

# RPR MAC Model

## (Contention Resolution and Fairness Issue)

Byoung-Joon (BJ) Lee

March 14, 2001  
Hilton Head Island, SC

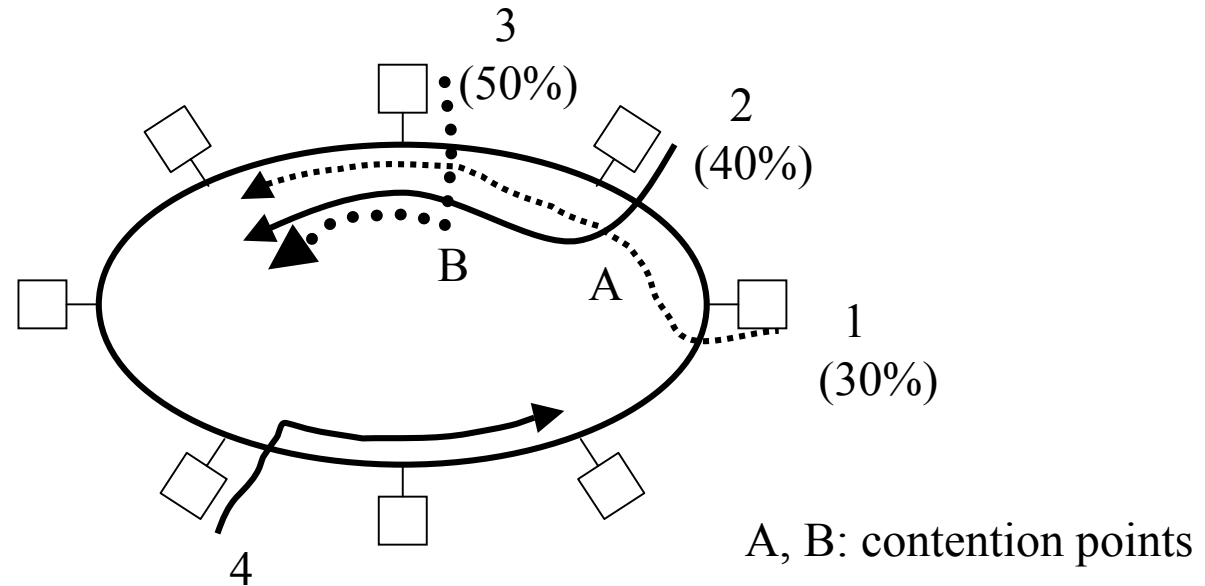
# What is the Issue?

- Fair (or unfair) allocation of ring bandwidth under congestion is a complex problem.
  - Potential for lengthy standardization effort
  - May also have implication on scalability w.r.t. geographical coverage, link speed, and # of nodes
- Is it an essential part of MAC definition, or a system issue?
  - Leave this mechanism as a vendor differentiation area?
- Can we instead specify a minimum set of common functionality?
  - Considered necessary for interoperability where multi-vendor boxes coexist in a ring.

# Existing MACs and Fairness

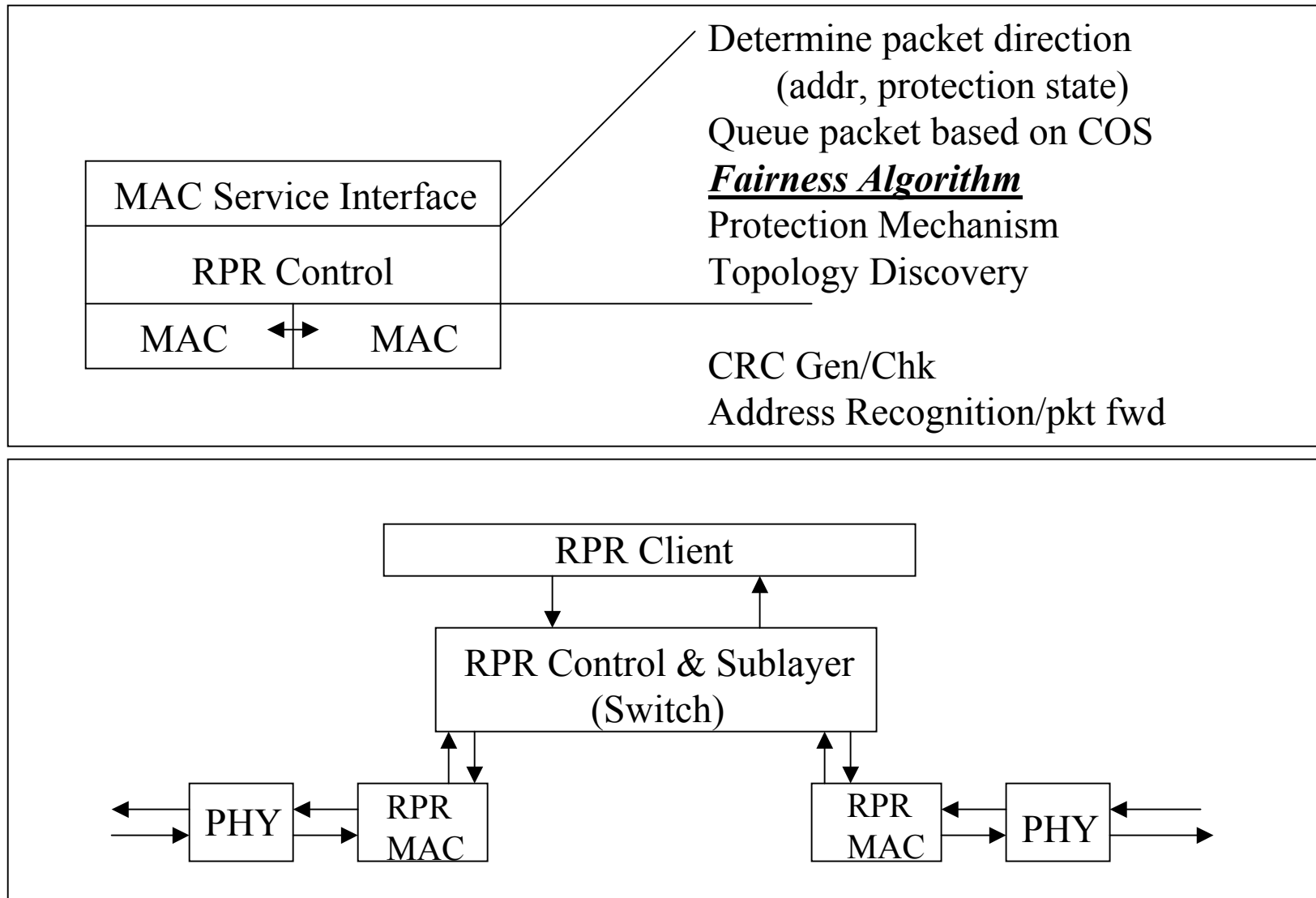
- MAC is to resolve access contention among multiple nodes sharing a common physical transmission medium, thus the name “Medium Access Control”
  - IEEE 802.3 Ethernet does it by CSMA/CD
  - IEEE 802.5 Token Ring by token passing
  - ANSI FDDI by timed token protocol
  - IEEE 802.6 DQDB by generating slots which carry busy/idle status, and distributed queueing with bandwidth balancing mechanism
- In all of the above, “fair” allocation of shared link bandwidth is part of the MAC.

# Contention Resolution and Fairness in RPR

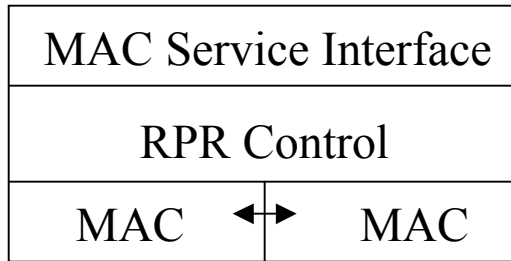


- Is RPR a shared medium?
  - Yes and No, depending on traffic pattern due to destination stripping
  - Flows 1, 2, and 3 form a contention domain, while flow 4 is contention-free
- Consider a case where flows 1, 2, and 3 try to transmit 30, 40, and 50% of the ring bandwidth, respectively.
  - Contention resolution is needed between the ring and host traffic at 'A'
  - Contention resolution also takes the form of fair/unfair bandwidth allocation under congestion at 'B'

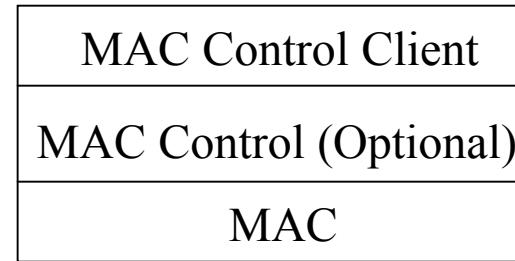
# Revisiting RPR MAC Models Suggested So Far



# Comparison with 802.3x MAC Control Layer



802.17



802.3x

- In 802.3, the MAC control sub-layer defines simple flow control for full-duplex operation.
  - It is not a shared medium network any more, thus no CSMA/CD.
    - MAC is not necessary, except for the frame format.
  - The architecture also allows specifications of alternative flow control mechanisms.

# Comparison with 802.3x MAC Control Layer

*(cont'd)*

- Topology discovery and protection mechanisms optimized for Ethernet switched ring can also be part of MAC control sub-layer?
  - New frame format is required to include ring ID, TTL, etc.
- Since RPR ring segments are pt-to-pt full-duplex links, similar approach deserves a hard look?

# Summary

- Fair (or unfair) allocation of ring bandwidth under congestion is a complex problem.
  - Potential risk for lengthy standardization effort
- Architectural approach of 802.3x MAC control sub-layer may provide flexibility, in that the fairness mechanism under congestion can be left as an option?
  - Unlike in the full-duplex switched networks, however, RPR MAC still need contention resolution between the host and ring transit traffic, at the minimum.
- It is considered desirable only to specify a minimum set of common functionality for in-time standard.
  - However, the specification should also be sufficiently detailed enough to allow interoperability.