

## Random Early Detection (RED)

15-744 Computer Networks

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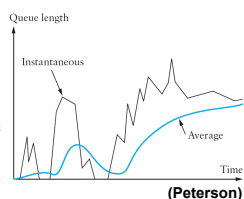
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## Why We Need it?

- We learned **TCP congestion control** last week!
  - Sent, ACKed, congestion window, AIMD, etc.
- Issues
  - TCP needs to create losses to find the available bandwidth of the connection.
  - Who's the best to detect congestion and resolve it?
  - Full queue of a gateway significantly increases the average delay.
  - **Congestion avoidance by Gateway** !

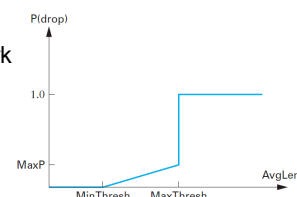
## Key Design Concepts of RED (1/2)

- How to know?
  - **Average** queue sizes
  - Effect of a low-pass filter
  - Busty traffic vs persistent traffic
- How to let them know?
  - **Drop** a packet or **Mark** a packet probabilistically.
  - Dropping requires end hosts to follow the TCP rule
  - Marking requires end hosts to understand the special bits



## Key Design Concepts of RED (2/2)

- Avoid global synchronization
  - Prevents underutilization
- Fairness
  - More share of the bandwidth, more likely to be dropped
- Randomly drop or mark a packet with prob  $p$ !



## Discussion

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- Based on other literature and Class Discussion Pages
- Dropping or Marking a packet ?
  - Understandable in the TCP context, may not be in other protocols or to ignorant users.
  - In ATM network, if one cell is dropped, then all the others are useless.
- Queue?
  - Largely rely on FIFO
  - How to determine optimum average queue size for max throughput and min delay for various configurations?
  - Scheduling or multi-level queue?