TCP interactions with BOD/DAMA Networks

Marie-Jose Montpetit
Don Hoffman
Demand Assignment Multiple Access (DAMA)
- Link protocol for “uplink” slot assignment in a shared channel (e.g., MF-TDMA).
- Use scarce network resources effectively by adjust bandwidth utilization to actual traffic.
- Commonly used in various satellite networks (LEO and GEO) and fixed broadband terrestrial wireless networks.

Bandwidth on Demand (BOD)
- Signaling protocol used to request DAMA slots.
- Distinct from resource reservation signaling (e.g., Q.2931 or RSVP).
- Time from request initiation to slot availability can range from 10ms to 500ms depending on link latency and framing structure.
Example

CASE #1
Centralized allocation

Transparent node

CASE #2
Distributed allocation

Processing node

Bandwidth Manager

Wired or Wireless Link

Local manager
DAMA signaling

Resource manager

Wired or Wireless Link

Local manager
DAMA signaling

Resource manager

Requests/Allocations

Bandwidth Manager

Requests/Allocations

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Interactions with TCP

- **Access delay:**
  - How long until the bandwidth is initially available (Request time + framing)
  - How long until a change of bandwidth becomes effective

- **Queuing delay:**
  - TCP/IP traffic may be queued waiting for access

- **Bandwidth Quantization**
  - Bandwidth in terms of specifics “chunks”
  - May exclude some IP packet fragments and results in delay variations
Challenges

- TCP/IP transparency to BoD specifics
- Influence on:
  - Slow start and window sizes.
  - Retransmission time out.
  - Congestion avoidance.
  - Fairness between ground stations.
Solution Space

- Defining/predicting bandwidth requirements for:
  - Non-elastic, signaled (e.g., RSVP) services.
  - Elastic, TCP-like services.
- Optimization of request/allocation delay cycle.
- Optimization of packet/fragment transmission.
- DAMA interaction with congestion control (through interaction with mechanisms like ICMP, ECN, RED).