RETHER : A Real-Time Ethernet Protocol

Chitra Venkatramani, Tzi-cker Chiueh
Experimental Computer Systems Laboratory
Department of Computer Science
SUNY at Stony Brook

Outline

- Motivation
- Single-segment RETHER
- Multi-segment RETHER
- Performance measurements
- Stony Brook Video Server
- Future work

Motivation

- Increasing number of distributed multimedia applications.
  - ➤ Continuous media data require periodic network access.
  - ➤ Examples:Videoconferencing, Videoservers.
- Large existing base of Ethernet
  - ➤ Most prevalent LAN architecture.

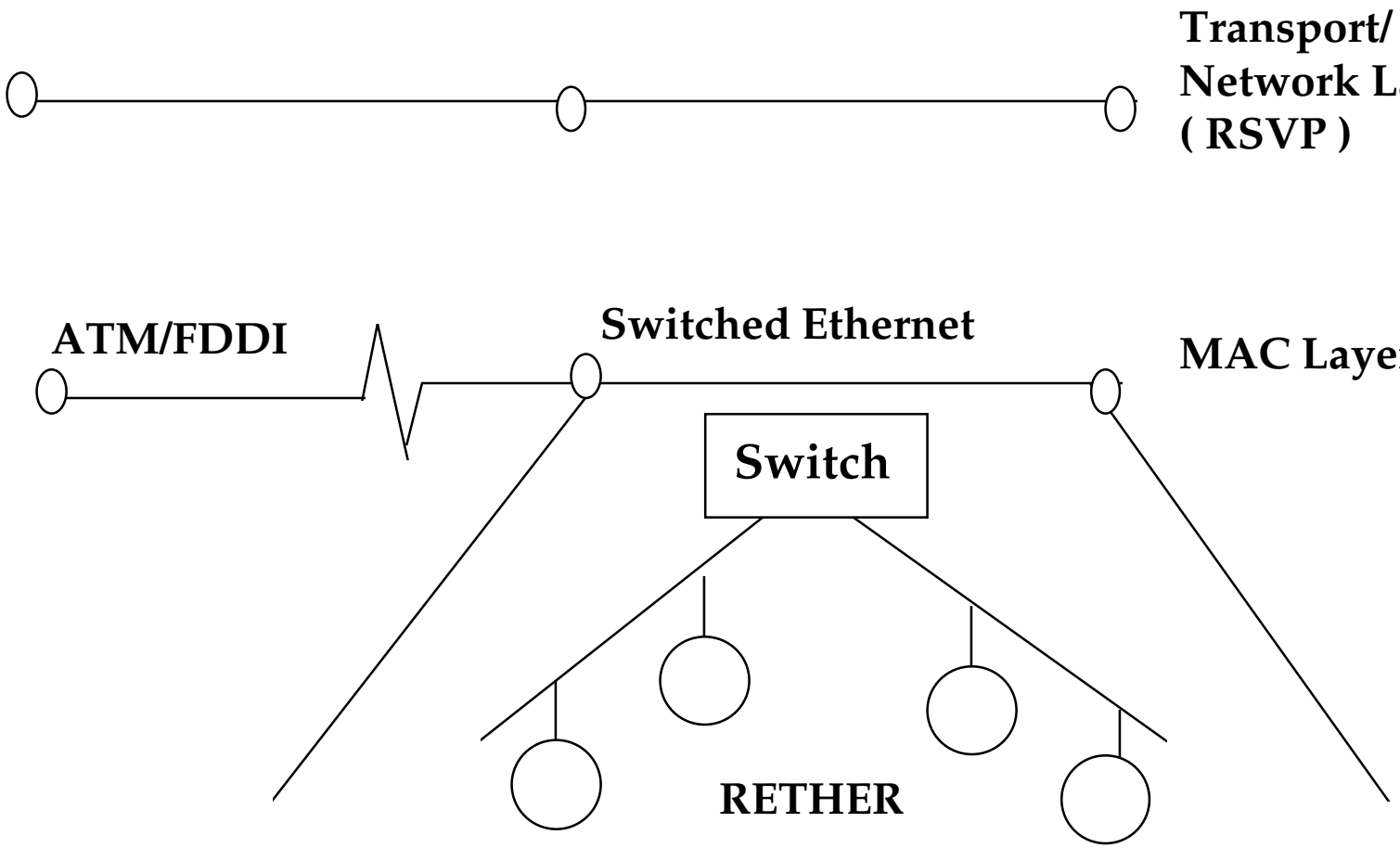
Ethernet drawbacks

- Probabilistic MAC protocol
  - ➤ Network access delay cannot be bounded
- No prioritization of traffic
- Ethernet exhibits “capture” effect under heavy load[Boggs, et al, 1988]

Features of RETHER

- Designed for applications with periodic channel access requirements
- Timed token passing MAC protocol for bandwidth guarantees across single and multiple Ethernet segments
- Software implementation for commodity Ethernet hardware
- Hybrid protocol -- uses token passing only when there are real-time streams

Overview

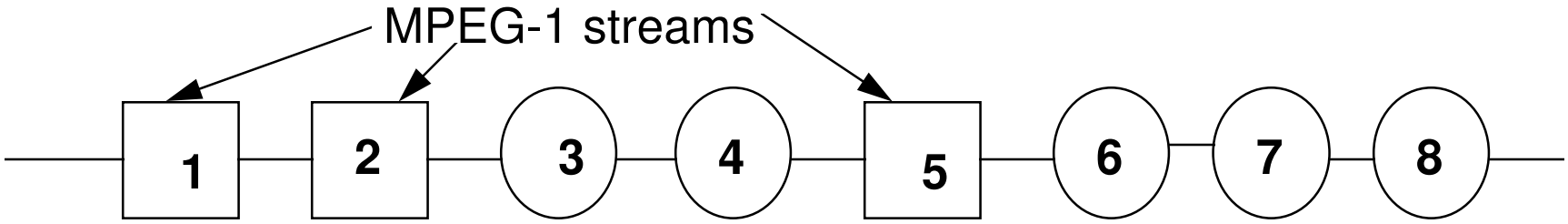

Transport/
Network Layer
(RSVP)
ATM/FDDI
Switched Ethernet
MAC Layer
Switch
RETHER

Single-segment RETHER

- Token Circulates in Cycles
  - ➤ Cycle time set at network initialization
- Token Holding Time

  THT_{RT}=Data per cycle/Ethernet bw + S/W overhead
- RT Nodes Visited First
- NRT Nodes Visited in Remaining Time

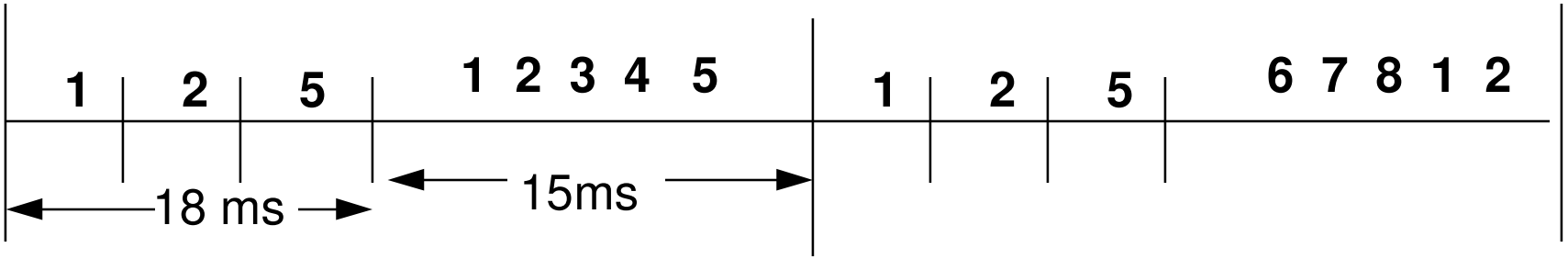
Example



1.5Mbps = 6.25 KB/frame @ 30 frames per sec.

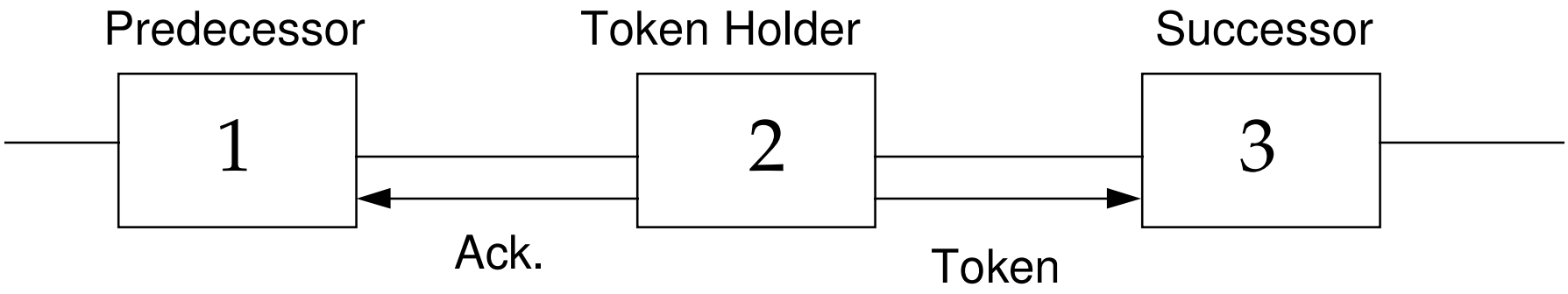
Token Cycle Time = 1/30 sec = 33 millisec.

THT = 6 millisec on 10Mbps Ethernet.



Fault Tolerance

- Token Bus Maintenance
  - Node Crash
  - Token Corruption
  - Rebooting of Nodes

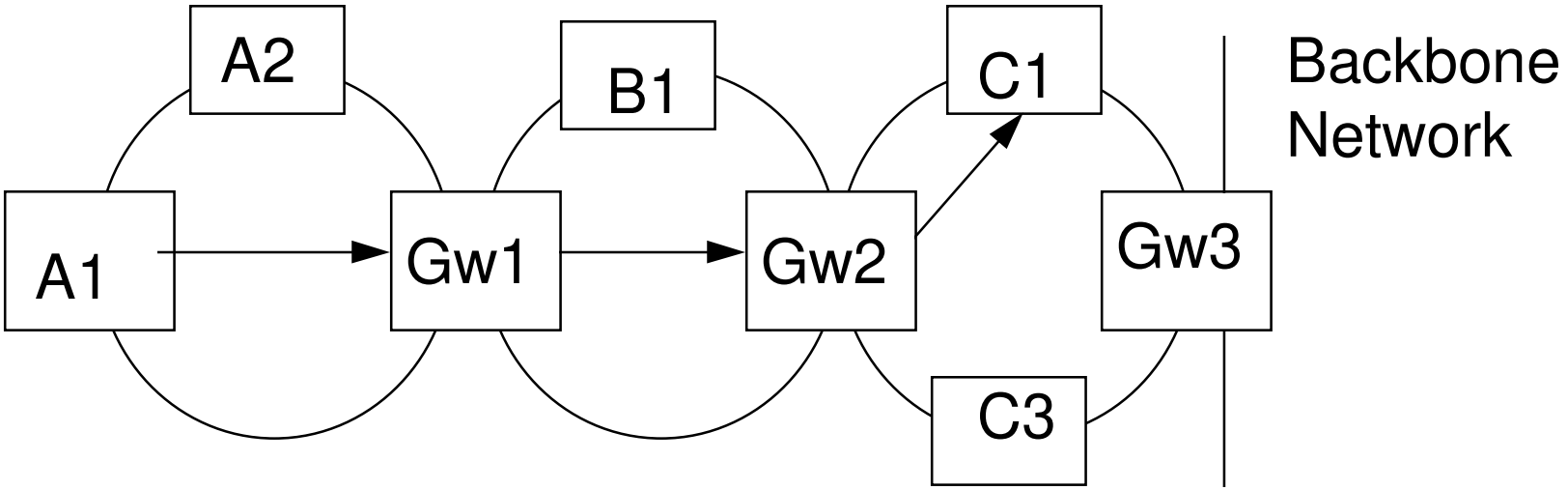


Admission Control

- Distributed
- Admission on arrival of token because token carries up-to-date stream information

Multi-segment RETHER

- Multi-segment connection broken down into multiple sub-connections



Token Passing

- Independent token cycles
- Problem : Cycle time discrepancy between adjacent segments
  - ➤ Interrupt Overhead from multiple cards
  - ➤