ASSIGNMENT - C.N

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S3 MCA

Q Quality of Service and its various methods

Quality of Service

QoS is a set of technologies that work on a network to guarantee that ~~work on a network~~ to its ability to dependably run high-priority applications and traffic under limited network capacity. QoS technologies accomplish this by providing differentiated handling and capacity allocation to specific flows in network traffic. This enables network admins to assign orders in which packets are handled.

Measurements of concern to QoS are bandwidth, latency, jitter and error rate. This renders QoS of particular importance to high bandwidth, real-time traffic such as voice over IP video conferencing and video-on demand that have a high sensitivity to latency and jitter.

Techniques to improve QoS

includes

i) Scheduling
ii) admission control
iii) Traffic Shaping
iv) Resource Reservation

a) Traffic Shaping

The mechanism to control the amount and rate of traffic send to the network is traffic shaping.

methods

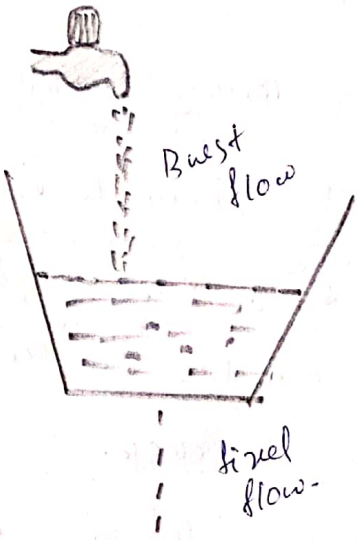
- Leaky bucket
- Token Bucket

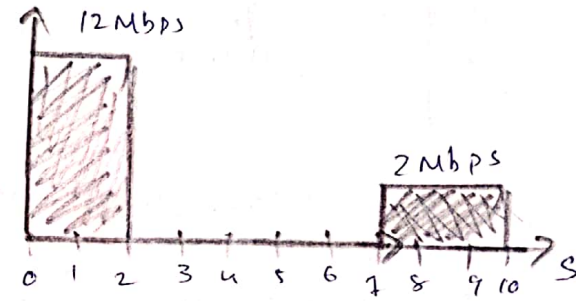
~~Token Bu~~

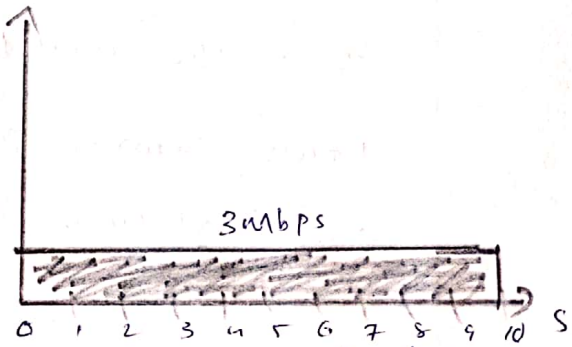
Leaky Bucket

A bucket with a small hole at the bottom will leak water from it at a constant rate as long as there is water. The leaking rate doesn't affected by rate at which water is filled ~~on~~ in the bucket

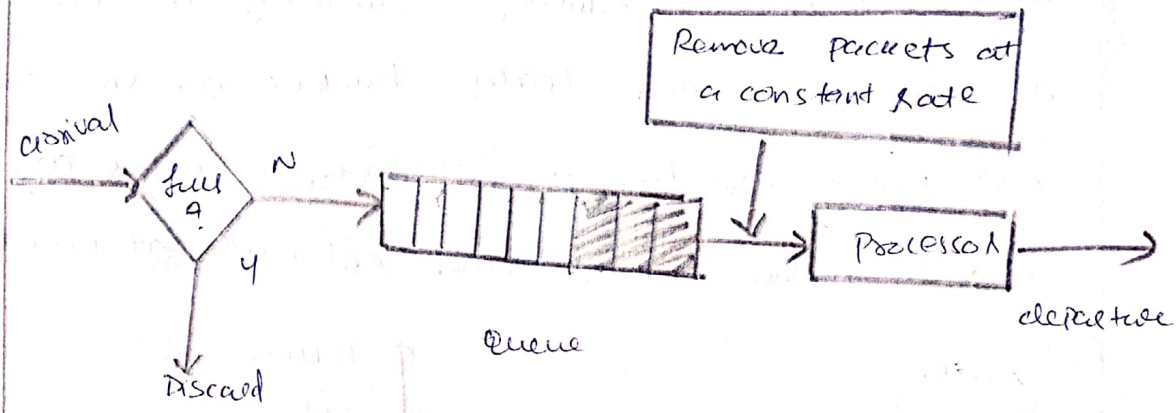
unless bucket is empty. Similarly in n/w a technique called leaky bucket can smooth out burst traffic. The Bursty chunks are stored in the bucket and sent out at an avg. rate.







In above figure, we assume that the n/w has committed a bandwidth of 3Mbps for a host. The use of the leaky bucket shapes the input traffic to make it conform to this commitment. The host sends a burst data at a rate of 12Mbps for 2 seconds, for a total of 24 Mbs of data. The host is silent for 5 sec. and then sends data at rate of 2Mbps. Total of 30 Mb data in 10 seconds. The leaky bucket smoothens the traffic by sending out data at a rate of 3Mbps during 10 seconds.



The implimentation of leaky bucket as shown above uses a FIFO queue to hold the packets. The traffic consists of fixed-size packets the process removes a fixed number of packets from queue at each tick of the clock.

For variable length packets, the fixed o/p rate must be based on the no. of bytes or bits.

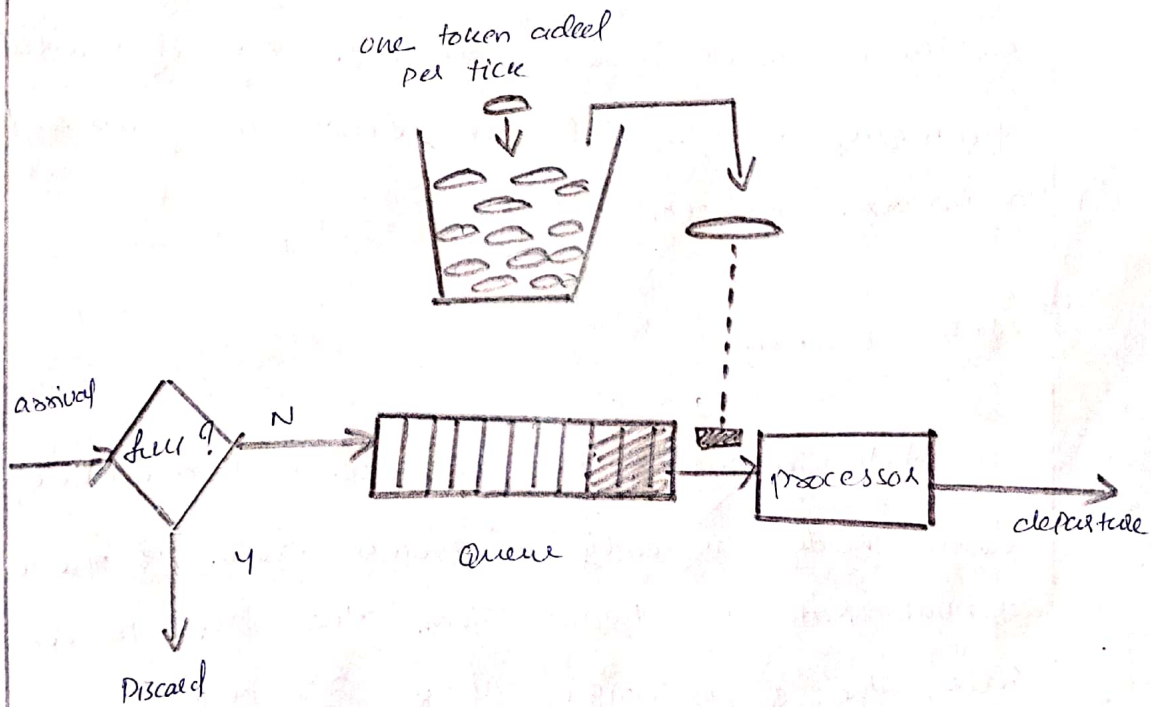
A leaky bucket algorithm shapes bursty traffic into fixed rate traffic by averaging the data rate. It may drop the packets if bucket is full.

ii) Token Bucket

Leaky bucket does not credit an idle host. It's very restrictive eg. if a host is not sending for a while, the bucket becomes empty. Now if host has bursty data, the leaky bucket

allows only an average rate. The idle time of host is not considered.

But the token bucket algorithm allows idle hosts to accumulate credit for future in form of tokens. For each tick of clock, the sim sends n ~~tocket~~ tokens to bucket. The sim removes one token for every cell of data sent. Token bucket can easily be implimented with a counter. The token is initialized to zero. Each time a token is added, the counter is incremented by 1. Each time a unit of data is sent, the counter is decremented by 1.



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

b) Resource reservation

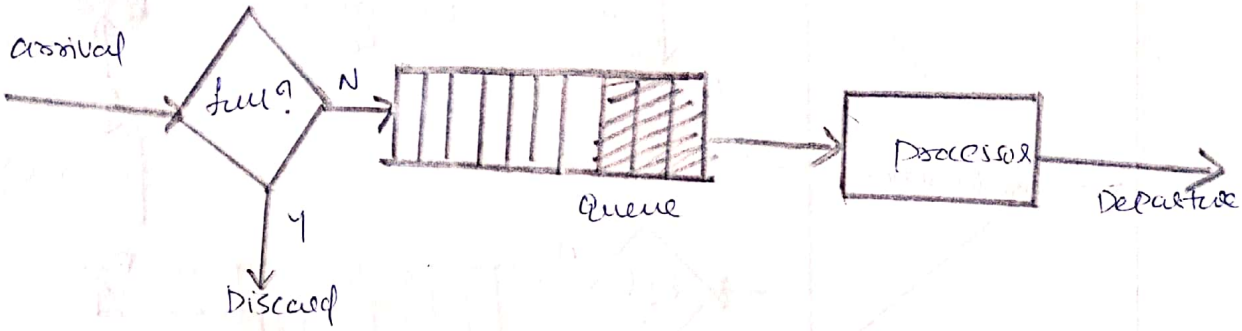
A flow of data needs resources such as buffers, bandwidth, CPU time, and so on. The quality of service is improved if these resources are reserved beforehand. We discuss in this section an QoS model called Integrated Services, which depends heavily on resource reservation to improve QOS.

c.) Scheduling

Packets from different flows arrive at a switch or router for processing. A good scheduling technique treats different flows in a fair and appropriate manner.

i) FIFO Queuing

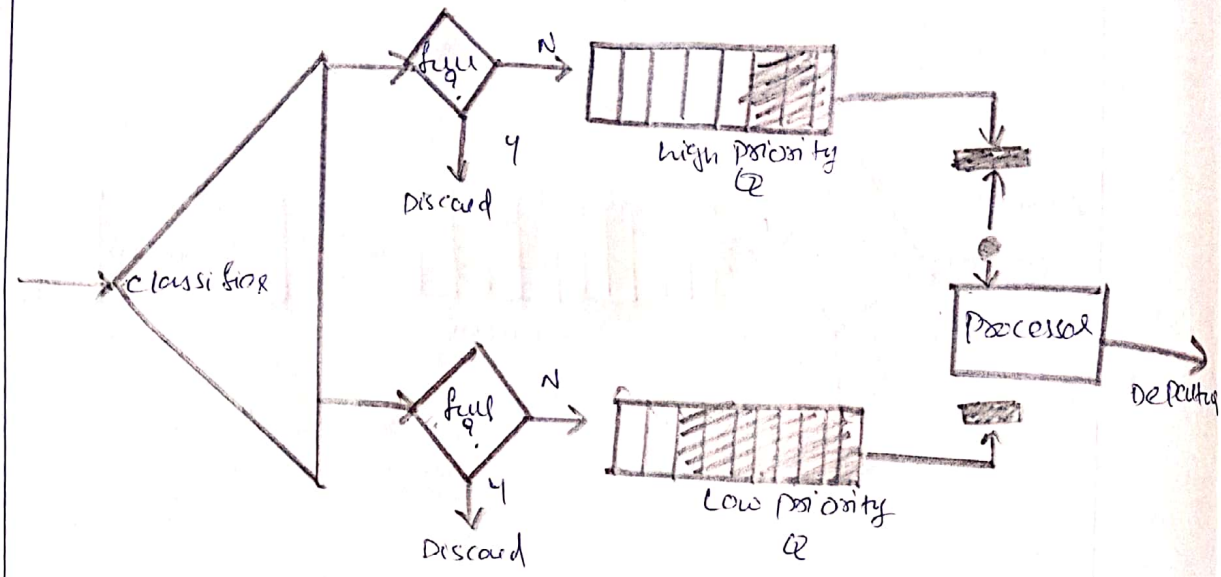
FIFO queuing, packets wait in a buffer until node is ready to process them. If the avg. arrival rate is higher than the avg. processing rate, the Q will fill up and new packets will be discarded. ~~A FIFO Q is termitted to~~



(iii) Priority Queuing

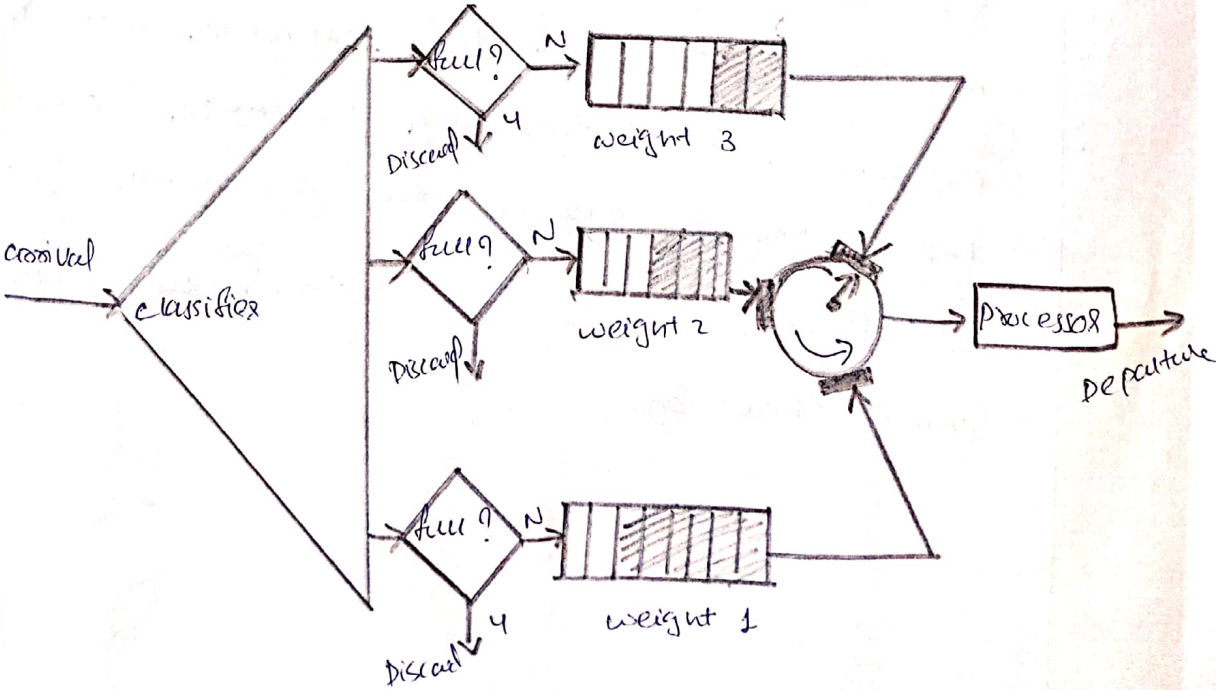
Here packets are 1st assigned to a priority class. Each priority class has its own queue. The packets in the highest priority queue are processed first. Packets in the lowest-priority queues are processed last. System won't stop serving until Q is empty.

Priority queue can provide better QoS than FIFO queue because higher priority traffic such as multimedia can reach the destination with less delay. But if there is a continuous flow in a high priority queue, the low priority queue packets will never get processed. which is called starvation.



iii) Weighted fair queuing

Here packets are still assigned to different classes and admitted to different queues. The queues however are weighted based on the priority of queues. Higher priority means a higher weight. The sim processes packets in each queue in a round robin fashion with the number of packets selected from each queue based on the corresponding weight.



d.) Admission Control

Refers to mechanism used by a router or a switch to accept or reject a flow based on predefined parameters called flow specifications. Before a router accepts a flow for processing, it checks the flow specifications to see if its capacity and its previous commitments to other flows can handle the new flow.