

Current Issues in ATM Forum Traffic Management Group: Part III

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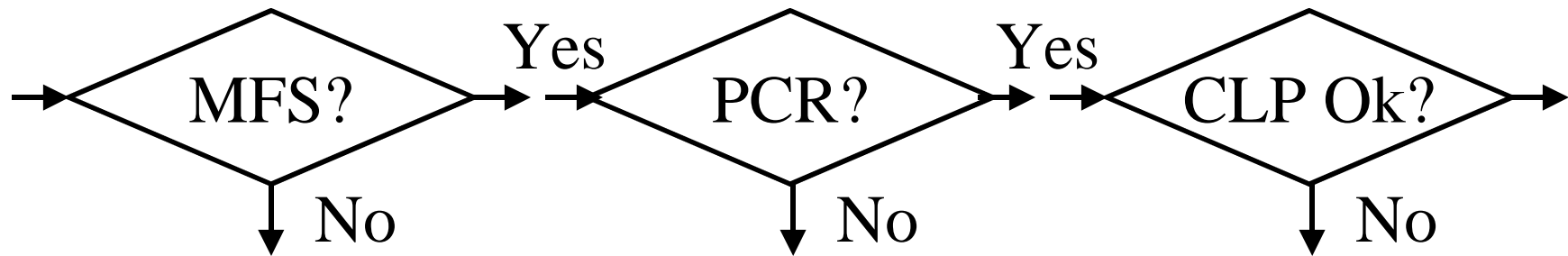


- ❑ GFR Update
- ❑ CDV Accumulation
- ❑ Joint Work with other Groups
 - TM and Net Mgmt
 - ABR API

Overview (Cont)

- TM and RBB
- TM and SAA
- TM and Test
- CLR with EPD
- ABR Policing
- Integrated Services
- TCP/IP over ATM

GFR

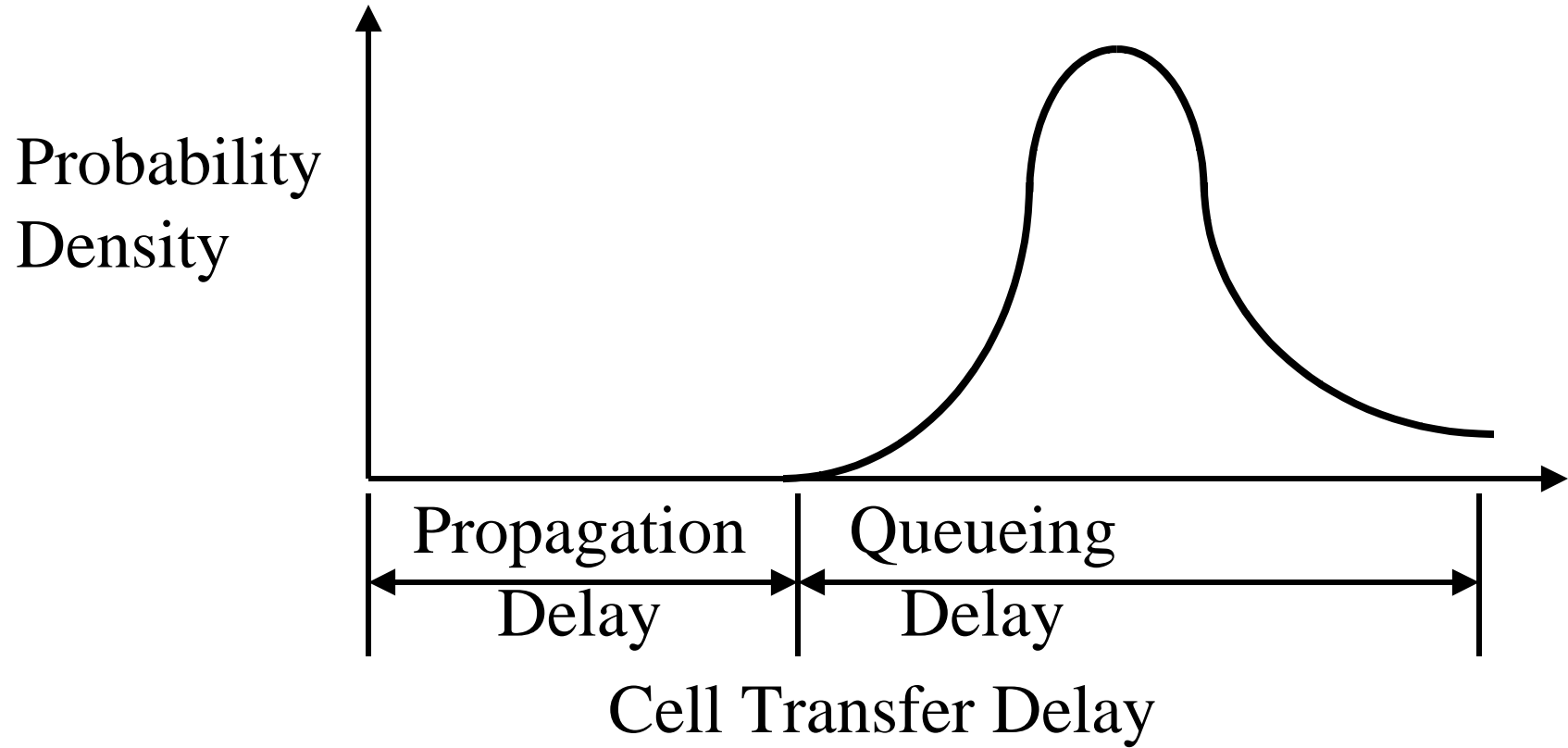


- ❑ Status of April'98 Meeting
- ❑ Three conformance tests:
 - Number of cells in the frame must be less than MFS (maximum frame size)
 - The rate should be below PCR
 - CLP bits must be either all 1 or all 0s.

GFR (Cont)

- ❑ Q1: How should the first, middle, and last cell be treated if they fail the test 1, 2, or 3?
- ❑ Q2: Should only the frames that pass one test go through the next? \Rightarrow Do these tests in series? What order?
- ❑ Agreement 1: Allow these tests in parallel. GCRA is updated even cells later fail CLP or MFS test.
- ❑ Agreement 2: Implementers also have a choice of omitting MFS and CLP tests.
- ❑ Agreement 3: Test for MFS-1 so that the last cell is always conformant.

CDV Accumulation



CDV (Cont)

□ TM4.0 specifies two methods:

1. Simple: $CDV_{total}(\alpha) = \Sigma CDV_i(\alpha)$

2. Asymptotic Method: Uses Mean, variance, discrepancy

○ Discrepancy_i = Measured $CDV_i(\alpha)$ - $CDV(\alpha)$ using Gaussian distribution

○ $CDV(\alpha) = [\Sigma \mu_i + (\Sigma \sigma_i^2)^{1/2} z_\alpha]$
+ $\max_i \{ CDV_i(\alpha) - (\mu_i + \sigma_i z_\alpha) \}$

□ Method 2 is accurate but complex (requires computing $CDV_i(\alpha)$)

CDV (Cont)

- ❑ Method 1 gives worst case \Rightarrow Overestimate
 \Rightarrow Underutilization, Blocking
- ❑ Use Chernoff method or Markovian Inequality:

$$\text{CDV}_{\text{total}}(\alpha) \leq -\log(\alpha)/s_N + (1/s_N) \sum M_i(s_i)$$

Here: $0 \leq s_N \leq s_{N-1} \leq \dots \leq s_1$

$F_i(s)$ is the moment generating function of distribution of switch delay. $M_i(s) = \log(F_i(s))$

Assumes local delays at switches are independent.

CDV (Cont)

- Further, assume delays at each switch are gamma distributed. Then

Switch Delay pdf: $f(t) = \lambda^r t^{r-1} e^{-\lambda t} / \Gamma r$

λ = scale parameter of the switch delay

r = shape parameter of the switch delay

- $CDV_{total}(\alpha) \leq -\log(\alpha)/s_N + (1/s_N) \sum r_i \log(\lambda_i / (\lambda_i - s_i))$

Where $0 \leq s_N \leq s_{N-1} \leq \dots \leq s_1 \leq \min \lambda_i$

CDV Method

- Two quantities are passed from switch to switch:
 1. $s_i = \min_{1 < j \leq i} \lambda_j / c, c > 1$
 2. If s_i is less than requested end-to-end CDV, accumulate $r_i \log(\lambda_i / (\lambda_i - s_i))$
- How do you select c ? Need more guidance.
- Ref: 97-0293

Joint Work with Other Groups

- ❑ TM and Net Mgmt
- ❑ ABR API
- ❑ TM and RBB
- ❑ TM and SAA
- ❑ TM and Test

TM and Net Mgmt

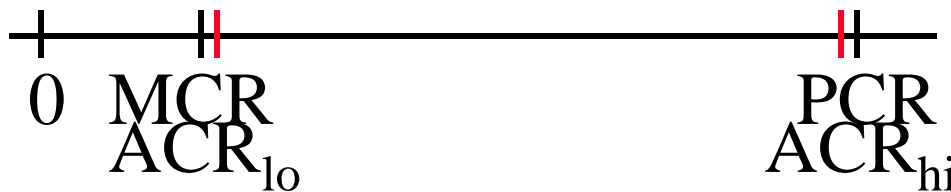
- ❑ Management of ABR Service
- ❑ Count invalid RM cells, valid RM cells
- ❑ Invalid: $BN=1$ and $DIR=0$, $ER>PCR$, ...
- ❑ Ref: 97-0478R2
- ❑ Traffic Descriptors for CBR, VBR, ABR, UBR
- ❑ CBR Traffic Descriptor: PCR, SCR, MBS, CDVT, p-to-p CDV, max CTD CLR
- ❑ Ref: 97-0923
- ❑ Accumulative Parameters: FRTT, maxCTD, peak-to-peak CDV

ABR API

- ❑ Query and Set: PCR, MCR, ICR, RIF, RDF, MCRmin
- ❑ Query: FRTT, TBE
- ❑ Set: ER (<PCR), MCR
- ❑ Query: ACR
- ❑ Ref: 97-0999*, 97-1020*, 97-1100*

Querying ACR

- When should the applications be notified of ACR change?
- Suggestion: two threshold crossing
- Ref: 97-1020*



Notify only if invalid



Notify if service down or up

TM and RBB

- ❑ RBB: Shared access over cable, asymmetric links
- ❑ Simplification of traffic parameters for residential users
- ❑ Effect of dual delays in cable modems
- ❑ Ref: 97-1081

TM and SAA

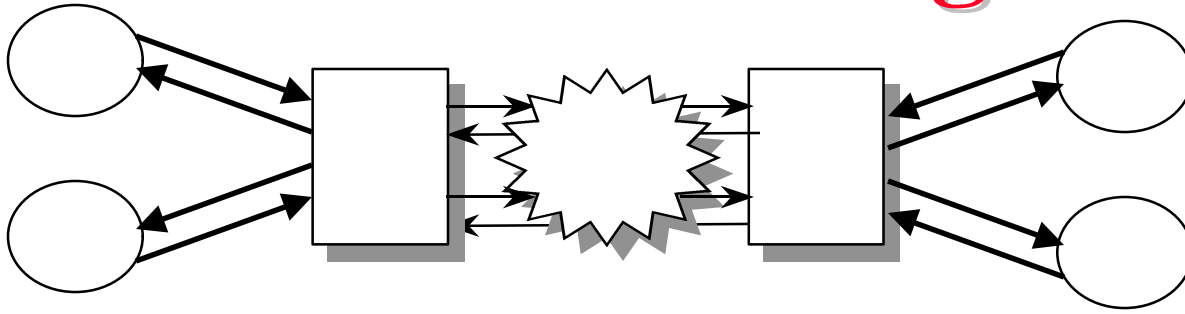
VBR Video

- ❑ Given mean, PCR of a video stream, how does one request SCR, MBS, ...
- ❑ Effective BW = $(1-\alpha)\text{Mean} + \alpha \text{PCR}$
- ❑ Higher Effective BW \Rightarrow Lower MBS
- ❑ Ref: 97-0756*, 97-0733, 97-0797
- ❑ Service Category for Video: CBR, VBR, ABR, ABT

CLR with EPD

- Cells dropped due to EPD be not counted in CLR

ABR Policing

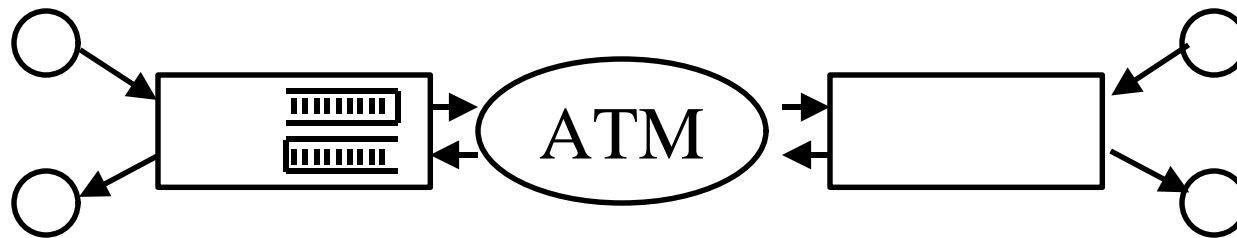


- ❑ Problem: Delay between the policer and the source
- ❑ Two algorithms in I.371.1
- ❑ Cyclic n-store Algorithm (B) improves with increasing n
- ❑ Algorithm B with large n = Algorithm A
- ❑ ATMF recommends Algorithm A (Dec 97)
- ❑ This is inconsistent with I.371.1
- ❑ Ref: 97-0964R1*, 97-0203R1

TCP/IP over ATM

- ❑ TCP/IP Traffic Mgmt
- ❑ IP Integrated Services

TCP/IP Traffic Mgmt



- ❑ Control TCP feedback based on ABR feedback
- ❑ Withhold Acks if long queues in router
- ❑ Modify fields in TCP packets
- ❑ NTT Algorithm: if $Q > t$, return acks at rate ACR/H otherwise ACR/L
- ❑ Achieved zero loss, high throughput, and fairness
- ❑ Ref: 97-0998, 97-0960, 97-0758R1*, 97-0562, 97-0117, 97-0116

TCP/IP (Cont)

- ❑ RPI Algorithm:
 - Compute rate r for a TCP session using ERICA+
 - Compute window $W = r * T$, where $T = RTT$
 - Change window in the TCP headers of returning packets
- ❑ The algorithm performs excellent if RTTs are known
- ❑ The algorithm performs better than no control if RTT is just guessed (more than actual)

Integrated Services

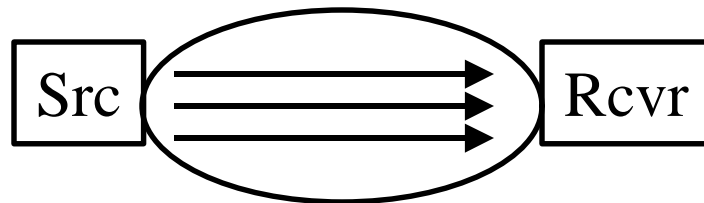
- ❑ Best Effort Service
- ❑ Controlled-Load Service: Performance as good as in an unloaded datagram network. No quantitative assurances. (Min throughput). User specifies token bucket parameters: peak rate p , bucket rate r , bucket size b
- ❑ Guaranteed Service: CBR or rt-VBR
 - Firm bound on data throughput and delay.
 - Delay jitter or average delay not guaranteed or minimized.
 - Users specify token bucket parameter and an allocated Rate R and delay slack S

Int. Services on ATM



- ❑ Guaranteed service = rt-VBR (or CBR)
PCR = p_r , SCR = R , MBS = b_r
- ❑ Controlled load service
= nrt-VBR (or ABR with MCR)
PCR = p_r , SCR = r_r , MBS = b_r
- ❑ Best effort = UBR (or ABR)
- ❑ Excess can be carried on a separate VC
- ❑ ATM rate should be 10% higher than IP rates to account for 5 byte header/48 byte payload

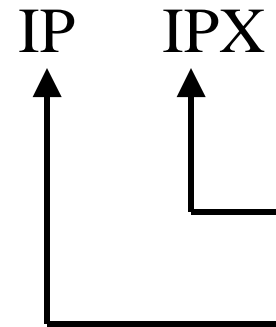
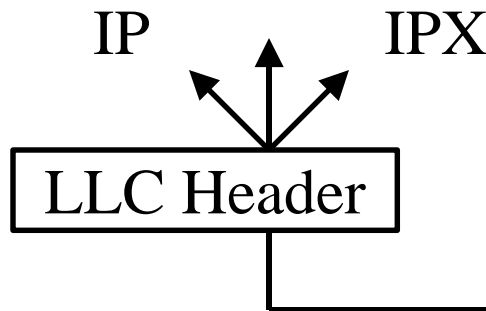
RSVP over ATM: Issues



- ❑ RSVP control messages on QoS or best effort VCs?
- ❑ Multiple RSVP sessions on one QoS VC?
- ❑ RSVP control is receiver oriented
 - ⇒ Receiver generates ResV messages.
 - ⇒ In ATM, either the subnet sender sets-up the VC or the receiver sets up the VC with backward direction traffic parameters (Not in pt-mpt VCs)
- ❑ VC Teardown: May not close explicitly ⇒ timeout

RSVP Over ATM (Cont)

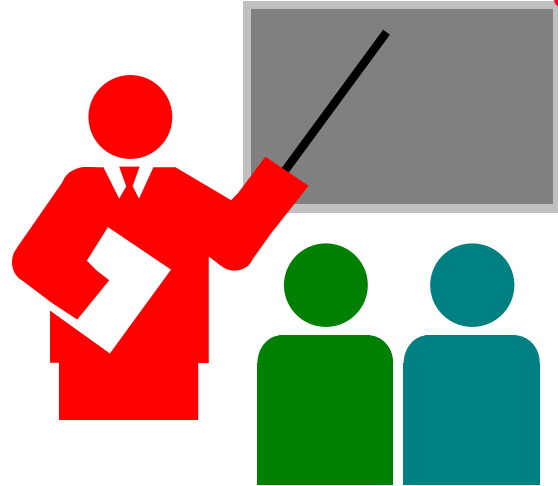
- ❑ Dynamic QoS:
RSVP allows QoS modification.
ATM does not \Rightarrow Need new VC setup.
Use old VC until the new VC is setup.
- ❑ Encapsulation: LLC encapsulation.
If only IP, VC based multiplexing is better



Desired Changes to ATM

- ❑ Heterogeneous Point-to-Multipoint:
Variegated VCs
- ❑ QoS Renegotiation
- ❑ Group Address
- ❑ Lightweight Signaling
- ❑ Ref: 96-1420

Summary



- ❑ GFR Conformance
- ❑ CDV Accumulation \Rightarrow Chernoff inequality proposed
- ❑ TM and Net Mgmt: ABR Management
- ❑ ABR API
- ❑ TM and RBB: Dual delays of ADSL

Summary (Cont)

- ❑ TM and SAA: VBR parameters
- ❑ TM and Test: Performance testing
- ❑ ABR Policing: Use algorithm A
- ❑ Integrated Services:
GL = CBR or rt-VBR, CLS = nrt-VBR or ABR
- ❑ TCP/IP over ATM: Hold acks or withhold receiver window credits