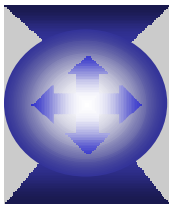

LANTERN COMMUNICATIONS

What de we mean by “Fair”?

IEEE 802.17

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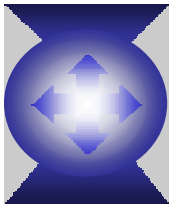
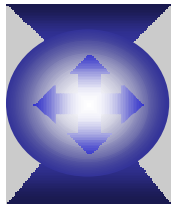
Media Access Control Protocol



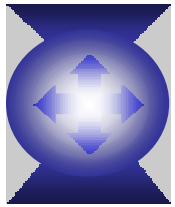
- Ethernet MAC is (was) CSMA/CD ***NOT*** Full Duplex
  - Collision Detection and Random Backup Algorithm
    - Was considered “state of the art”
    - Was complex!
    - Had interoperability issues!
      - Was inherently unfair to MACs that waited after carrier detect
      - Standard compliant MAC did not work well!
    - Is for LAN and “single tiered” networks
  - Ethernet “switches” are L2/L3 packet store and forward devices
    - Some have complex scheduling algorithms
    - There is no CSMA/CD MAC in Full Duplex Ethernet switches
- RPR MAC is required to provide “fair” access to the shared media

Fairness Criteria



- **Fairness != Equality**
- The MAC is responsible for supporting “fair” access to media
- Fair allocation of bandwidth is “proportional” or “weighted”
  - Subscribers (customers) can expect to get a fair proportion of “available” bandwidth
  - Available BW can be fairly distributed among SLAs
  - This does not preclude guaranteed bandwidth services with guaranteed jitter and delay
- Fair delay access to the ring
  - Access delays experienced by each subscriber is bounded and is node location independent
  - “Higher” SLAs experience “lower” delay

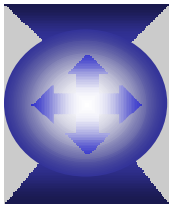
Efficiency



- High Link (Span) Utilization
  - Fairness algorithm should support high link utilization
  - Unused capacity can be reclaimed and distributed fairly to "bursty" traffic
  - "Bursty" and "guaranteed delay" traffic can co-exist

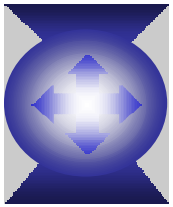
- Packet Loss in Transit
  - Discarding packets in transit wastes ring bandwidth
  - Fairness algorithm can minimize packet loss on the ring, by admitting only traffic that can reach its destination(s)

Fairness Algorithm Complexity



- Silicon Friendly
  - Reasonable gate-count
- No master node
  - Fully distributed algorithm
- Stable and Fast Convergence
  - 1-2 ring delay convergence time

Summary



- Per-SLA
  - BW allocated = BW reserved + a fair/weighted allocation of unused and available BW
  - Fairness algorithm can monitor and signal available BW

- Weighted Bandwidth Allocation
  - Based on SLA rates