Course: Computer and Communication Networks

Topic: Data Traffic and Transmission Control Protocol (TCP)

Presentation by

Ajay Kakkar

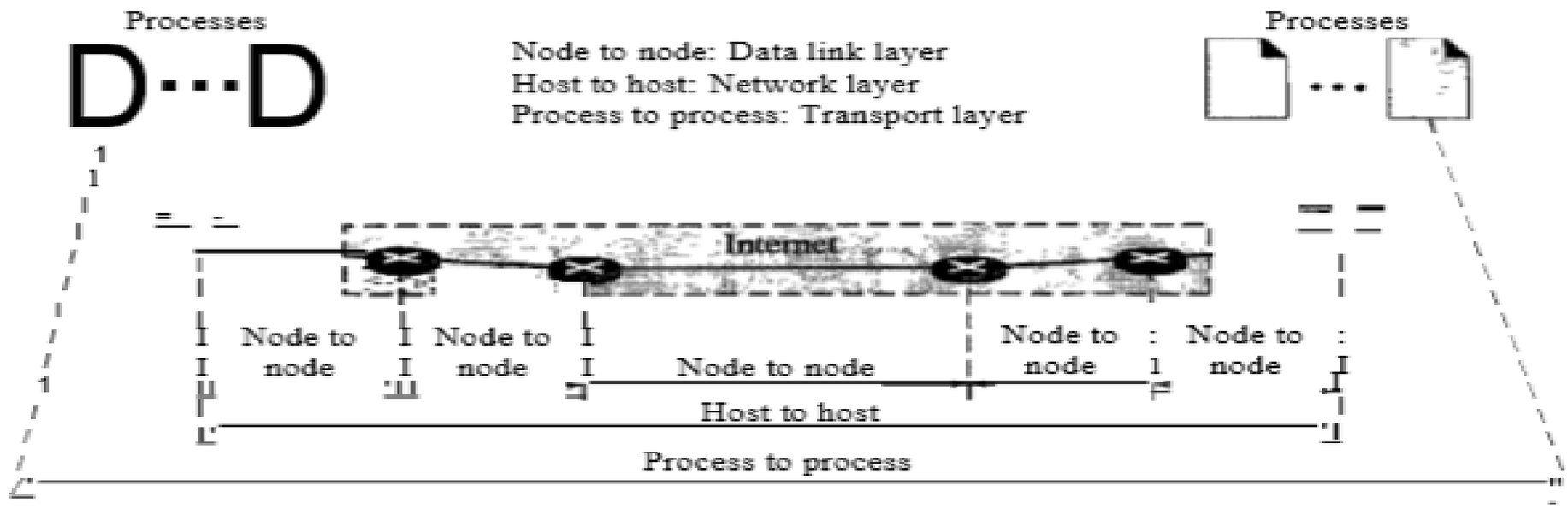
Assistant Professor

Department of Electronics and Communication Engineering,

Thapar Institute of Engineering & Technology
(Deemed to be University)
Bhadson Road, Patiala, Punjab, Pin-147004
Contact No. : +91-175-2393201
Email : info@thapar.edu

THAPAR INSTITUTE
OF ENGINEERING & TECHNOLOGY
(Deemed to be University)

Type of data deliveries



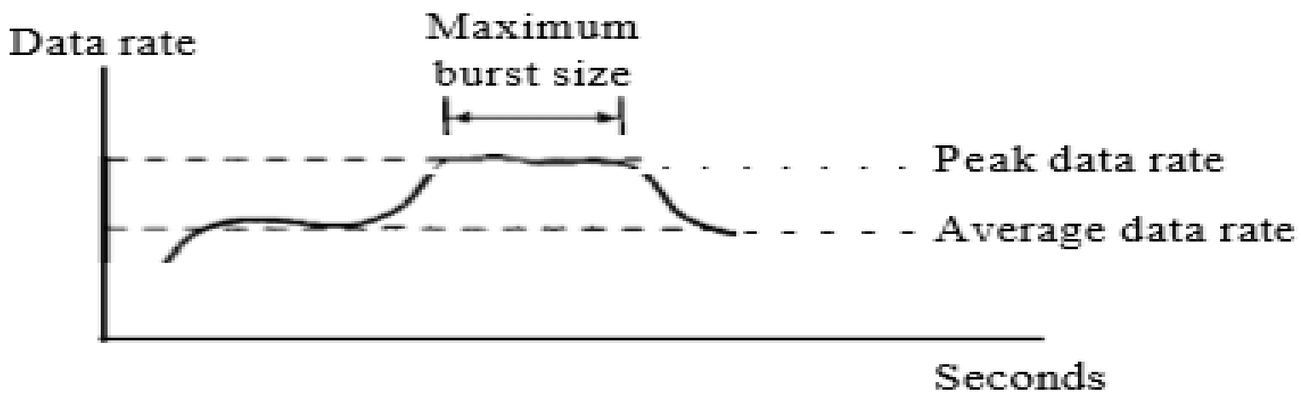
Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

DATA TRAFFIC

Traffic Descriptor

- Average Data Rate
- Peak Data Rate
- Maximum Burst Size
- Effective Bandwidth

$$\text{Average data rate} = \frac{\text{amount of data}}{\text{time}}$$



Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

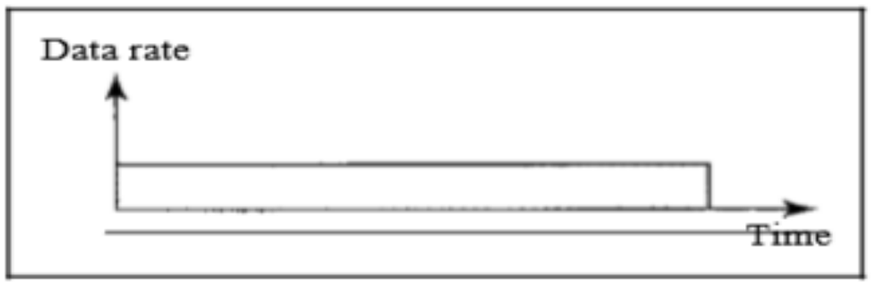
DATA TRAFFIC

Traffic Profiles

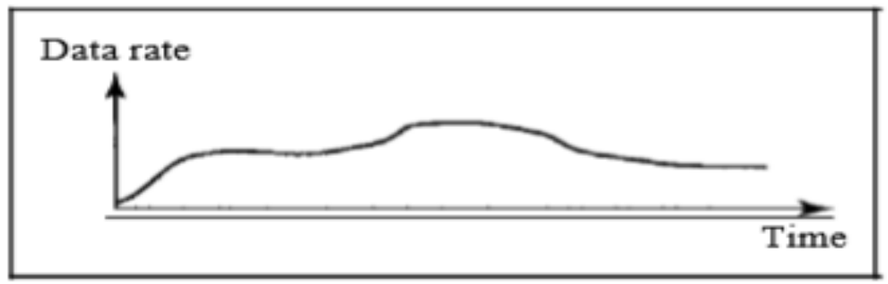
Constant Bit Rate

Variable Bit Rate

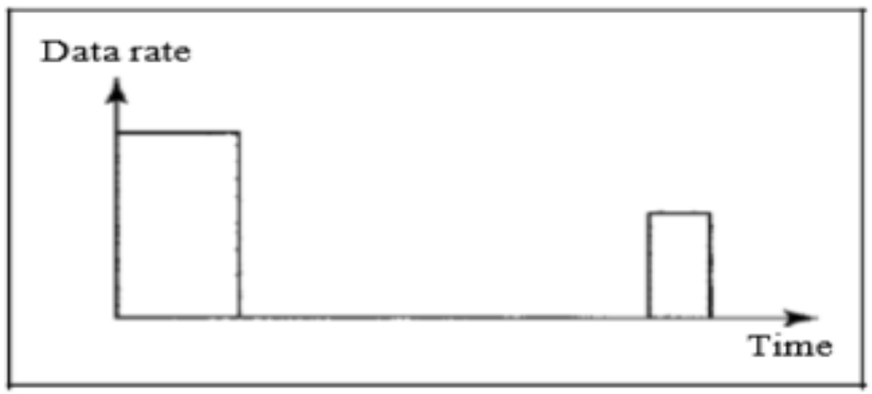
Bursty data



a. Constant bit rate



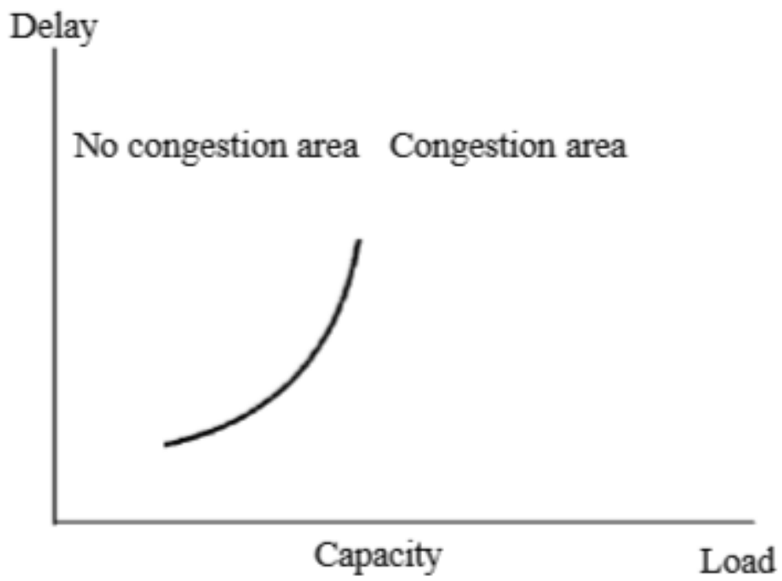
b. Variable bit rate

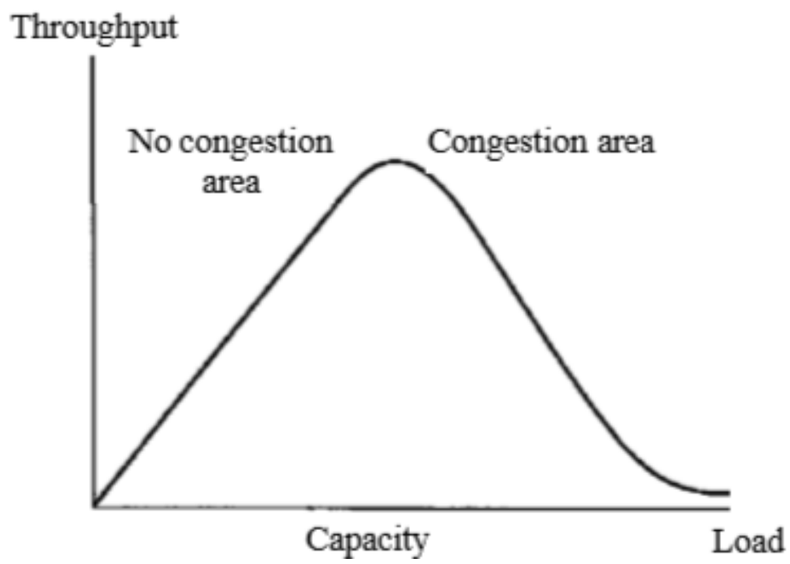


c. Bursty

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

Network Performance





Congestion control involves two factors that measure the performance of a network: ***Delay and Throughput.***

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

Transmission Control Protocol (TCP)

- **Data stream push:** TCP decides when sufficient data have accumulated to form a segment for transmission.

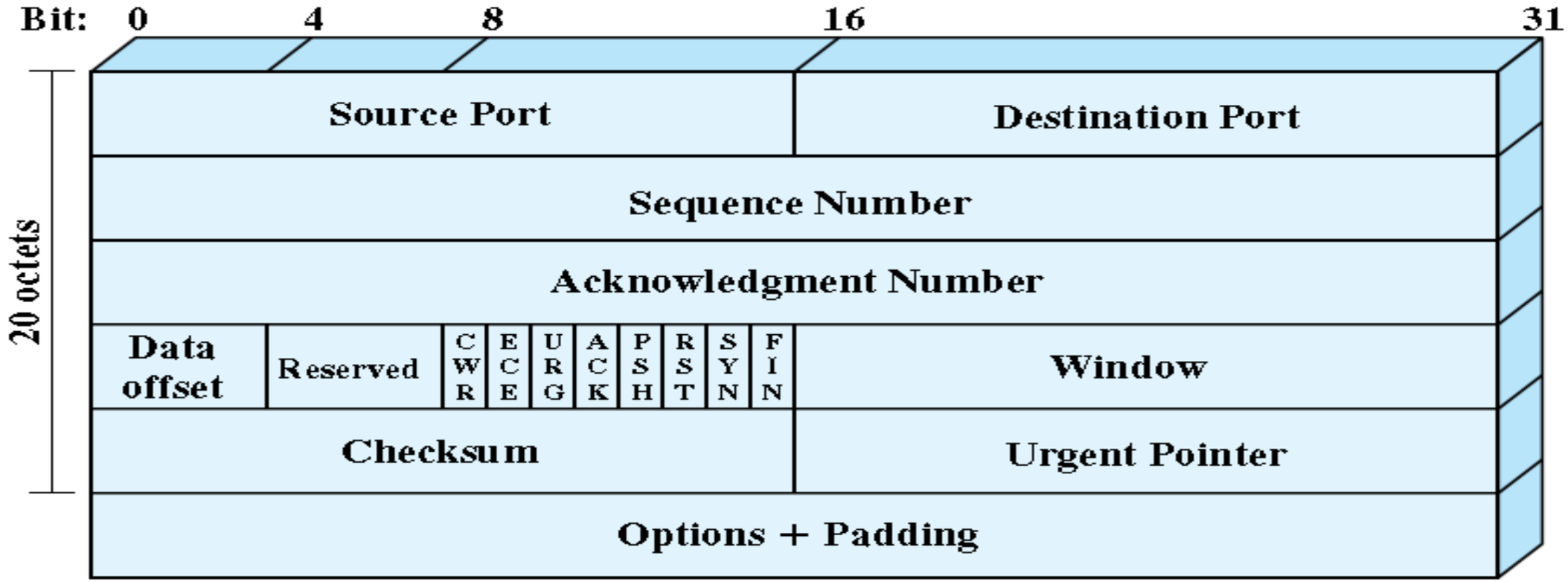
- The TCP user can require TCP to transmit all outstanding data up to and including that labeled with a push flag.

- **Urgent data signaling:** This provides a means of informing the destination TCP user that significant or “urgent” data is in the upcoming data stream.

- It is up to the destination user to determine appropriate action.

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

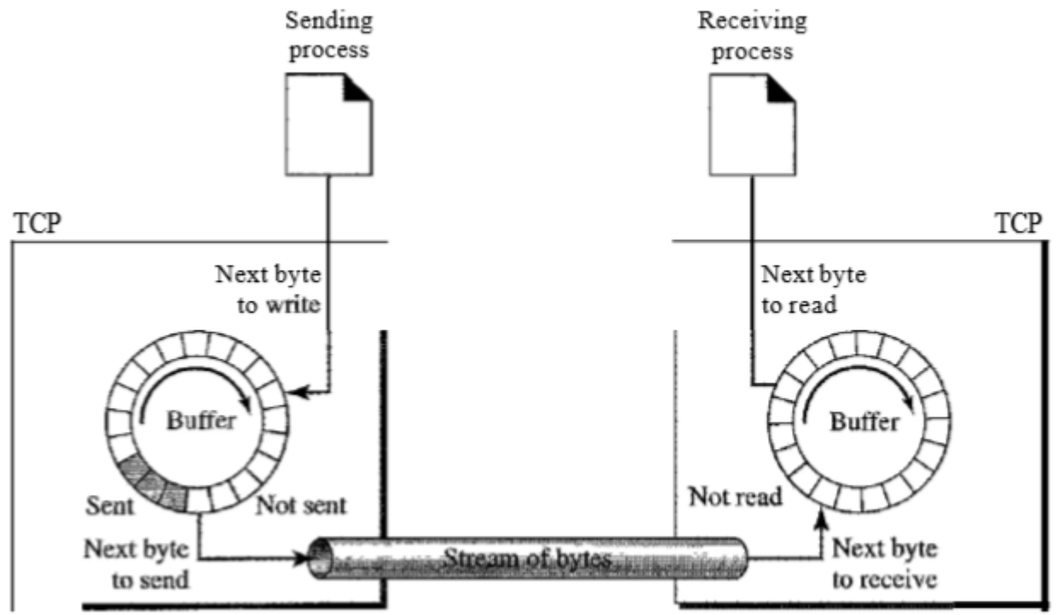
TCP Header



Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

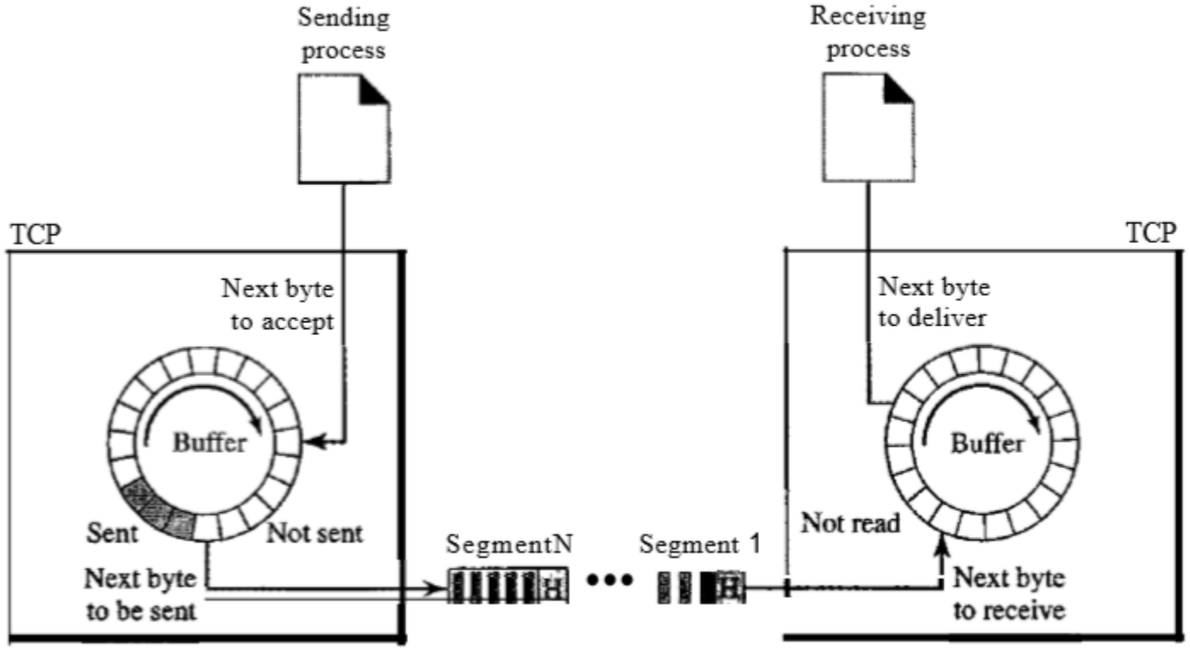
Stream Delivery Service

Sending and receiving buffers

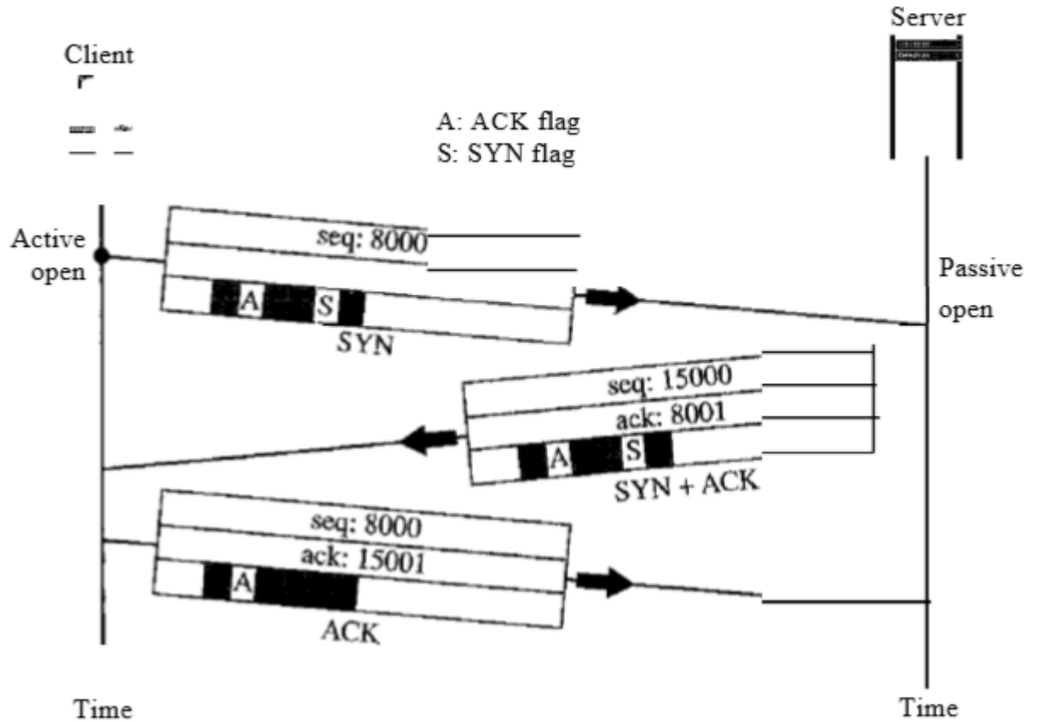


Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

TCP segments

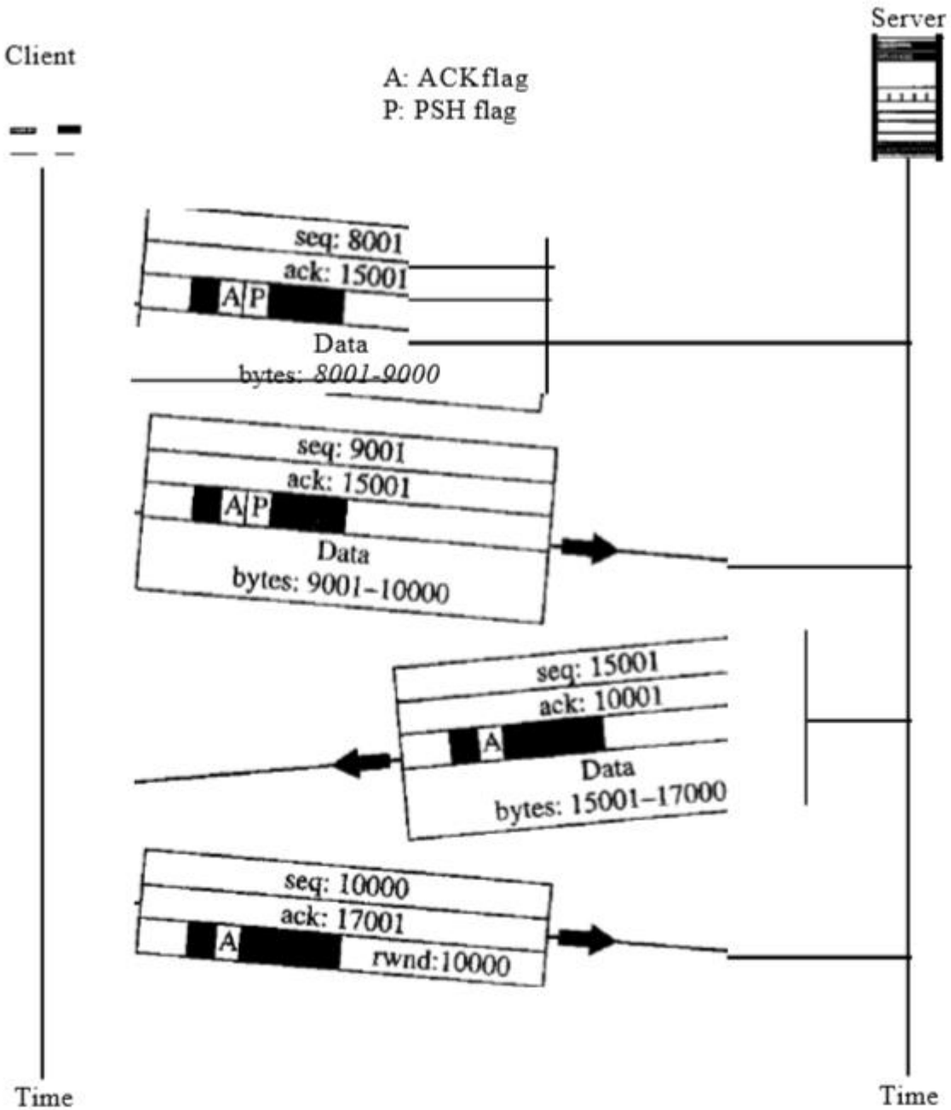


Connection establishment using three-way handshaking



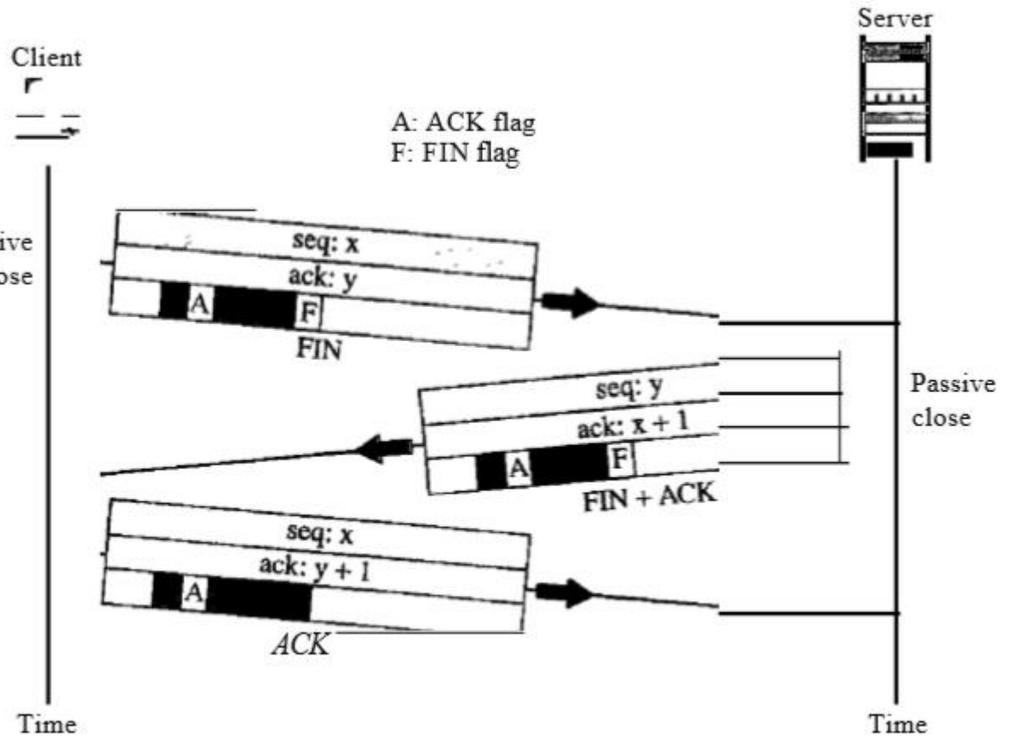
Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

TCP segments



Data Transfer

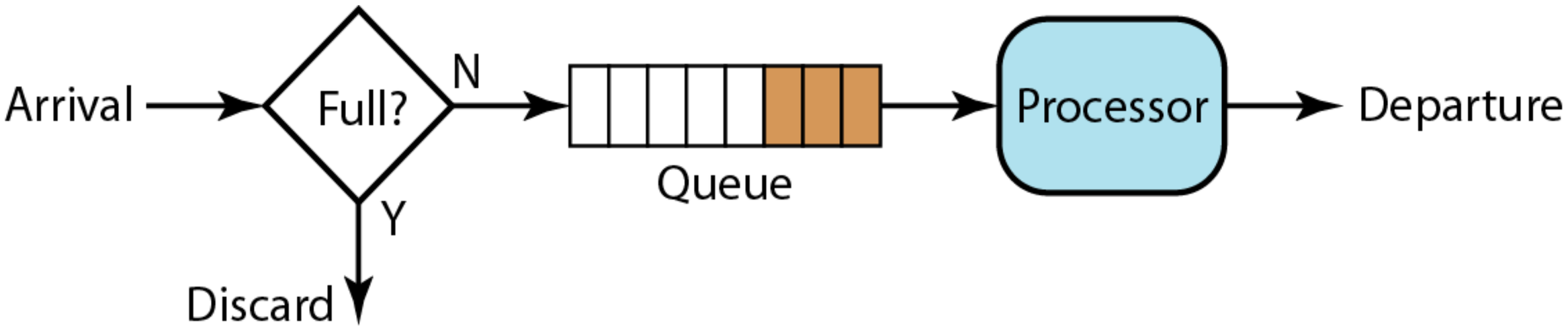
Connection termination using three-way handshaking



Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

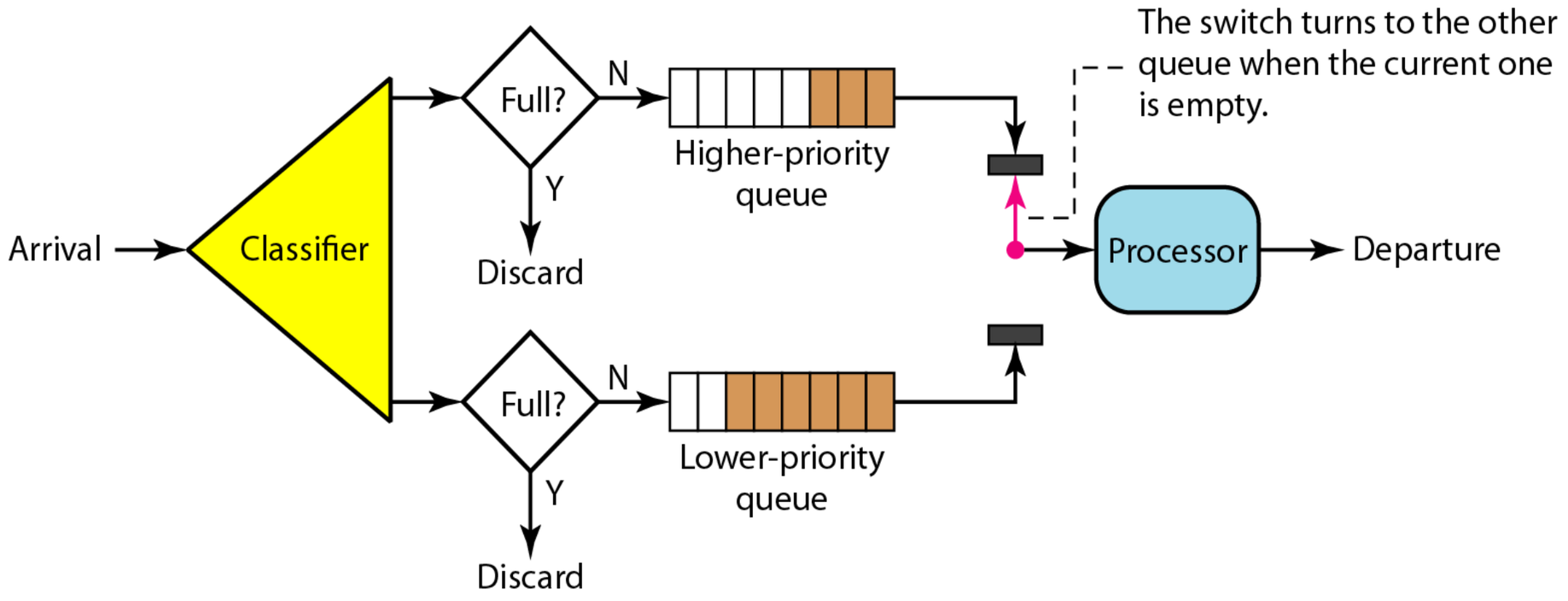
TECHNIQUES TO IMPROVE QoS

FIFO queue



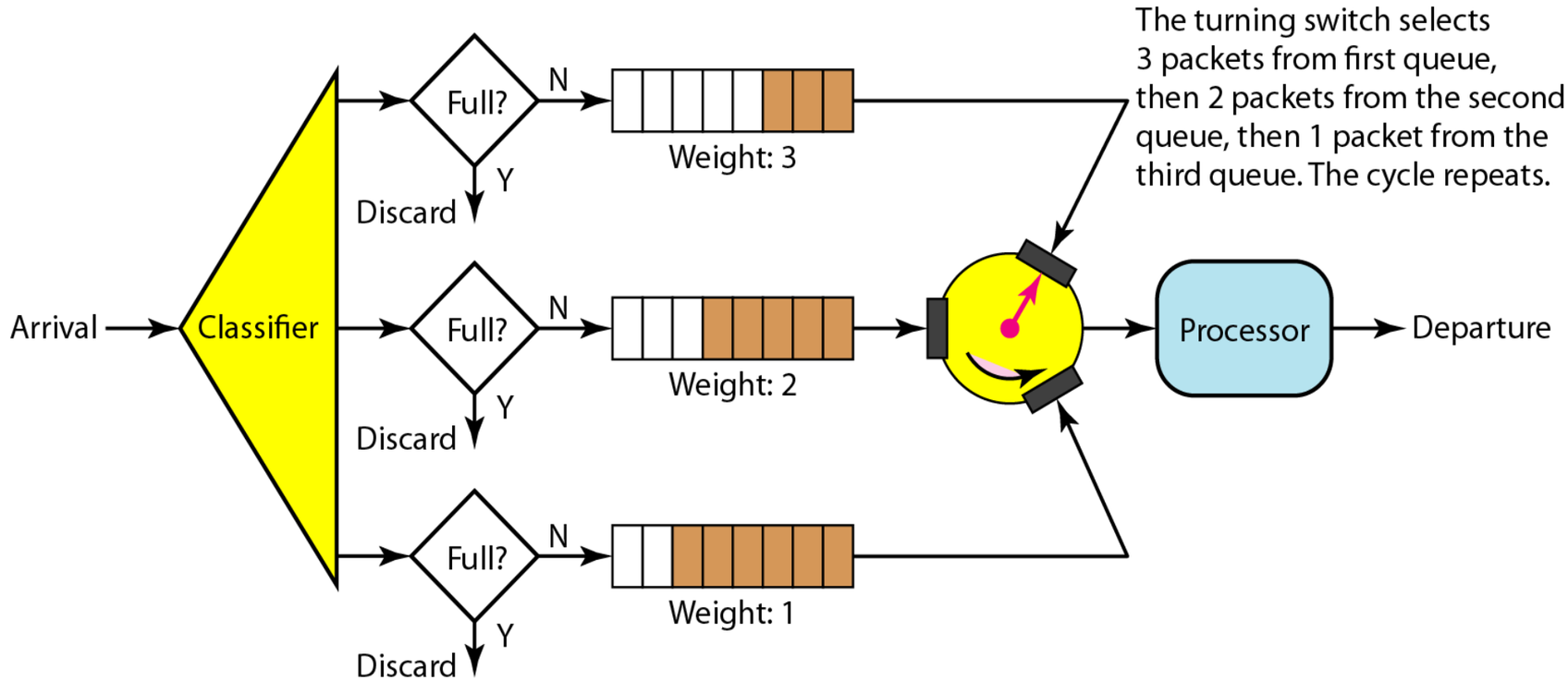
Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

Priority queuing



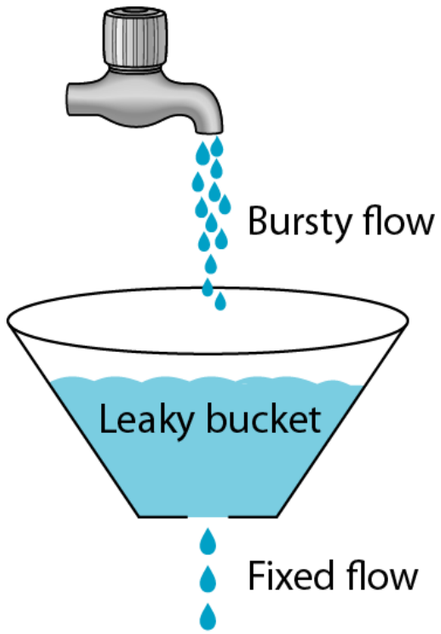
Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

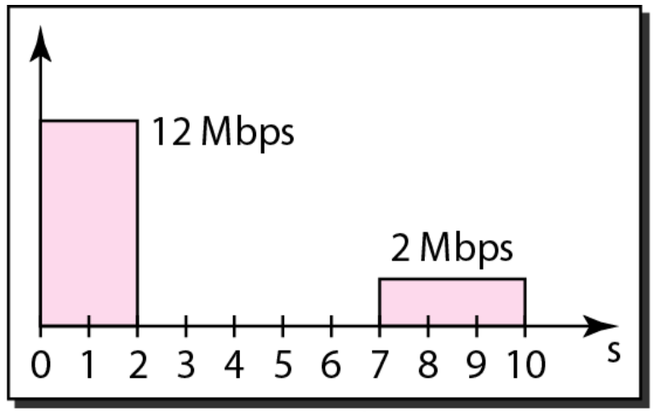
Weighted fair queuing



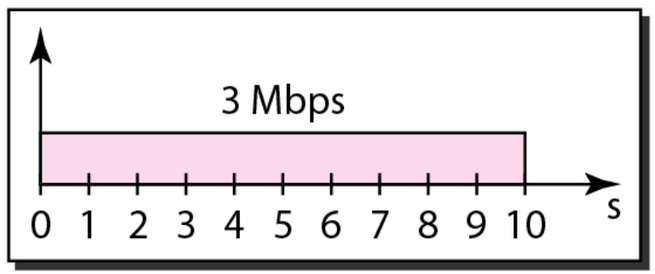
Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

Leaky bucket





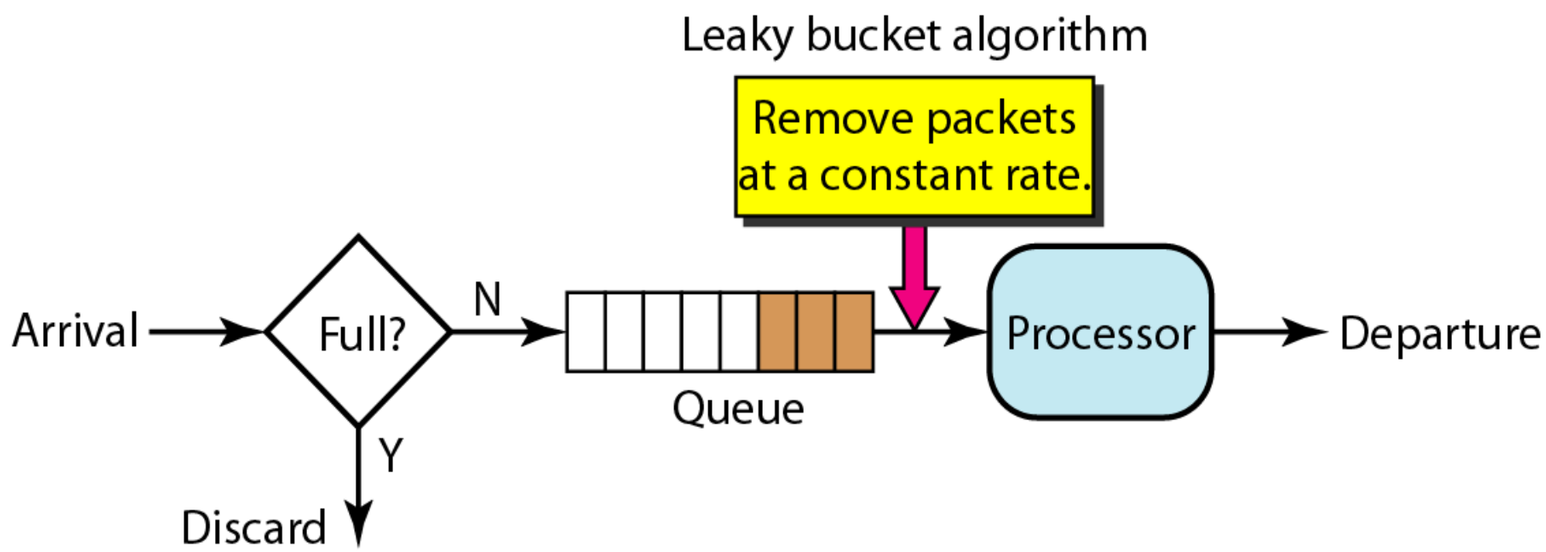
Bursty data



Fixed-rate data

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

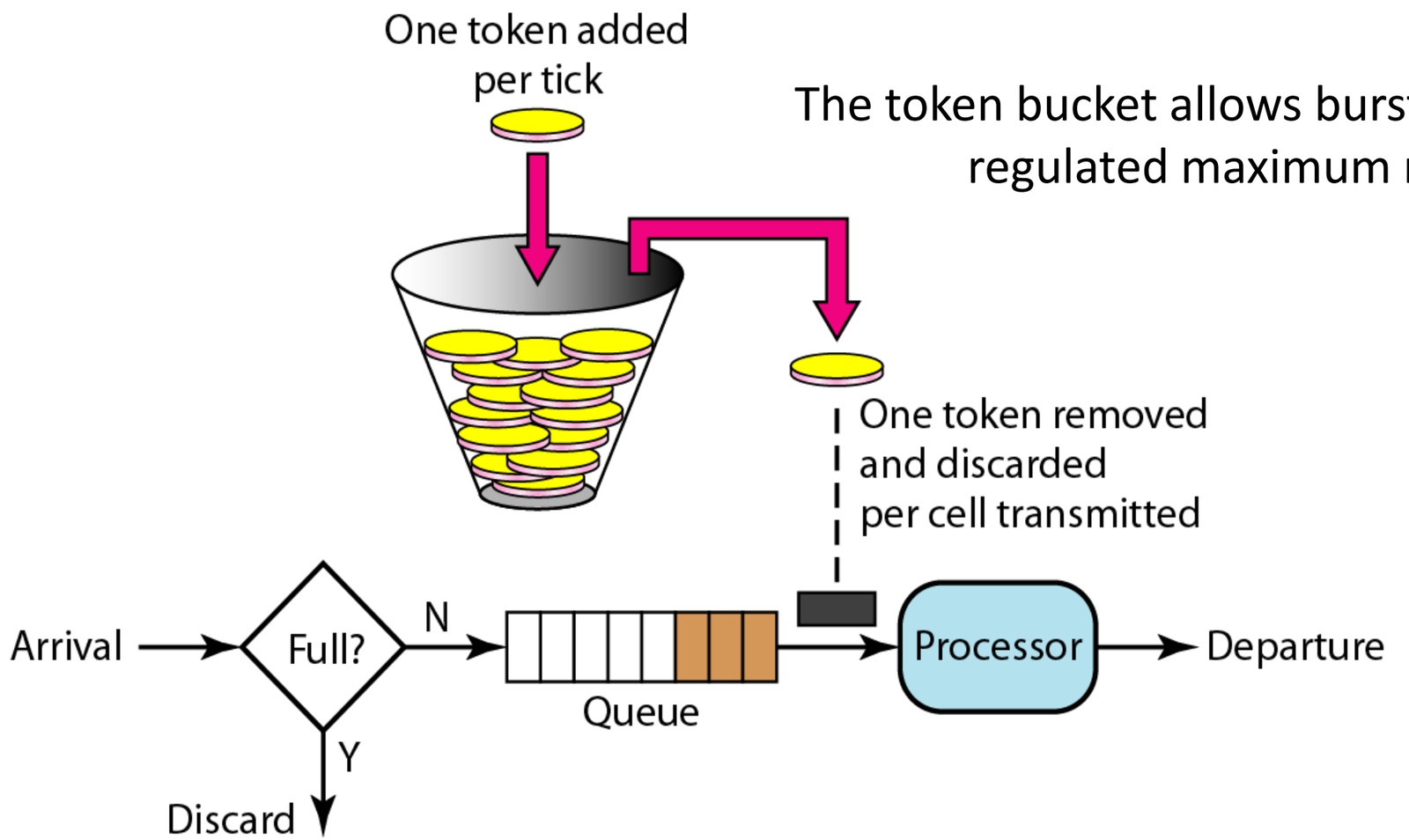
Leaky bucket implementation



A leaky bucket algorithm shapes bursty traffic into fixed-rate traffic by averaging the data rate. It may drop the packets if the bucket is full.

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

Token bucket



The token bucket allows bursty traffic at a regulated maximum rate.

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

INTEGRATED SERVICES

Integrated Services is a flow based QoS model designed for IP

- Signaling
- Flow Specification
- Admission
- Service Classes:

  a) Guaranteed Service Class, and b) Controlled-Load Service Class

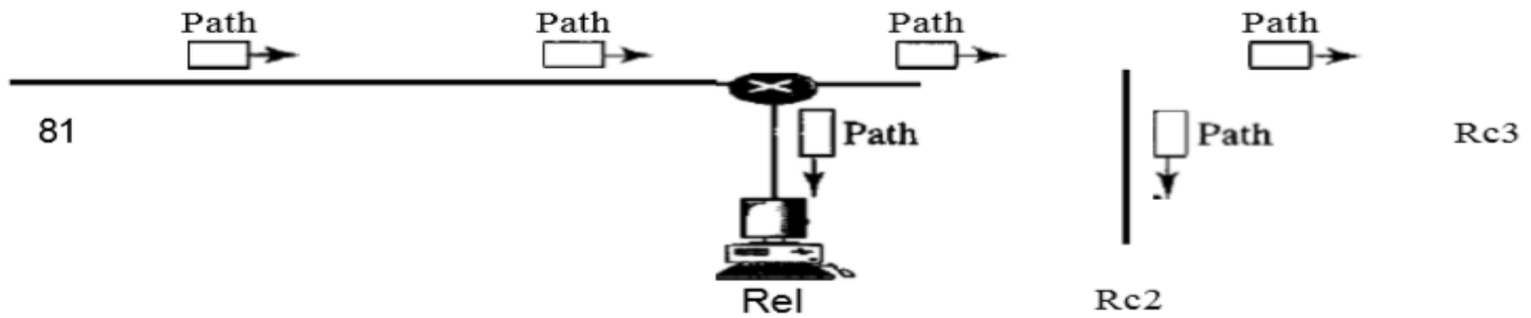
Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

RSVP (The Resource Reservation Protocol)

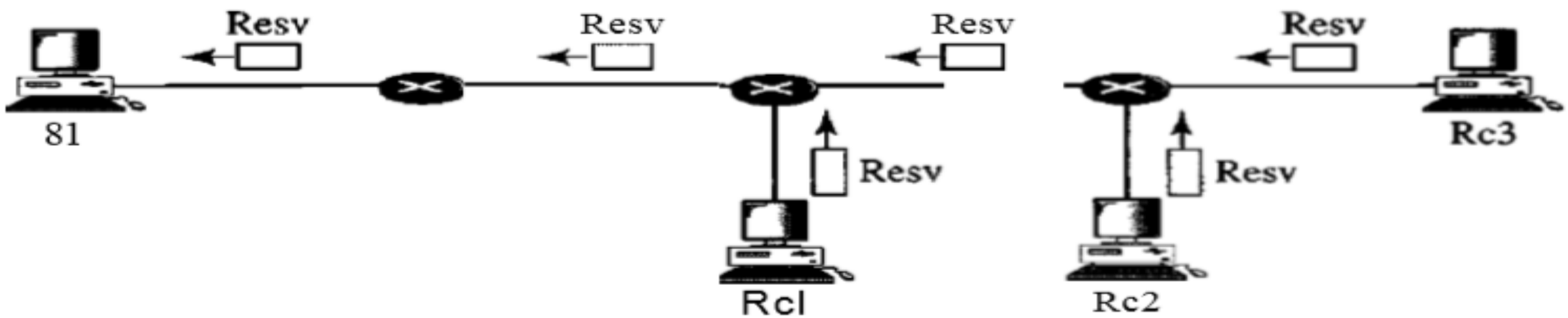
a) Multicast Trees b)Receiver-Based Reservation

RSVP Messages:

a) Path Message



b) Resv Messages



Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org

DIFFERENTIATED SERVICES

Differentiated Services is a class-based QoS model designed for IP

Two fundamental changes were made:

1. The main processing was moved from the **core of the network to the edge of the network.** This solves the **scalability** problem. The routers do not have to store information about flows. The applications, or hosts, define the type of service they need each time they send a packet.

2. **The per-flow service is changed to per-class service.** The router routes the packet based on the class of service defined in the packet, not the flow. This solves the service-type limitation problem. We can define different types of classes based on the needs of applications.

Benefits: **a) Low loss** **b) Low latency** **c) Ensured bandwidth**

Reference: 1. Ferouzan, Behrouz A., Data Communications and Networking, 2. Stallings William, Data and Computer Communication. 3. https://ieeexplore.ieee.org