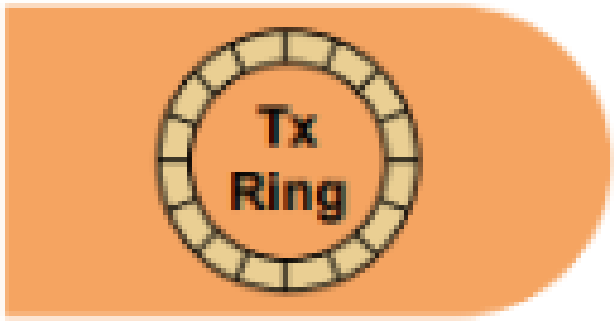
Quality of Service · Part 2

Queuing Comparison

	FIFO	PQ	CQ	WFQ	CBWFQ	LLQ
Default on Interfaces	>2 Mbps	No	No	<=2 Mbps	No	No
Number of Queues	1	4	Configured	Dynamic	Configured	Configured
Configurable Classes	No	Yes	Yes	No	Yes	Yes
Bandwidth Allocation	Automatic	Automatic	Configured	Automatic	Configured	Configured
Provides for Minimal Delay	No	Yes	No	No	No	Yes
Modern Implementation	Yes	No	No	No	Yes	Yes

First In First Out (FIFO)



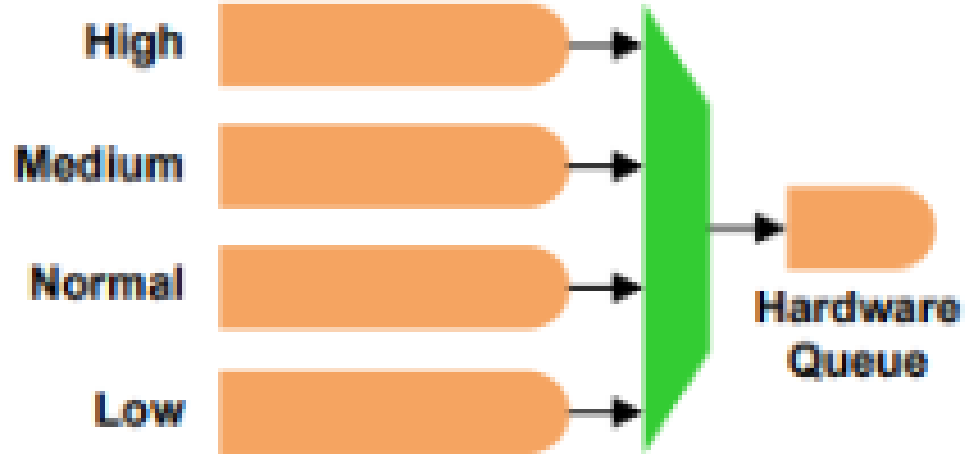
· Packets are transmitted in the order they are processed

· No prioritization is provided

· Default queuing method on high-speed (>2 Mbps) interfaces

· Configurable with the **tx-ring-limit** interface config command

Priority Queuing (PQ)

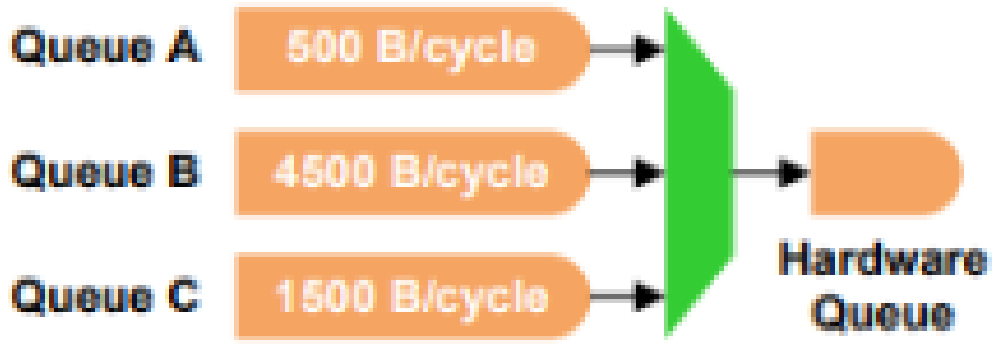


· Provides four static queues which cannot be reconfigured

· Higher-priority queues are always emptied before lower-priority queues

· Lower-priority queues are at risk of bandwidth starvation

Custom Queuing (CQ)

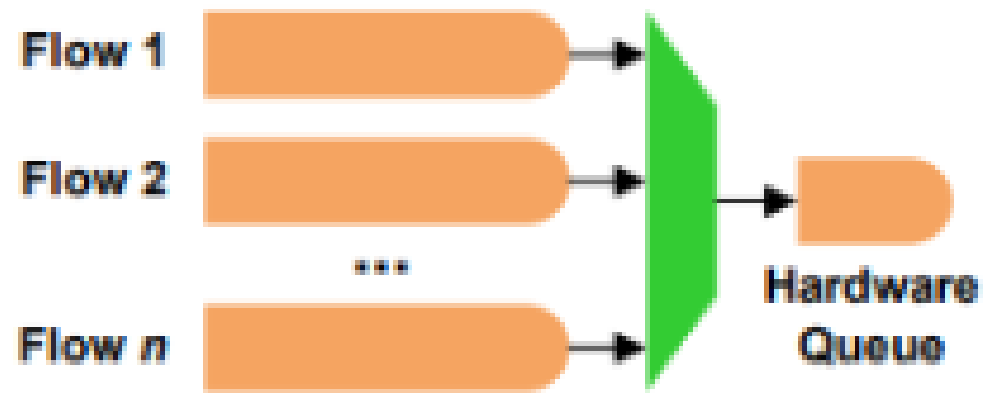


· Rotates through queues using Weighted Round Robin (WRR)

· Processes a configurable number of bytes from each queue per turn

· Prevents queue starvation but does not provide for delay-sensitive traffic

Weighted Fair Queuing (WFQ)

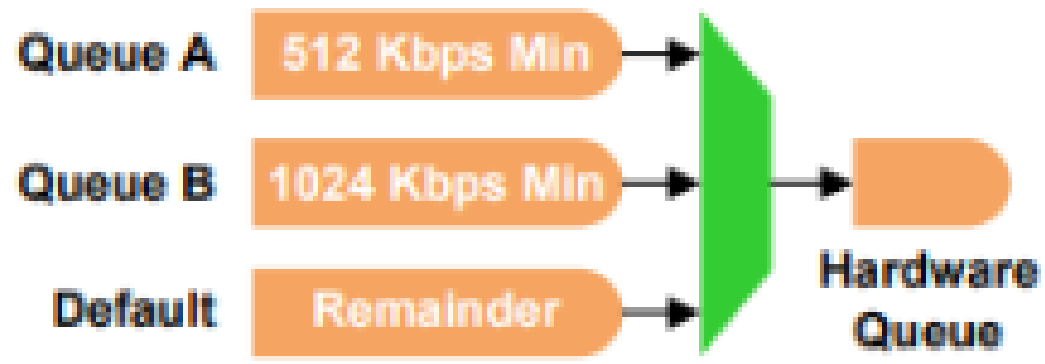


· Queues are dynamically created per flow to ensure fair processing

· Statistically drops packets from aggressive flows more often

· No support for delay-sensitive traffic

Class-Based WFQ (CBWFQ)

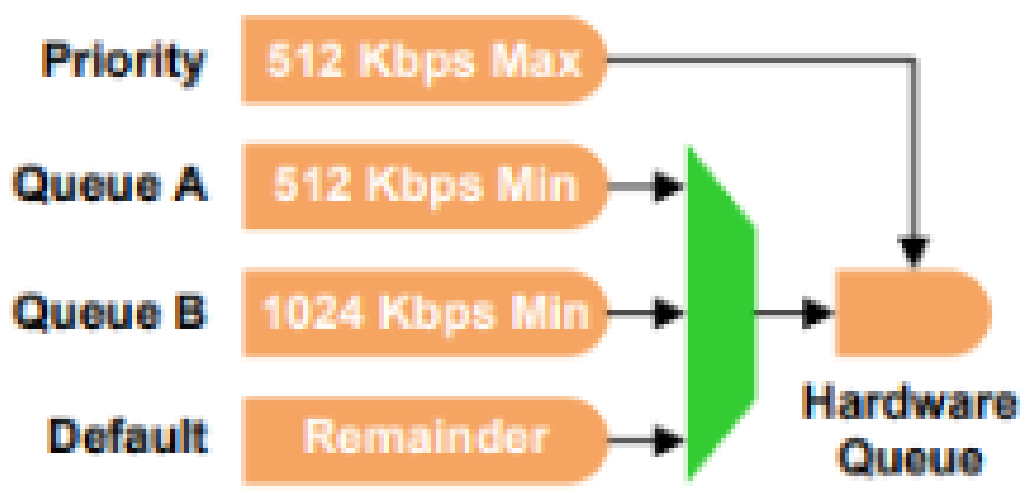


· WFQ with administratively configured queues

· Each queue is allocated an amount/percentage of bandwidth

· No support for delay-sensitive traffic

Low Latency Queuing (LLQ)



· CBWFQ with the addition of a policed strict-priority queue

· Highly configurable while still supporting delay-sensitive traffic

LLQ Config Example

Class Definitions

```
! Match packets by DSCP value
class-map match-all Voice
 match dscp ef
!
class-map match-all Call-Signaling
 match dscp cs3
!
class-map match-any Critical-Apps
 match dscp af21 af22
!
! Match packets by access list
class-map match-all Scavenger
 match access-group name Other
```

Policy Creation

```
policy-map Foo
 class Voice
  ! Priority queue policed to 33%
  priority percent 33
 class Call-Signaling
  ! Allocate 5% of bandwidth
  bandwidth percent 5
 class Critical-Apps
  bandwidth percent 20
  ! Extend queue size to 96 packets
  queue-limit 96
 class Scavenger
  ! Police to 64 kbps
  police cir 64000
   conform-action transmit
   exceed-action drop
 class class-default
  ! Enable WFQ
  fair-queue
  ! Enable WRED
  random-detect
```

Policy Application

```
interface Serial0
 ! Apply the policy in or out
 service-policy output Foo
```

LLQ Config Example

```
show policy-map [interface]
Show interface
show queue <interface>
Show mls qos
```