Current Issues in ATM Traffic Management

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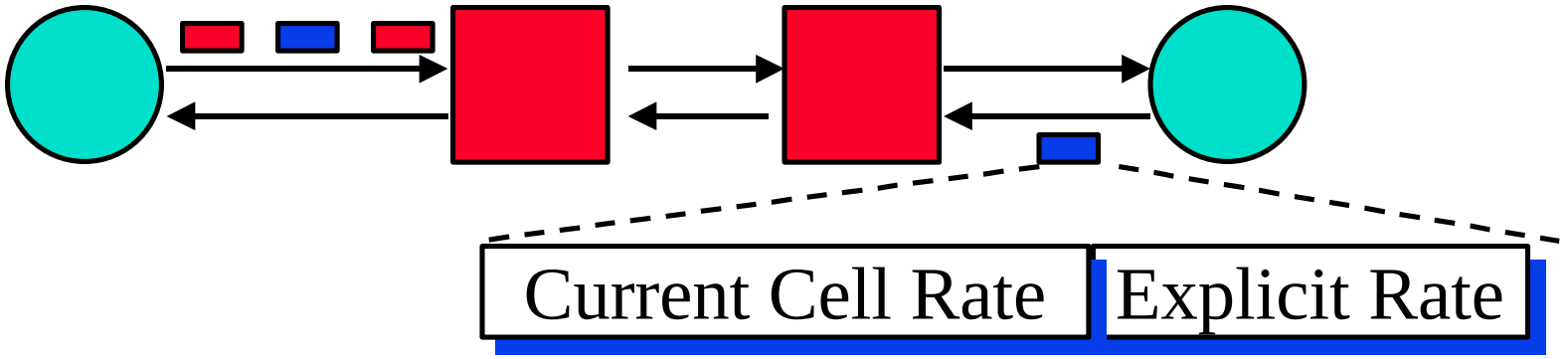
Overview

1. Guaranteed Frame Rate (GFR)
2. Point-to-Multipoint connections
3. Multipoint-to-point connections

ATM vs IP: Key Distinctions

- Traffic Management:
  Explicit Rate vs Loss based
- Signaling: Coming to IP in the form of RSVP
- PNNI: QoS based routing
- Switching: Coming soon to IP
- Cells: Fixed size or small size is not important

The Explicit Rate ABR

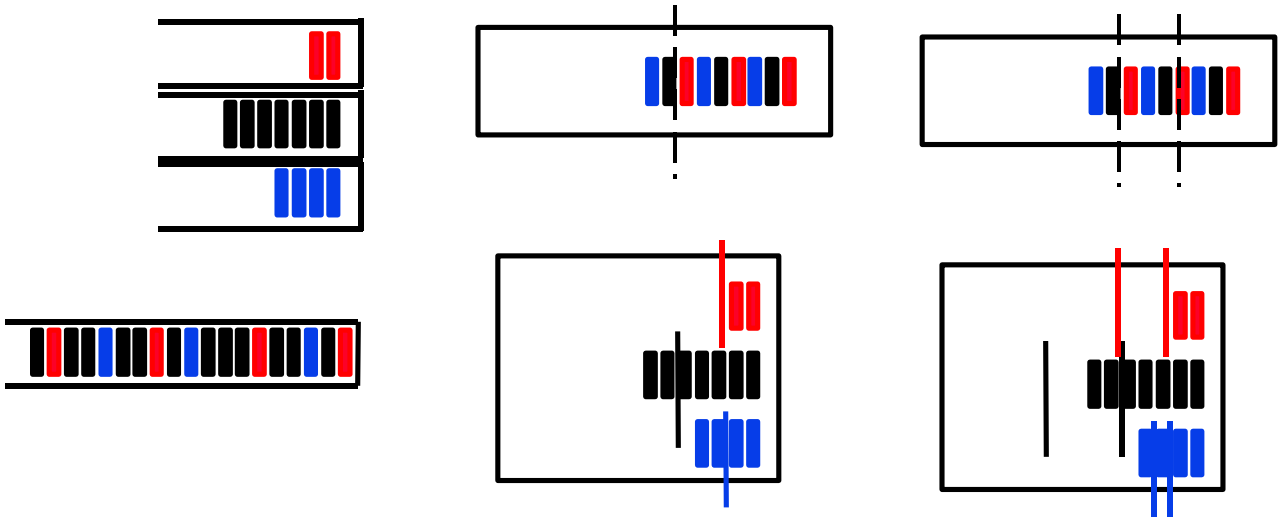


- Sources send one RM cell every n cells
- The RM cells contain "Explicit rate"
- Destination returns the RM cell to the source
- The switches adjust the rate down
- Source adjusts to the specified rate

Guaranteed Frame Rate (GFR)

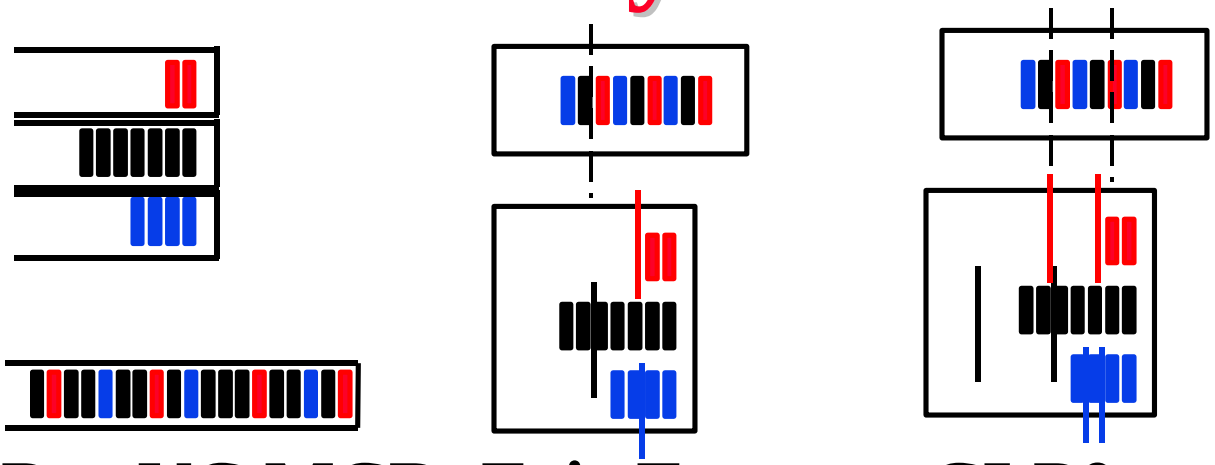
- UBR with min cell rate (MCR) ⇒ UBR+
- Frame based service
  - Complete frames are accepted or discarded in the switch
  - Traffic shaping is frame based.
    All cells of the frame have CLP=0 or all cells have CLP=1
  - All frames below MCR are given CLP =0 service.
    All frames above MCR are given best effort (CLP=1) service.

GFR Options



Queuing	Per-VC	FIFO
Buffer Management	Per-VC Thresholds	Global Threshold
Tag-sensitive Buffer Mgmt	2 Thresholds	1 Threshold

GFR Study I: Results

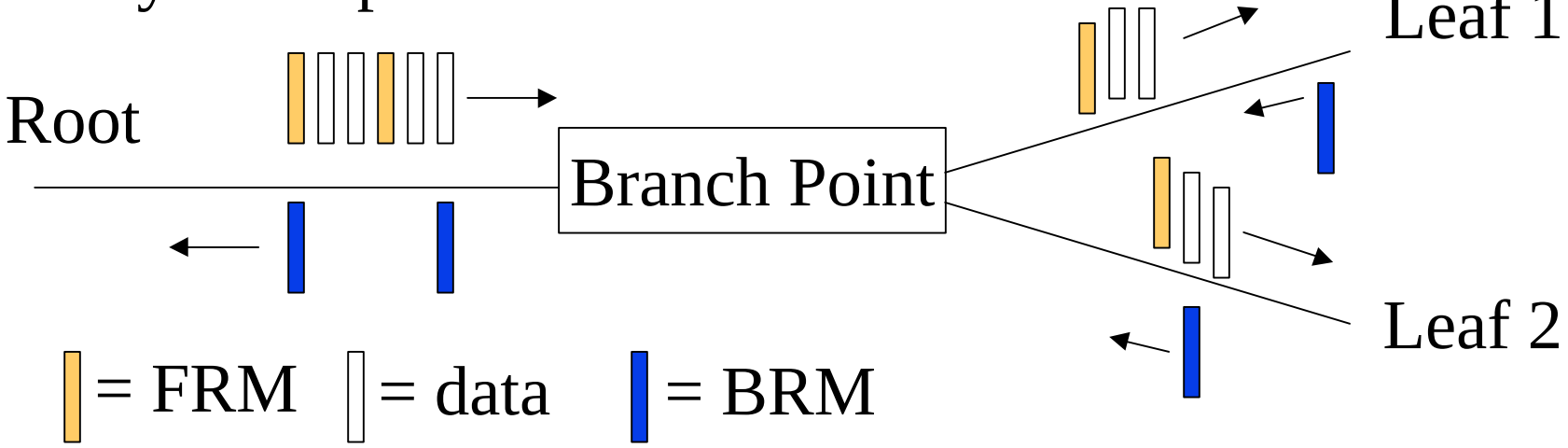


Per-VC MCR Fair Excess CLP0

- Per-VC queuing and scheduling is necessary for per-VC MCR. (FIFO ok for TCP w SACK at low loads)
- FBA and proper scheduling is necessary for fair allocation of excess bandwidth
- One global threshold is sufficient for CLP0+1 guarantees
  Two thresholds are necessary for CLP0 guarantees

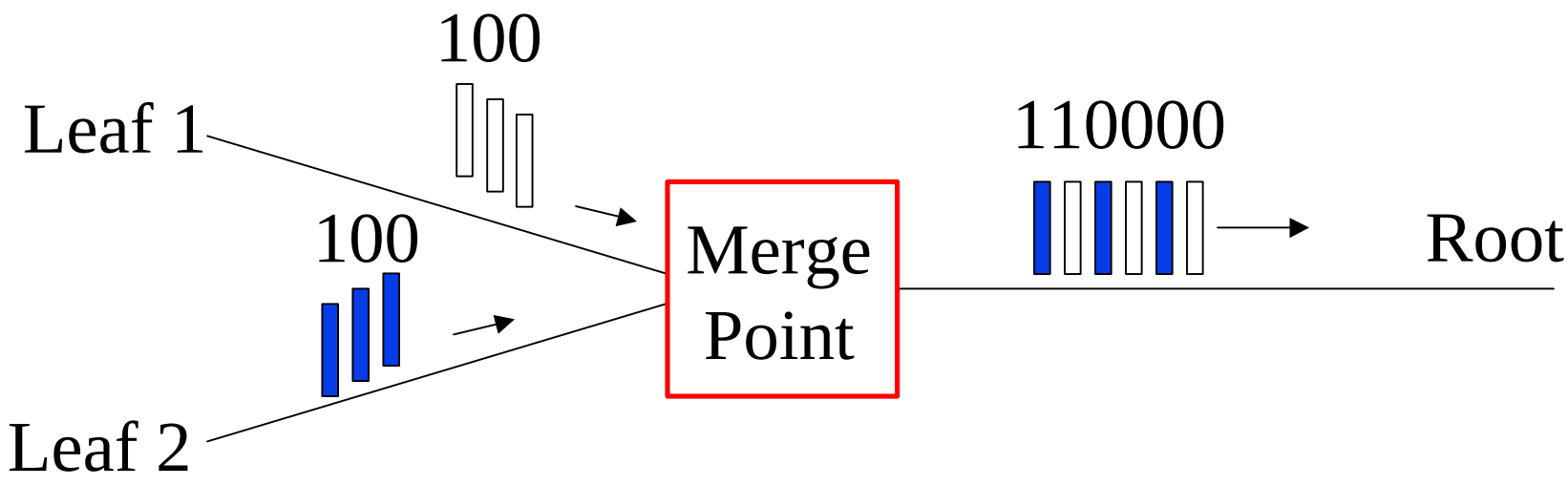
Point-to-Multipoint ABR

- Returning BRMs are consolidated.
  Minimum feedback is returned to source.
- Should wait for all BRMs?
  Should return all FRMs?
- Solution: Return bad news fast.
  Try to keep FRM/BRM ratio close to 1

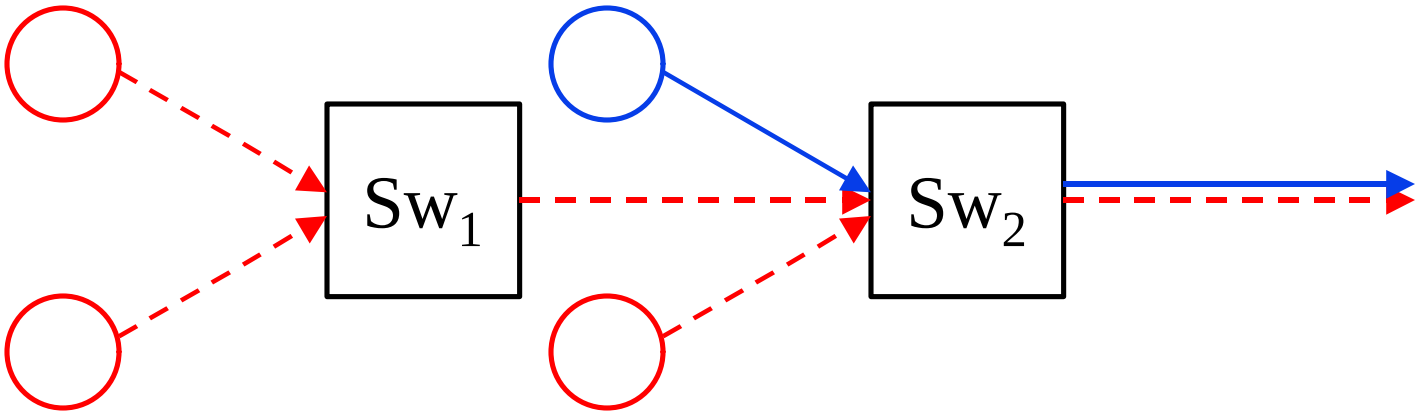


Multipoint-to-Point ABR

- Cell Interleaving Problem
- VC merge: Buffer at merge point till EOM bit = 1. Requires memory and adds to traffic burstiness and latency ⇒ Can't distinguish sources.

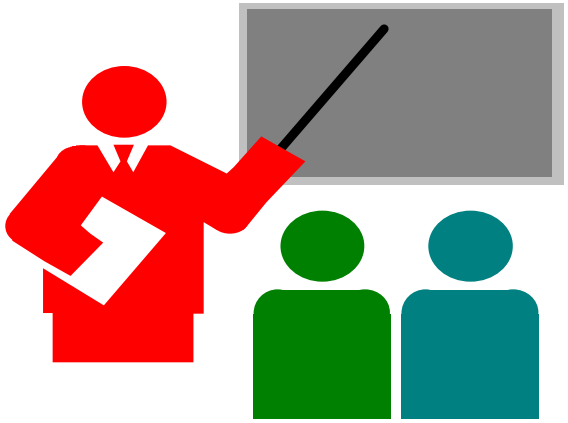


Sources, VCs, and Flows



- Sw_2 has to deal with
  - Two VCs: Red and Blue
  - Four sources: Three red sources and one blue source
  - Three flows: Two red flows and one blue

Summary



- GFR guarantees, in general, require per-VC queueing
- GFR guarantees may be possible w SACK TCP
- Point-to-mpt extensions to ABR switch algorithms
- Sources, VCs, and flows are different in Mpt-to-pt VCs

References

- All our contributions and papers are available on-line at http://www.cis.ohio-state.edu/~jain/
- "Simulation Experiments with Guaranteed Frame Rate for TCP/IP traffic," ATM Forum/97-0607, July 1997
- "GFR --Providing Rate Guarantees with FIFO Buffers to TCP Traffic" ATM Forum/97-0831, Sep 1997
- "Feedback consolidation algorithms for ABR point-to-multipoint Connections," ATMF/97-0615, July 1997
- "Fairness for ABR multipoint-to-point connections," ATM Forum/97-0832, Sep 1997,