Comparison

- Leased Lines
  - fixed bandwidth
  - users must build their own network
- X.25
  - full error control and correction
  - usually 64kbit/s, 2Mbit/s fastest
- N-ISDN
  - 64kBit/s to 2Mbit/s, circuit switched
  - relatively long call setup
- Frame relay
  - connection oriented (virtual circuits)
  - wideband, not broadband
- ATM
  - ATM is a *technology* SMDS is a *service*
  - SMDS can be used over ATM