

Questions Asked

- What major corporations are using IVD?
- International trends in IVD
- ♦ Voice over IP
- Private corporate ATM networks
- Public ATM networks
- ◆ IVD business models

Questions Answered

- ♦ Voice over IP
- ♦ QoS in IP networks
- The state of ATM
 Private corporate ATM networks
 Public ATM networks

Voice over IP

- 1st application "free" calls to Paris worth almost that much
- to do it right requires QoS controls in network not yet state of the art

how to do it

simple - throw bandwidth at problem hard - reserve bandwidth & delay needed

Quality of Service (QoS) in IP

- the ability to define or predict aspects of the performance of systems on a network
- one of the original goals for the Internet Protocols
 - "type of service" differ in speed, latency & reliability datagram protocol (for robustness)
- ♦ little or no QoS features in LAN protocols

Integrated Services (Int-Serv)

- architecture for supporting real-time applications over the Internet Protocols and the Internet
- guaranteed delay bounds absolute upper bound of delay
- link sharing set maximum shares of a link
- predictive real-time service stable delay
- overview Informational RFC 1633

Int-Serv, contd.

basic parts

admission control - determines if new flow can be added

classifier - determines flow for incoming packet

packet scheduler - queues packets for transmission also requires an estimator for outgoing packet stream uses Weighted Fair Queuing (WFQ)

not just traffic prioritization on a link

Int-Serv, cont.

- priority be itself is not enough if too much high-priority traffic prioritization does not help separate request process not accepted if it would overload
- requires flow-specific state in routers change in basic Internet model use soft state - can change on path change vs. hard state - set at start, teardown at end
- may require request & flow authentication

Delay Affected Application Types

- real-time applications

 application "plays" packets a fixed delay after transmission
 queues up packets that arrive before
 intolerant applications drop packets that arrive after adaptive applications can change delay to deal with network

 elastic applications
- use data when it shows up
 Int-Serv delay features control time-of-delivery of packets absolute and variance

Int-Serv, Resource-Sharing

- multi-enity link-sharing split one link between organizations
- multi-protocol link-sharing split link between protocols (IP, SNA, IPX etc) can help deal with different congestion responses
- multi-service sharing application-based limit amount of file transfer

RSVP

- Resource ReServation Protocol (RSVP)
- implementation of INTSRV reservation process
- can be used to set aside resources for a specific application along a communications path
- can transfer the requests to a new path if rerouted
- simplex (one direction per reservation)
- ♦ receiver-oriented
- may make use of QoS-active links

RSVP - Process

- using admission control, router
 will accept reservation request if enough capacity record reservation and forward resv to next-hop
 if not - send resverr to previous hop
- state refreshed periodically with new messages
 - entry removed on timeout
- periodic refresh deals with reroute

RSVP & Int Serv Status

- protocols nearly ready
- ♦ performance issues
- ♦ scaling issues
- ♦ authorization issues
- accounting issues
- end system vs. border router
- advanced reservations very hard

Current Status, Problems and Future Directions of ATM Technology

The end of a dream?

ATM under attack

- by competing technology
- ♦ by need
- ♦ by zealots
- by complexity
- by standards process
- ♦ by ATM

Competing Technology

- switched Ethernet
- ◆ 100 Mb Ethernet
- ♦ Gb Ethernet
- ♦ RSVP

Need for ATM

- ♦ QoS is a major driver
- ♦ where is it needed?
- ♦ LAN vs. WAN
- ♦ end to end?

Zealots

"and there is just no ATM there! we are talking about _real_ 155MB, no fake"

Complexity

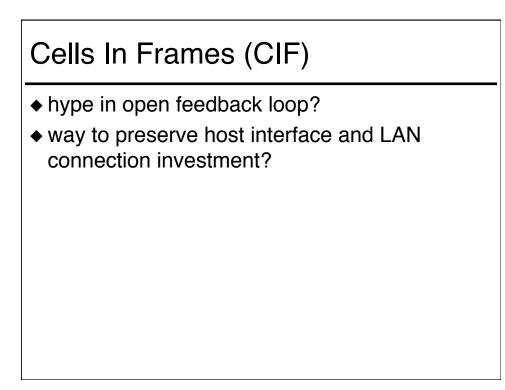
- much session-dependent state in the net
- ♦ routing
- QoS scheduling (time-share again?)
- in comparison to alternatives

Standards Process

- ♦ rather big
- rather political
- rather commercial
- rather confusing
- why was it necessary to say that ATM Forum would not commit patricide (anymore)?
- ♦ slow?

ATM

- ♦ the ATM dream
- was it the original mission?
- could it have been real?
- Idid it do more harm than good?



ATM's future

♦ one of the gang

Future

 no monoliths assuming type of desktop connectivity is chancy

- no predictable end to end technology other than transport protocol
- the transport protocol of the future will be called IP