Computer Networks: Congestion Control and QoS

By,

Mr. Kumar Pudashine, (MEng, AIT)
CCNP (Security), CEH, ITIL Expert, ISO 27001, CISA, AcitivIdentity Certified
Information Technology Division,
Agricultural Development Bank,
Ramshahpath, Kathmandu
Nepal

August 2016

Network Congestion: What It is ??

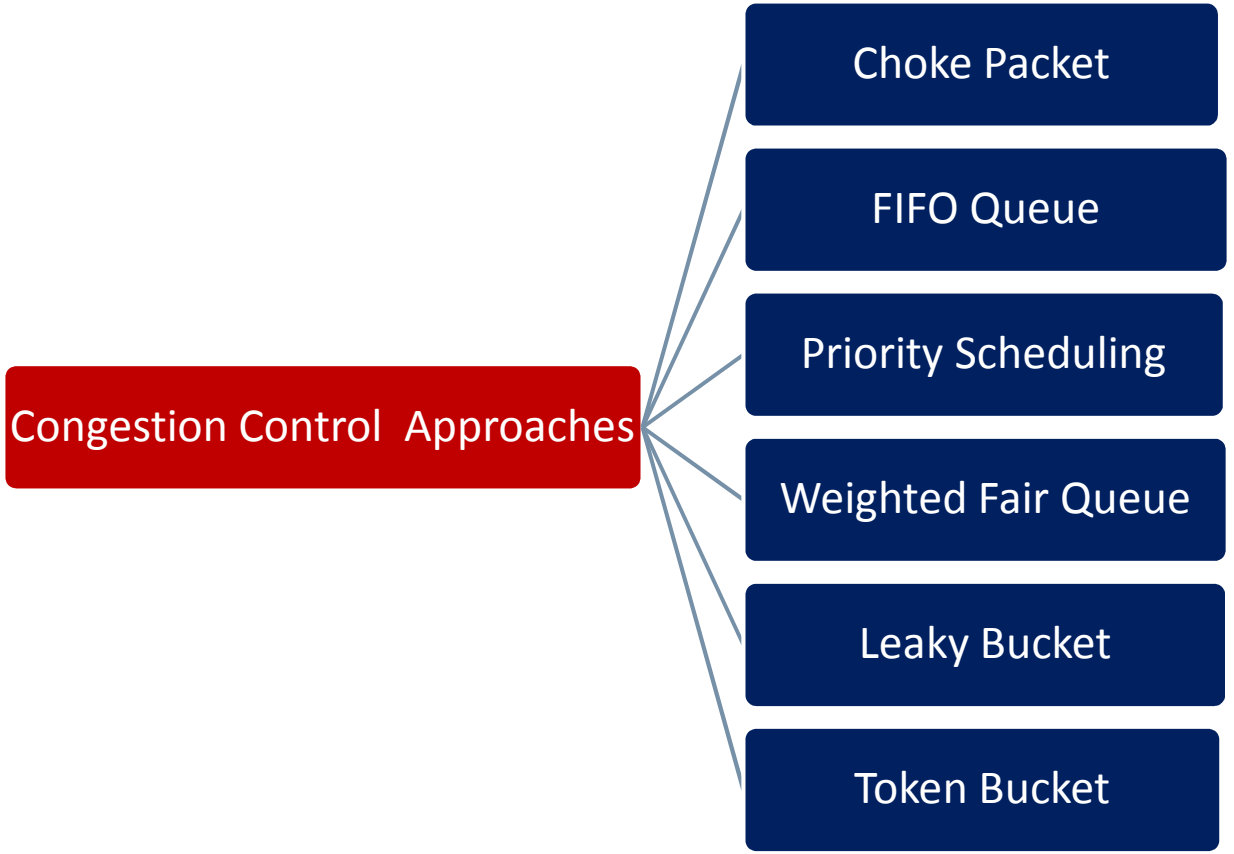
- *Network Congestion* is the situation in which an increase in data transmissions results in reduction of *Throughput*.

- Congestion occurs when the number of packets being transmitted through the network approaches the packet handling capacity of the network.

- Congestion Control Types.
  - ✓ Open Loop (Prevent Congestion occurring by Good Design)
  - ✓ Closed Loop (Detect => Feedback => Correct)

- Why Congestion Occurs ??
  - ✓ Bursty Traffic
  - ✓ Insufficient Memory
  - ✓ Low Buffer Space
  - ✓ Low Processor

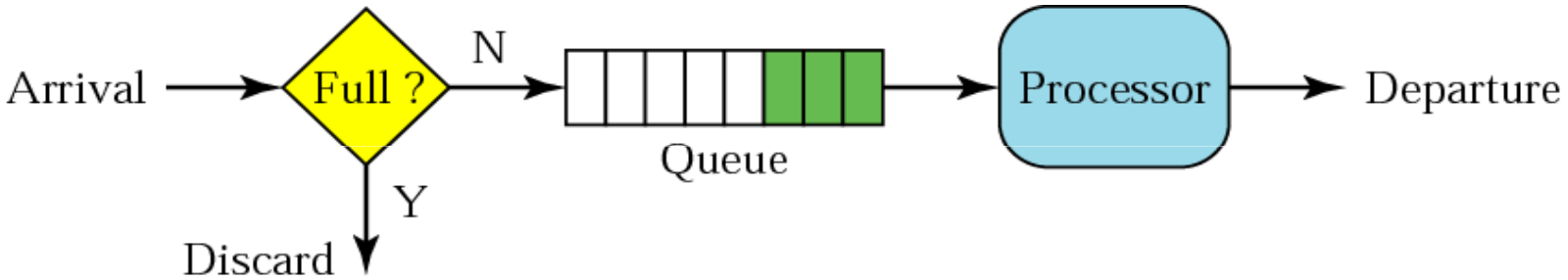
Congestion Control: Approaches ??



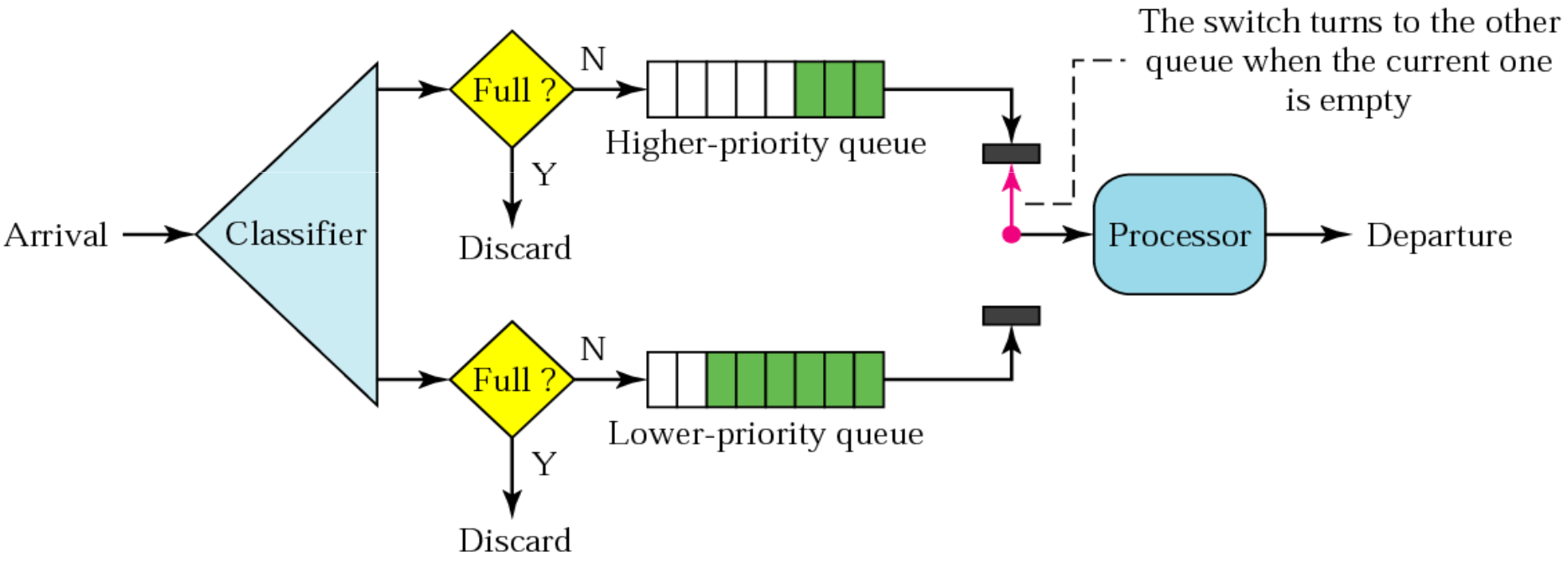
Congestion Control: Choke Packet

- A more direct way of telling the Source to Slow down.
- Choke Packet is a Control Packet generate at Congested Node.
- It is then transmitted to Source.
- The Source on receiving the Choke Packet must reduce its Transmission Rate.
- Hop by Hop Choke Packet is more efficient than Choke Packet.
- It Enables each Hop to reduce its Transmission Rate even before Choke Packet receives at Source.

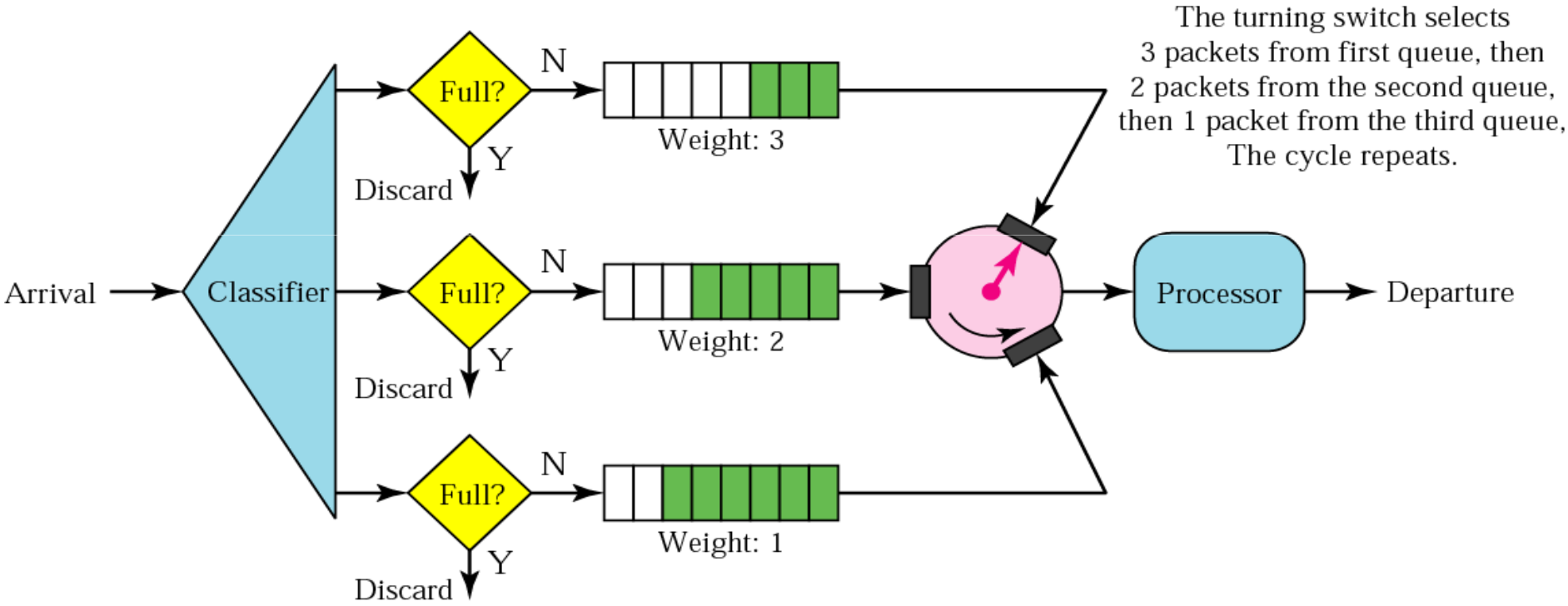
Congestion Control：FIFO Queue



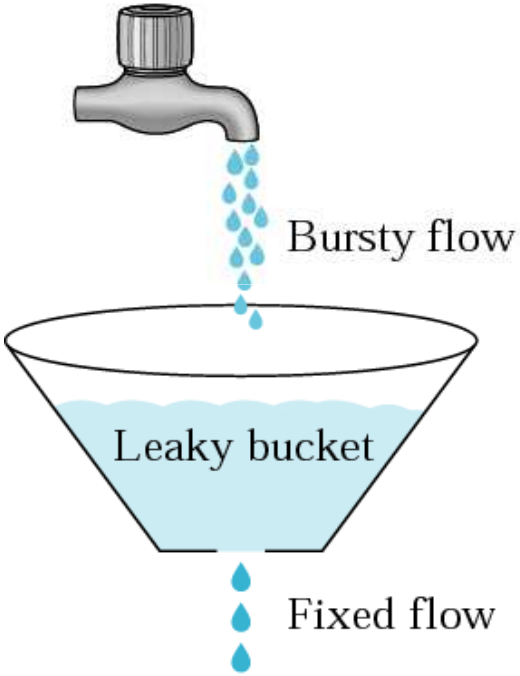
Congestion Control：Priority Queuing

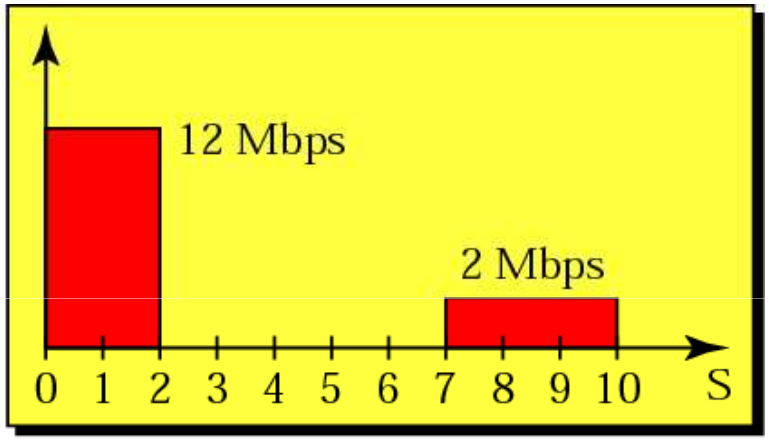


Congestion Control : Weighted Fair Queuing

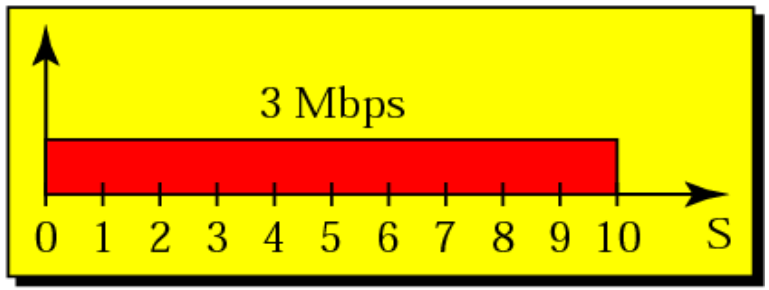


Congestion Control: Leaky Bucket



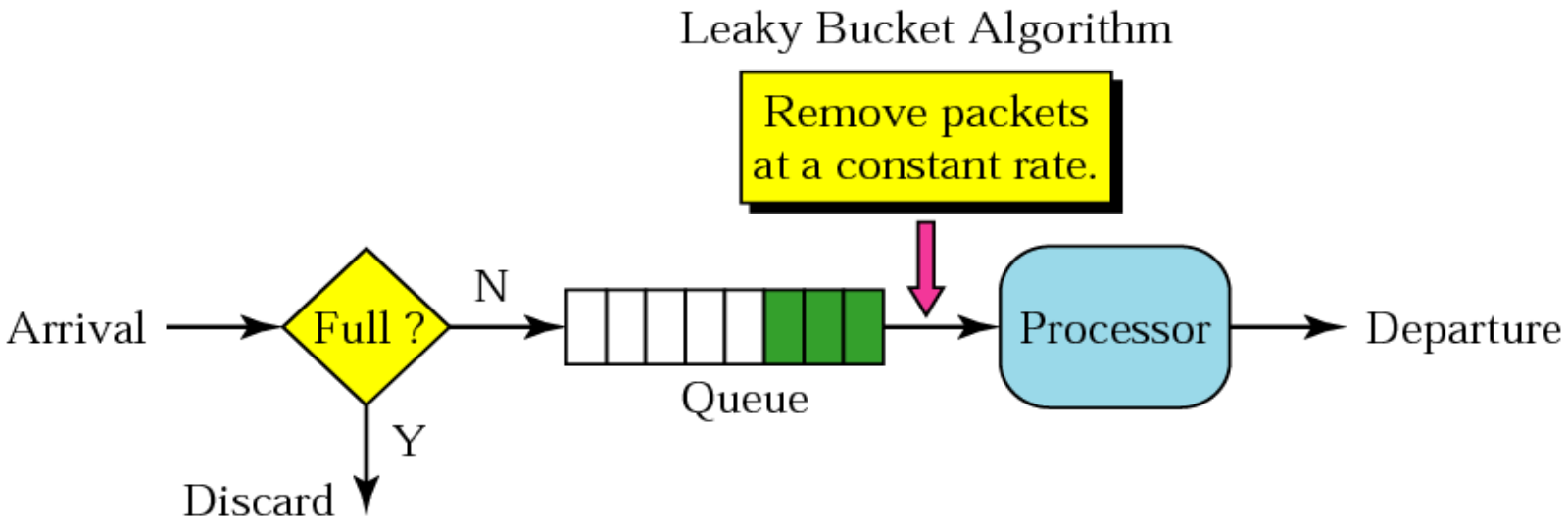


Bursty data

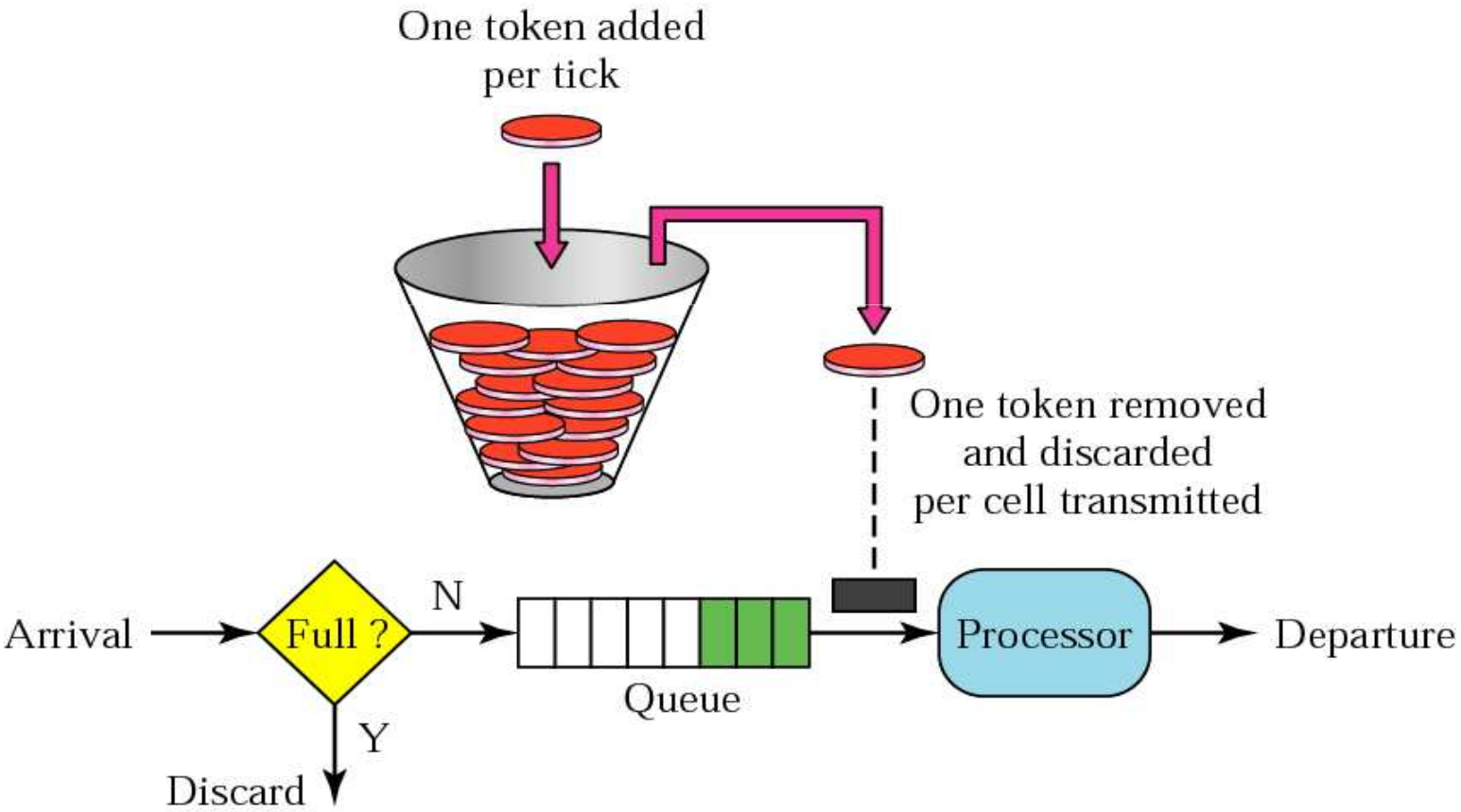


Fixed-rate data

Congestion Control: Leaky Bucket Implementation



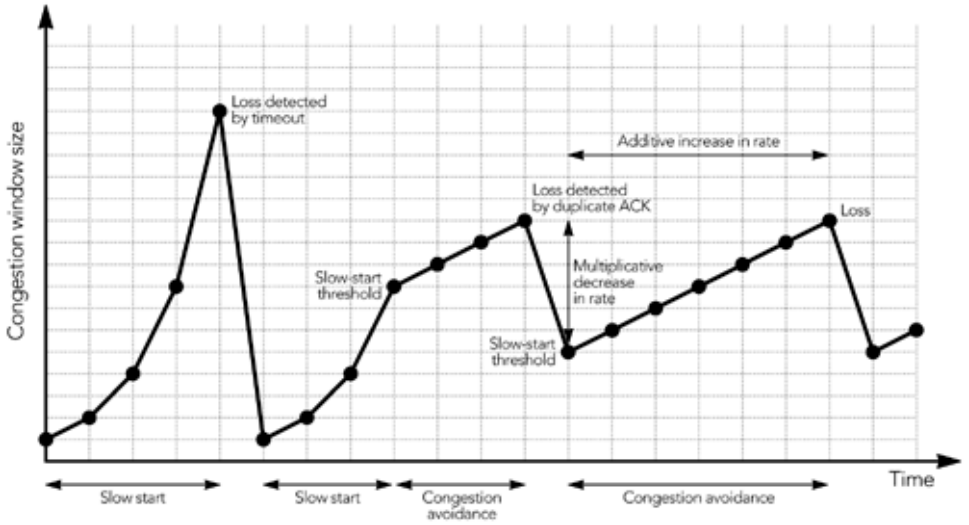
Congestion Control: Token Bucket



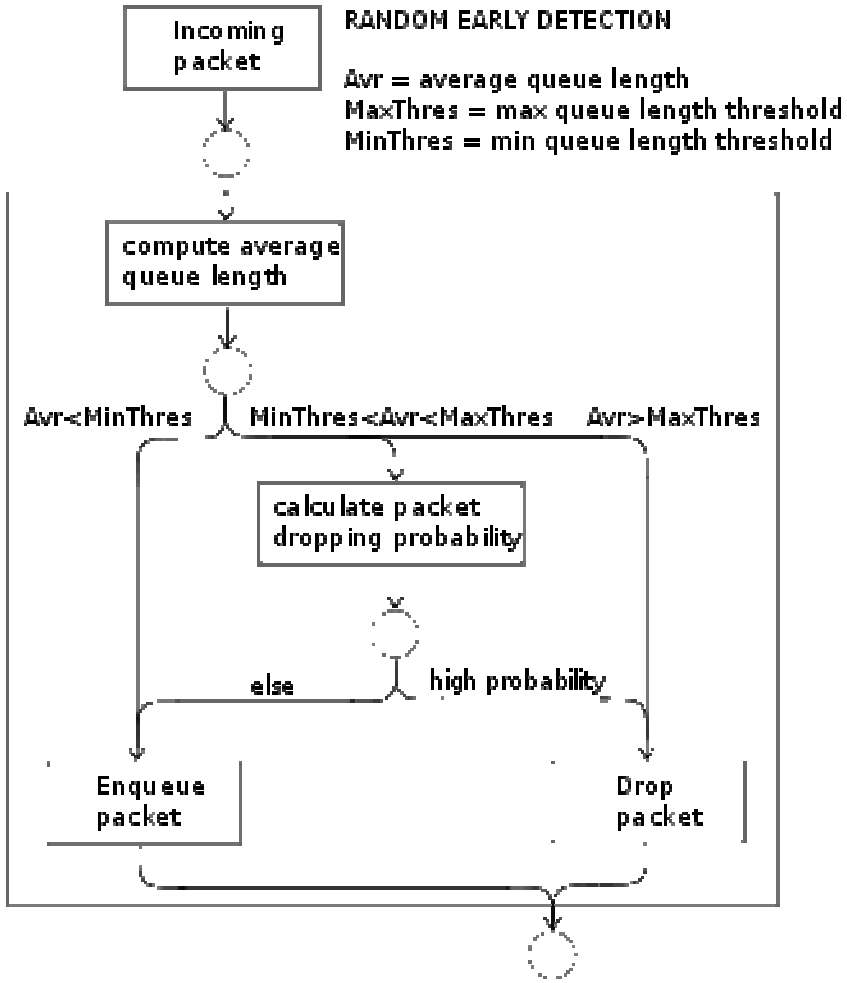
TCP Congestion Control : AIMD

- AIMD => Additive Increase Multiplicative Decrease.
- Feedback Control Algorithm Best Known for TCP Congestion Avoidance.
- AIMD Combines Linear growth of the Congestion Window with an Exponential reduction when a Congestion takes Place.

$$w(t+1) = \begin{cases} w(t) + a & \text{if congestion is not detected} \quad a > 0 \\ w(t) \times b & \text{if congestion is detected} \quad 0 < b < 1 \end{cases}$$



Random Early Detection



Thank You