ECSE-6600: Internet Protocols

Informal Quiz #08

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Congestion Control (Slide set #9): Informal Quiz

Congestion Control

- Scheduling refers to the control of which packet is dropped from buffers
- Scheduling refers to the control of which packet gets access to the link capacity that becomes available
- FIFO queueing necessarily requires the use of drop-tail packet-drop policy
- FIFO is an example of a scheduling & queueing policy
- FIFO+droptail provides service isolation among the participating TCP flows
- Burstiness is the same as an occurrence of a congestion event
- Congestion refers to sustained overload due to demand at a resource being larger than capacity
- Synchronization occurs because DropTail leads to bursty and correlated packet losses amongst flows; and flows react to same events
- Random packet dropping can help alleviate the synchronization problems caused by drop-tail
- Dropping packets early has the risk that transient burstiness may be mistaken for true overload (demand > capacity)
- Marking packets instead of dropping them avoids non-linearities caused by loss detection and retransmission mechanisms
- Differentiating which packets to drop (even within a FIFO queue) can be used as a mechanism to provide protection to fragile flows (I.e. whose performance is vulnerable to packet losses).
- Marking instead of dropping implies trusting end-systems to control demand.

Congestion Control

- RED determines random drop probability by comparing the average queue size to a max and min thresholds
- RED uses average queue size instead of the absolute queue size
- RED also provides perfect isolation between flows (I.e. does not allow one flow's misbehavior affect the performance received by another flow)
- A key difference between RED and REM is the way the packet drop or mark probability varies as a function of link congestion
- When a packet is marked with a single-bit to indicate congestion, the packet is retransmitted by the source
- DECbit, RED and REM differ in the way they mark the congestion bit during phases of congestion
- The concept of accumulation is exactly the same as the concept of a queue
- Accumulation is roughly the contribution of each flow to the overall queueing in the network
- The ratio of steady-state accumulations is equal to the ratio of rates received by the flows
- Monaco uses a higher-priority queue for control packets to allow accurate accumulation estimation compared to the estimation approach used by TCP Vegas
- An explicit rate feedback scheme can potentially send back more feedback information quickly compared to a loss-based or single-bit based feedback scheme

Congestion Control

- One of the implications of the square-root formula for TCP throughput is that when there are double the number of flows seeking bandwidth, we could see quadruple the loss rate
- TCP timeout behavior leads to throughput that is worse than that predicted by the simple square-root formula
- All binomial congestion control schemes are TCP-friendly
- All binomial congestion control schemes can achieve a stable equilibrium point
- In the primal-dual optimization model, TCP is a special, approximate case of the primal (source-control) algorithm and AQM schemes are a special, approximate case of the dual (link-control) algorithm