Current Issues in ATM Forum Traffic Management Group: Part III

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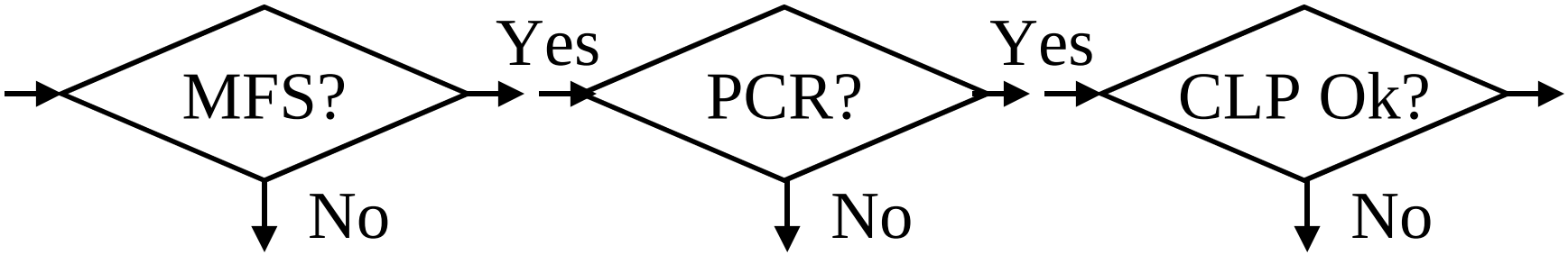
Overview

- 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

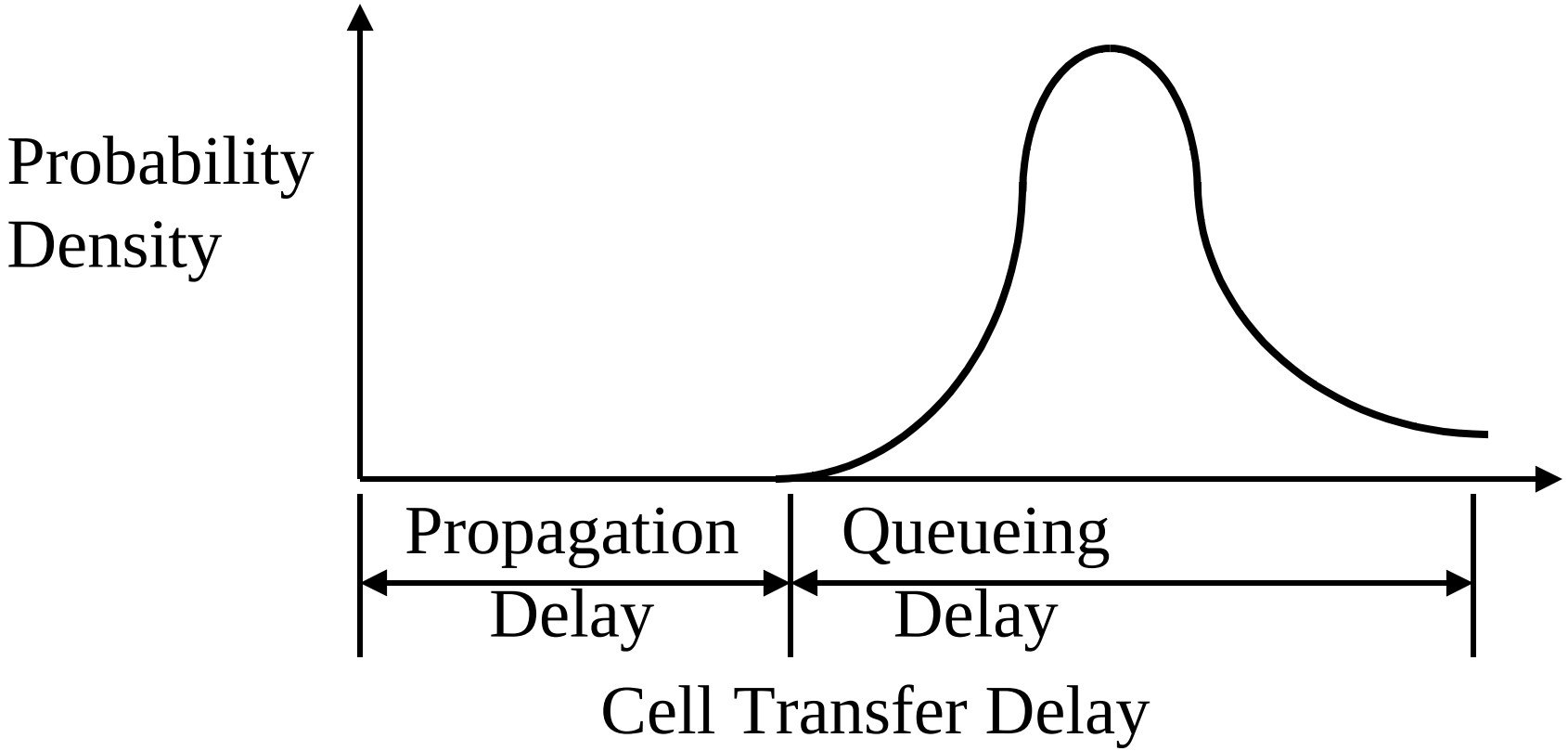


- Status of April'98 Meeting
- Three conformance tests:
  - Number of cells in the frame must be less than MFS (maximum frame size)
  - The rate should be below PCR
  - CLP bits must be either all 1 or all 0s.

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? ⇒ 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
   - $CDV(\alpha) = [\Sigma\mu_i + (\Sigma\sigma^2_i)^{1/2}z_a] + \max_i\{CDV_i(\alpha)-(\mu_i+\sigma_i z_\alpha)\}$

- 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:

$$CDV_{total}(\alpha) \leq -\log(\alpha)/s_N + (1/s_N)\ \Sigma\ M_i(s_i)$$

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

$F_i(s)$ 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
- $CDV_{total}(\alpha) \le -\log(\alpha)/s_N + (1/s_N)\Sigma\, r_i \log(\lambda_i/(\lambda_i - s_i))$
  Where $0 \le s_N \le s_{N-1} \le \ldots \le s_1 \le \min \lambda_i$

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

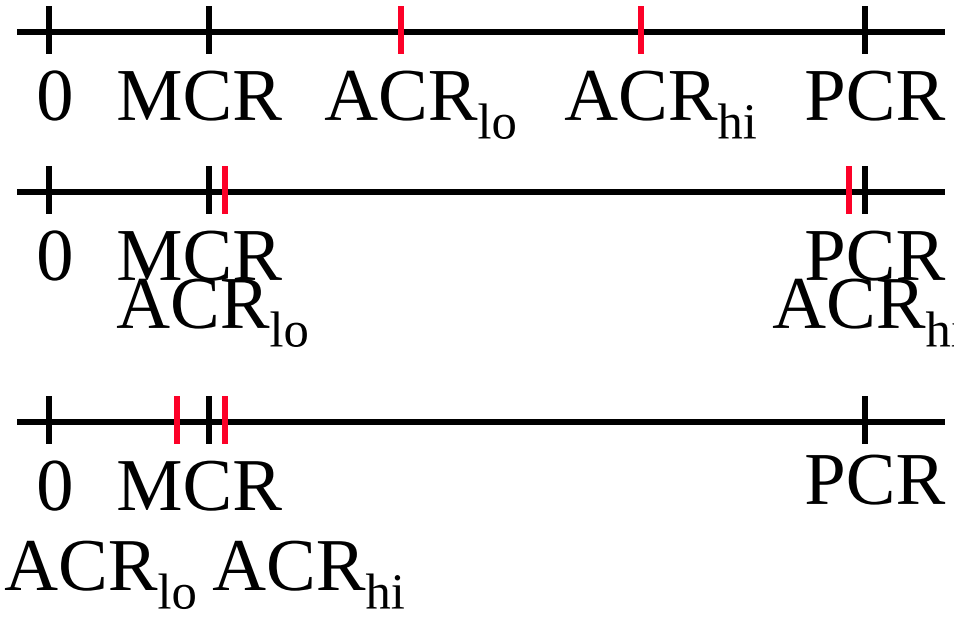
- Management of ABR Service
- Count invalid RM cells, valid RM cells
- Invalid: BN=1 and DIR=0, ER>PCR, ...
- Ref: 97-0478R2
- Traffic Descriptors for CBR, VBR, ABR, UBR
- CBR Traffic Descriptor: PCR, SCR, MBS, CDVT, p-to-p CDV, max CTD CLR
- Ref: 97-0923
- Accumulative Parameters: FRTT, maxCTD, peak-to-peak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



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

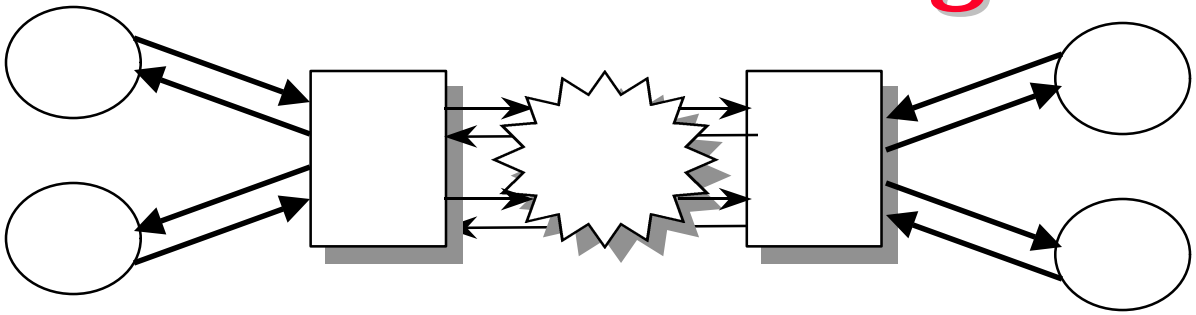
VBR Video

- Given mean, PCR of a video stream, how does one request SCR, MBS, ...
- Effective BW = (1-α)Mean+ α PCR
- Higher Effective BW ⇒ 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

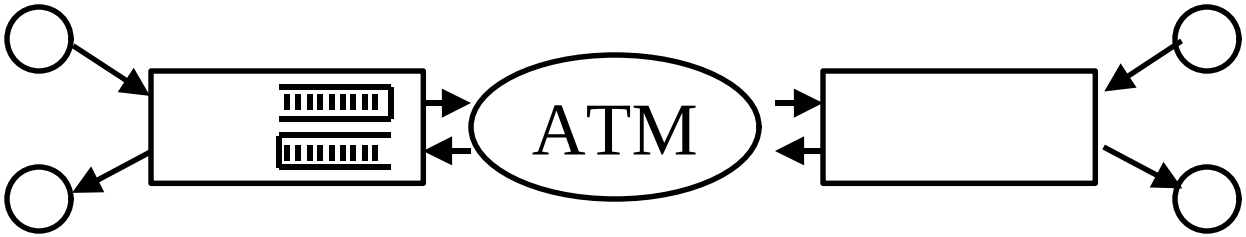


- Problem:Delay between the policer and the source
- Two algorithms in I.371.1
- Cyclic n-store Algorithm (B) improves with increasing n
- Algorithm B with large n = Algorithm A
- ATMF recommends Algorithm A (Dec 97)
- This is inconsistent with I.371.1
- Ref: 97-0964R1*, 97-0203R1

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+
  - Comput 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)

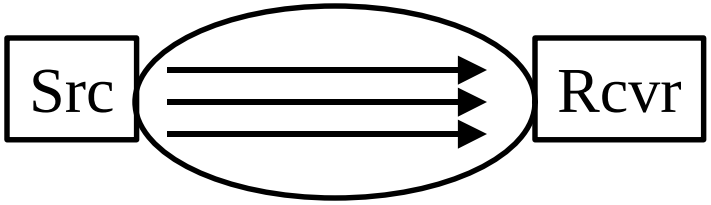
Integrated Services

- 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

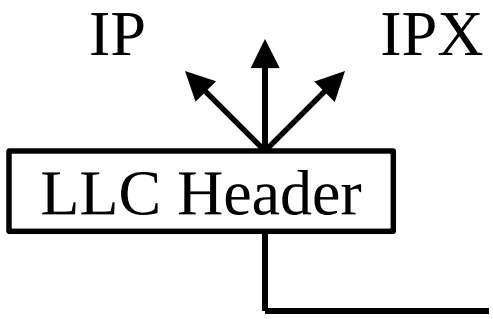
RSVP over ATM: Issues

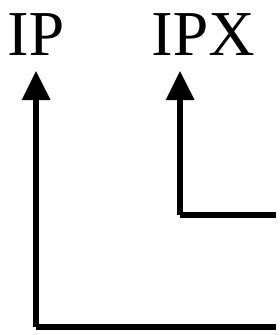


- RSVP control messages on QoS or best effort VCs?
- Multiple RSVP sessions on one QoS VC?
- RSVP control is receiver oriented
  ⇒ Receiver generates ResV messages.
  ⇒ In ATM, either the subnet sender sets-up the VC or the receiver sets up the VC with backward direction traffic parameters (Not in pt-mpt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

RSVP Over ATM (Cont)

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

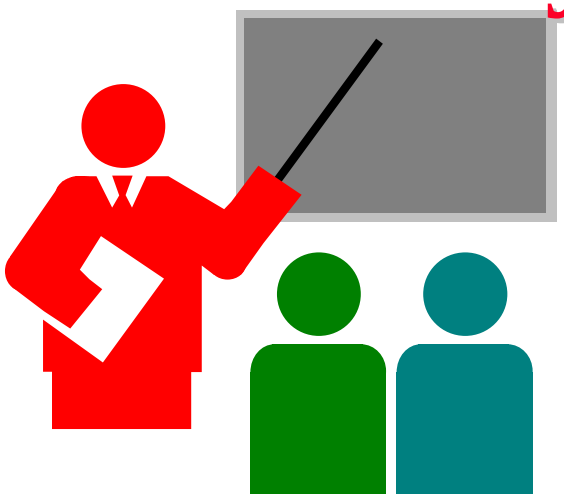




Desired Changes to ATM

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

Summary



- GFR Conformance
- CDV Accumulation ⇒ 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 withold receiver window credits