Chapter 10: Queuing and Compression

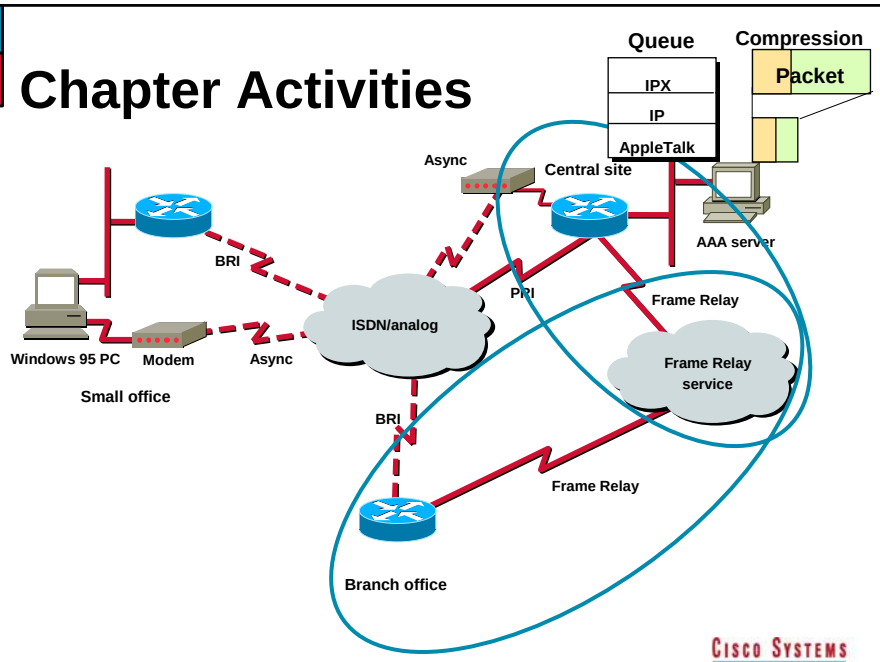
*** Revised: HoonJae Lee**

Objectives

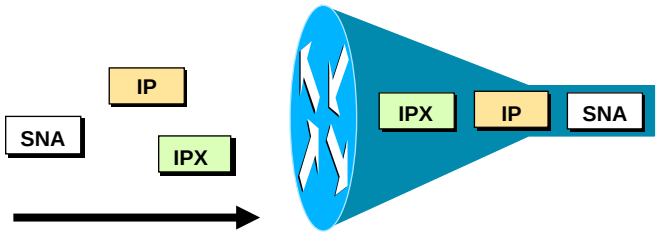
Upon completion of this chapter, you will be able to perform the following tasks:

- **Determine why queuing is enabled, identify alternative queuing protocols, and determine the best queuing method**
- **Configure weighted fair, priority, and custom queuing on your network interfaces**
- **Verify proper queuing configuration and troubleshoot an incorrect configuration**
- **Enable data compression**

Chapter Activities

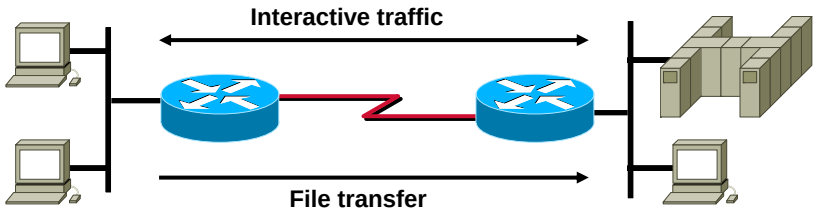


Queuing Overview



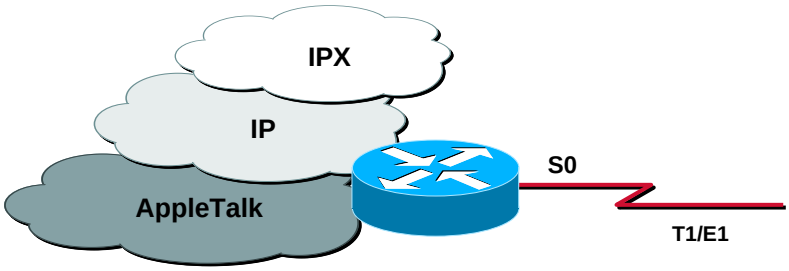
- Prioritizes traffic through router
- Cisco IOS software offers weighted fair queuing, priority queuing, and custom queuing

The Need for Traffic Prioritization



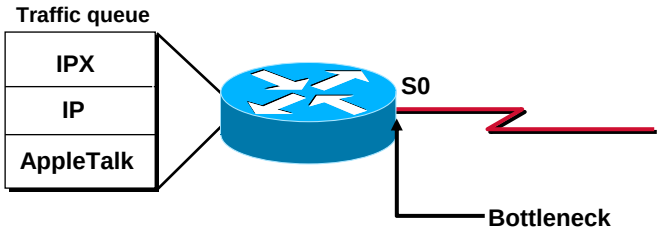
- Delay-sensitive applications may require higher priority than others

Effective Use of Traffic Prioritization



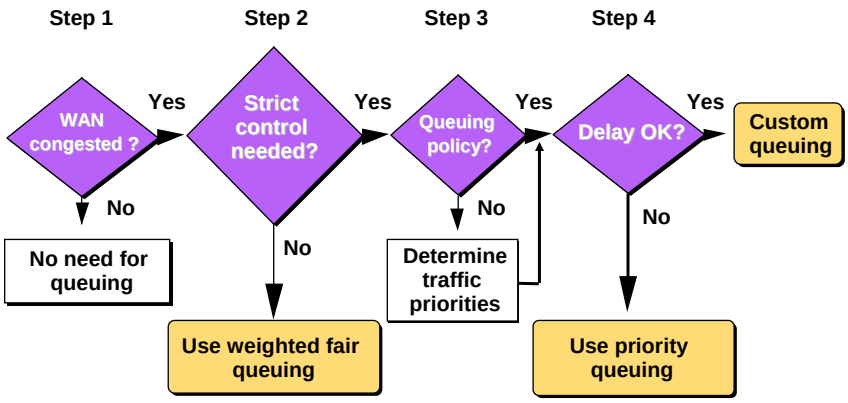
- Prioritization is most effective on bursty WAN links (T1/E1 or below) that experience temporary congestion

Establishing a Queuing Policy



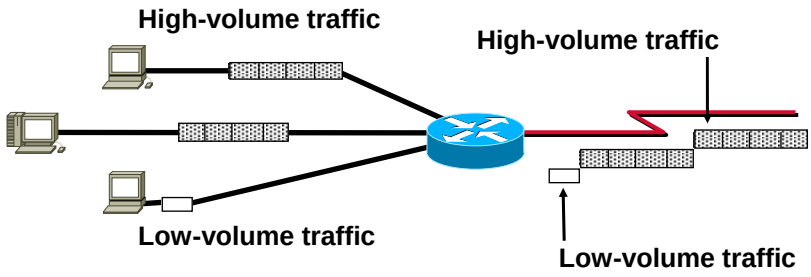
- Determines which packets get through first
- Helps provide acceptable service levels and control WAN costs

Choosing a Cisco IOS Queuing Option



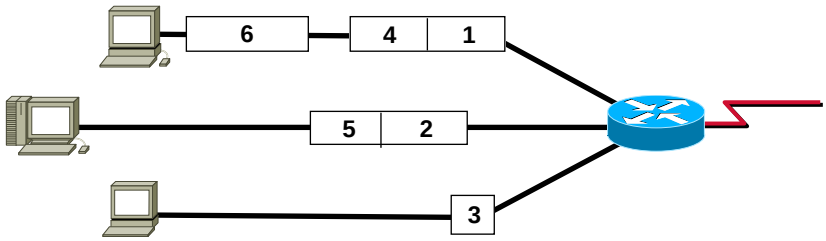
Data Stream Classification

FIFO queuing



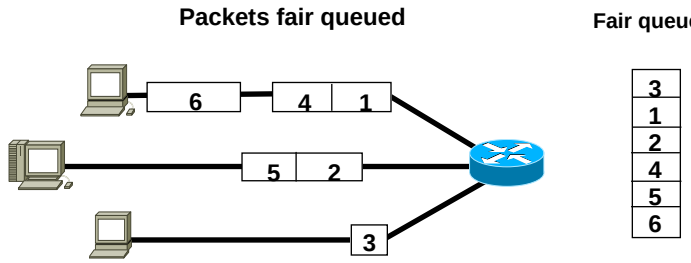
Fair Queuing Operation

Packets in order of arrival



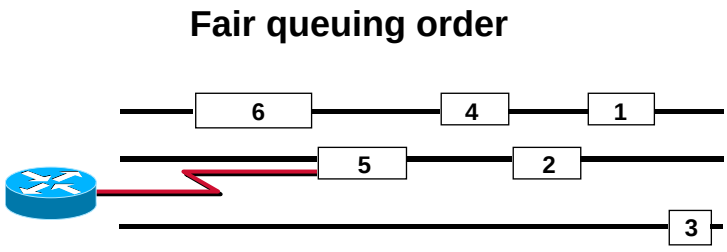
- Messages are sorted into conversations

Fair Queuing Operation (cont.)



- Conversations are assigned a channel
- Sorts the queue by order of the last bit crossing its channel

Fair Queuing Operation (cont.)



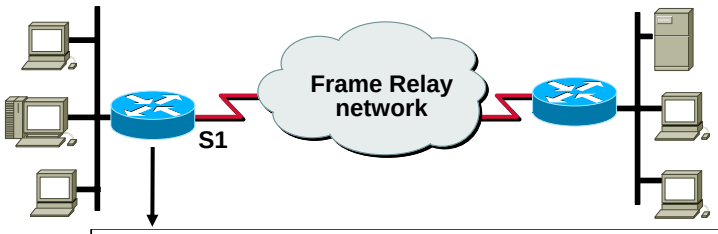
- Messages are transmitted in a fair order
- High-volume conversations share the link

Configuring Weighted Fair Queuing

```
Router(config-if)#fair-queue {congestive-discard-threshold}
```

- **Enables weighted fair queuing**

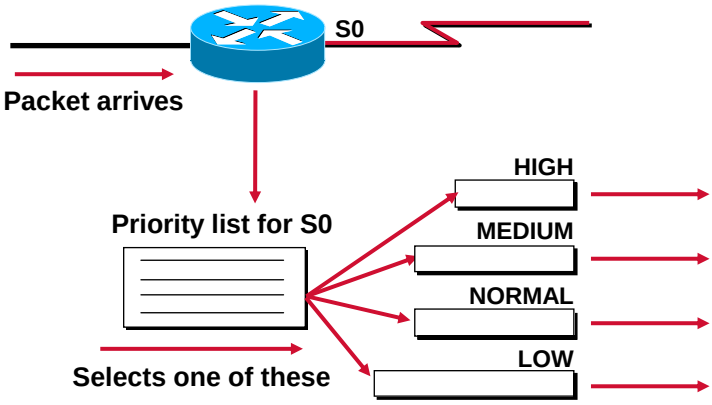
Weighted Fair Queue Example



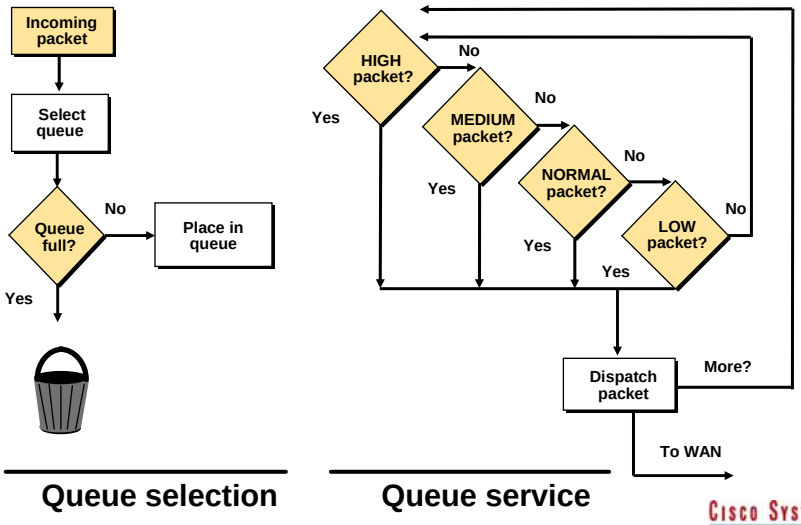

```
Router(config)#interface Serial 1
 Router(config-if)#encapsulation frame-relay
 Router(config-if)#fair-queue 128
 Router(config-if)#bandwidth 56
```

Appears in output only if congestive discard threshold is modified.

Priority Queuing Overview



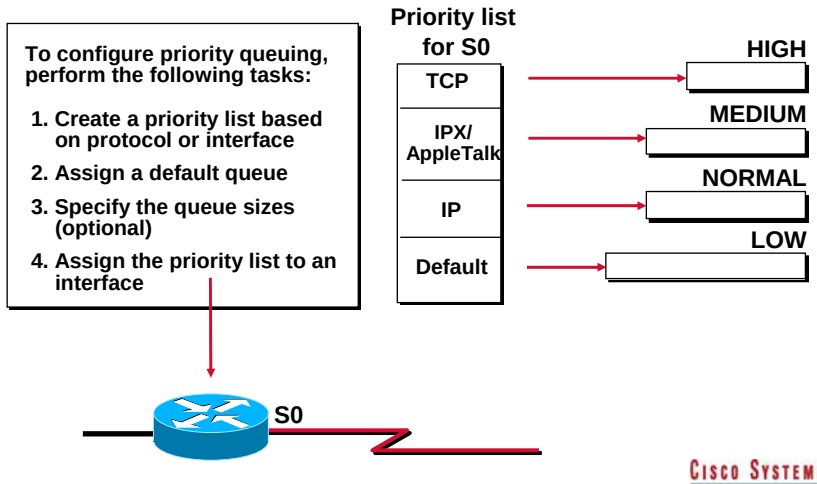
Priority Queuing Operation



Priority Queuing Configuration Tasks

To configure priority queuing, perform the following tasks:

1. Create a priority list based on protocol or interface
2. Assign a default queue
3. Specify the queue sizes (optional)
4. Assign the priority list to an interface



Configuring Priority Queuing—Step 1

```
Router(config)#priority-list list-number protocol
protocol-name {high | medium | normal | low}
queue-keyword keyword-value
```

- **Sets queue priority by protocol type**

```
Router(config)#priority-list list-number interface
interface-type interface-number
{high | medium | normal | low}
```

- **Sets priority by incoming interface type**

Configuring Priority Queuing—Steps 2 to 4

Step 2

```
Router(config)#priority-list list-number default
{high | medium | normal | low}
```

- **Assigns a default queue**

Step 3 (Optional)

```
Router(config)#priority-list list-number queue-limit
high-limit medium-limit normal-limit low-limit
```

- **Specifies the queue sizes**

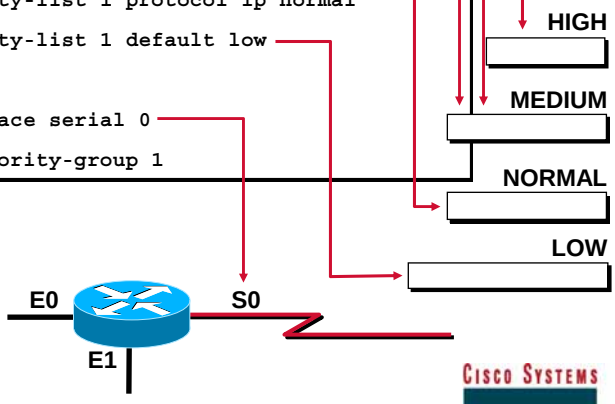
Step 4

```
Router(config-if)#priority-group list
```

- **Links the priority list to an interface**

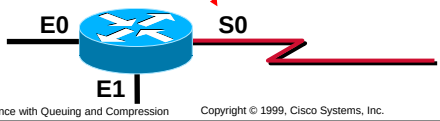
Priority Queuing Example 1

```
Router(config)#priority-list 1 protocol ip high tcp 23
Router(config)#priority-list 1 protocol appletalk medium
Router(config)#priority-list 1 protocol ipx medium
Router(config)#priority-list 1 protocol ip normal
Router(config)#priority-list 1 default low
!
Router(config)#interface serial 0
Router(config-if)#priority-group 1
```

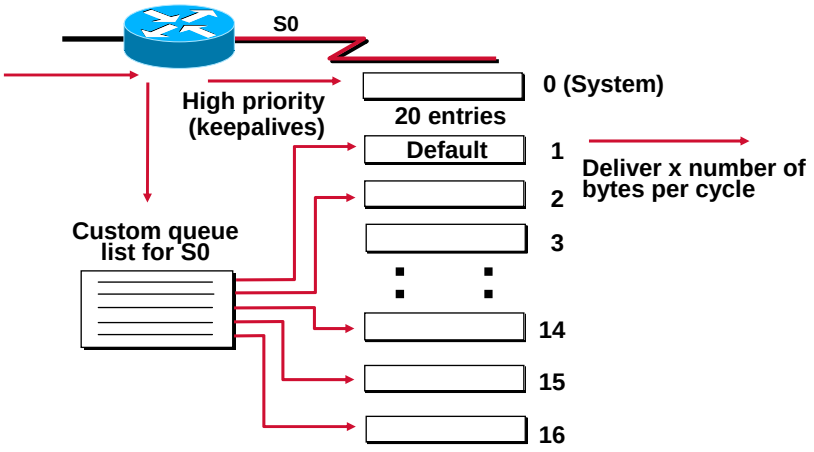


Priority Queuing Example 2

```
Router(config)#priority-list 2 protocol ip high tcp 23
Router(config)#priority-list 2 ip high list 1
Router(config)#priority-list 2 interface ethernet 0 medium
Router(config)#priority-list 2 protocol ip normal
Router(config)#priority-list 2 default low
Router(config)#priority-list 2 queue-limit 15 20 20 30
!
Router(config)#access-list 1 permit 10.1.1.0 0.0.0.255
!
Router(config)#interface serial 0
Router(config-if)#priority-group 2
```

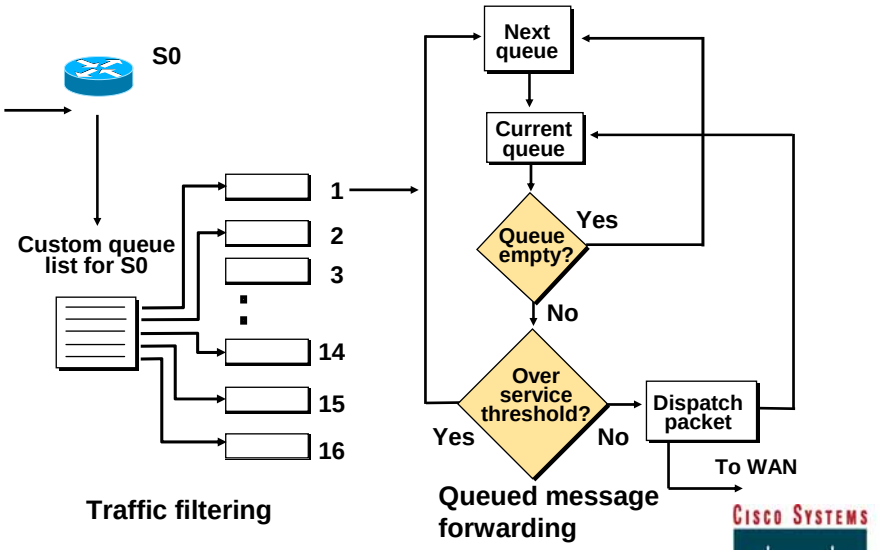


Custom Queuing



- Queues handled in round-robin fashion

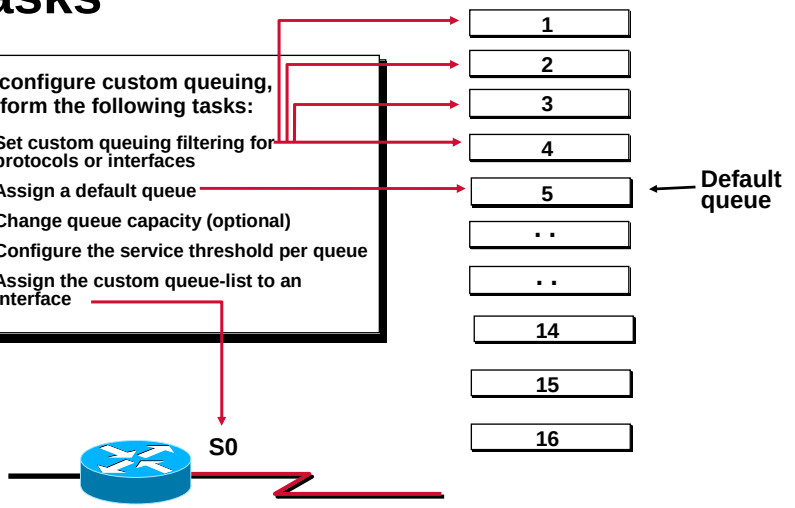
Custom Queuing Operation



Custom Queuing Configuration Tasks

To configure custom queuing, perform the following tasks:

1. Set custom queuing filtering for protocols or interfaces
2. Assign a default queue
3. Change queue capacity (optional)
4. Configure the service threshold per queue
5. Assign the custom queue-list to an interface



Configuring Custom Queuing—Step 1

```
Router(config)#queue-list list-number protocol
protocol-name queue-number queue-keyword keyword-value
```

- Sets queue priority by protocol type

```
Router(config)#queue-list list-number interface
interface-type interface-number queue-number
```

- Sets priority by interface type

Configuring Custom Queuing—Steps 2 to 3

Step 2

```
Router(config)#queue-list list-number default queue-number
```

- Assigns a priority queue for packets that do not match any other rule in the queue list

Step 3

```
Router(config)# queue-list list-number queue
queue-number limit limit-number
```

- Changes the capacity of a queue

Configuring Custom Queuing—Steps 4 to 5

Step 4

```
Router(config)#queue-list list-number queue
queue-number byte-count byte-count-number
```

- **Assigns a threshold byte count per queue per transfer**

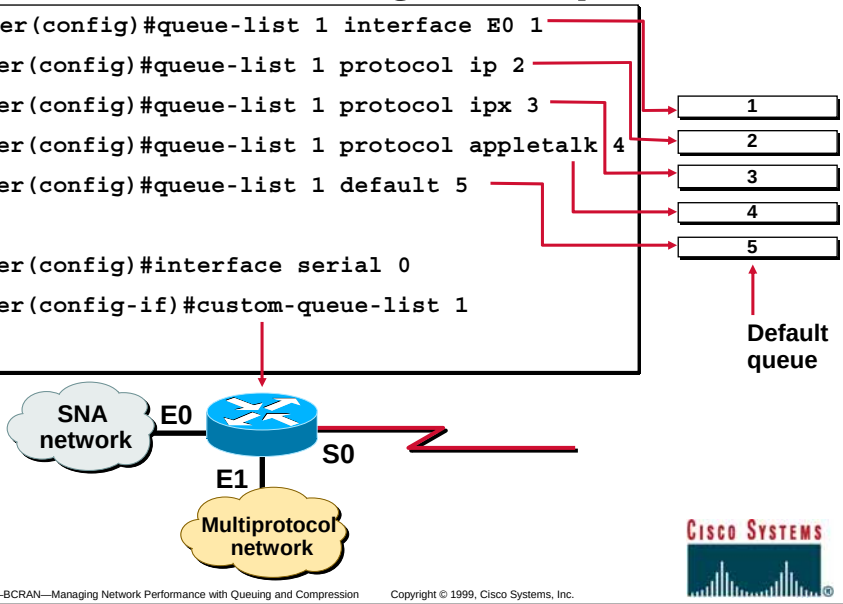
Step 5

```
Router(config-if)#custom-queue-list list
```

- **Assigns a queue list to an interface**

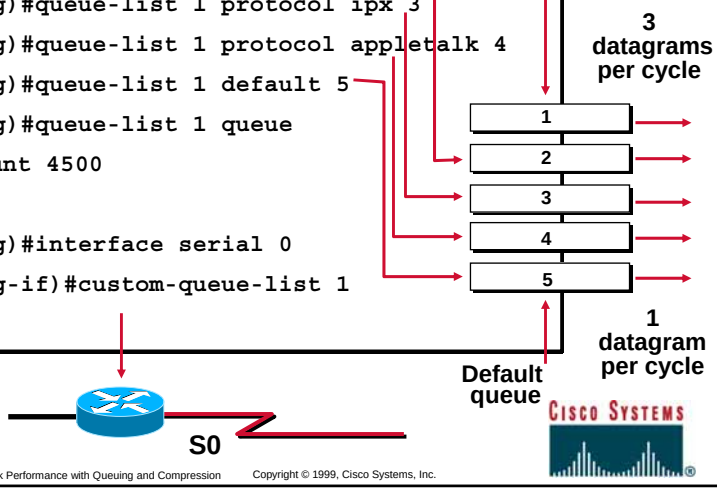
Custom Queuing Example 1

```
Router(config)#queue-list 1 interface E0 1
Router(config)#queue-list 1 protocol ip 2
Router(config)#queue-list 1 protocol ipx 3
Router(config)#queue-list 1 protocol appletalk 4
Router(config)#queue-list 1 default 5
!
Router(config)#interface serial 0
Router(config-if)#custom-queue-list 1
```



Custom Queuing Example 2

```
Router(config)#queue-list 1 protocol ip 1 tcp 20
Router(config)#queue-list 1 protocol ip 2
Router(config)#queue-list 1 protocol ipx 3
Router(config)#queue-list 1 protocol appletalk 4
Router(config)#queue-list 1 default 5
Router(config)#queue-list 1 queue
   1 byte-count 4500
!
Router(config)#interface serial 0
Router(config-if)#custom-queue-list 1
```



Verifying Queuing Operation

```
Router#show queueing int S0

Interface Serial0 queueing strategy: fair
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
     Conversations  0/1/256 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
```

- **Displays queuing status on all interfaces**

Verifying Queuing Operation (cont.)

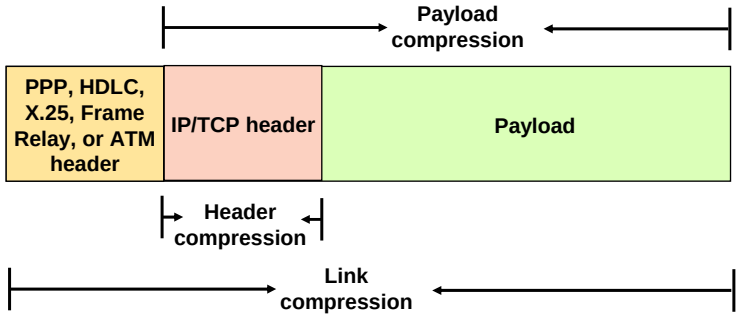
```
Router#show queueing custom
Current custom queue configuration:
List  Queue Args
3     5     default
3     1     interface Serial 3
3     3     protocol ip
3     3     byte-count 1518
```

- Displays information for custom queue list 3

Queuing Comparison Summary

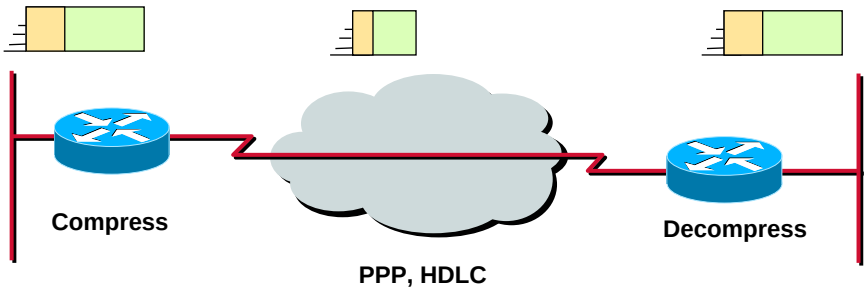
Weighted Fair Queuing	Priority Queuing	Custom Queuing
No queue lists	4 queues	16 queues
Low volume given priority	High queue serviced first	Round-robin service
Conversation dispatching	Packet dispatching	Threshold dispatching
Interactive traffic gets priority	Critical traffic gets through	Allocation of available bandwidth
File transfer gets balanced access	Designed for low-bandwidth links	Designed for higher-speed, low-bandwidth links
Enabled by default	Must configure	Must configure

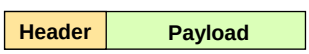
Implementing Compression Overview



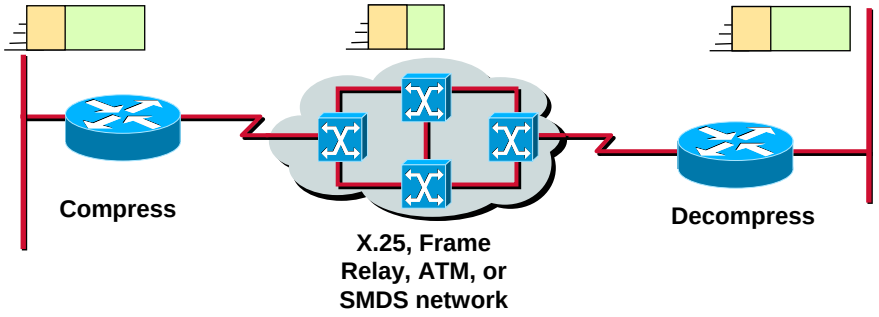
Compression allows more efficient use of bandwidth

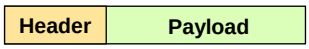
Implementing Link Compression over a Point-to-Point Connection



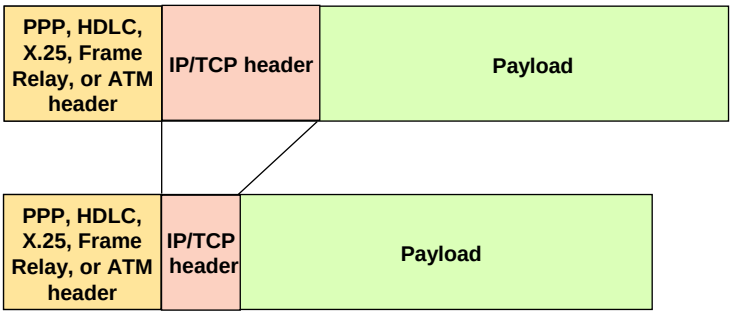


Implementing Payload Compression

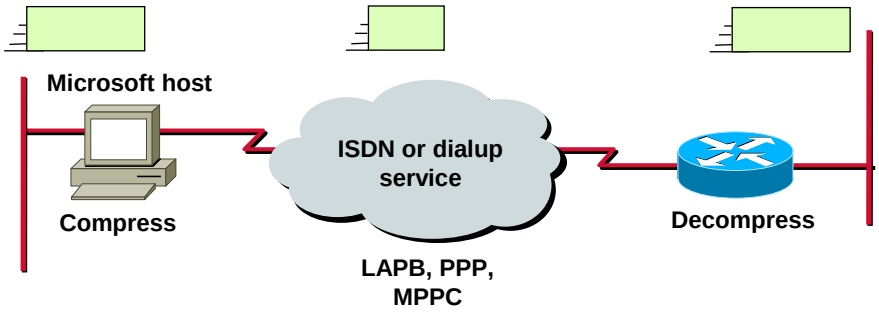




Using TCP IP Header Compression



Implementing MPPC



Other Compression Considerations

- Modem compression
- Encrypted data
- CPU cycles versus memory

Configuring Compression

```
Router(config-if)#compress [ predictor | stac | mppc ]
```

- Configures software compression for LAPB, PPP, and HDLC for a link

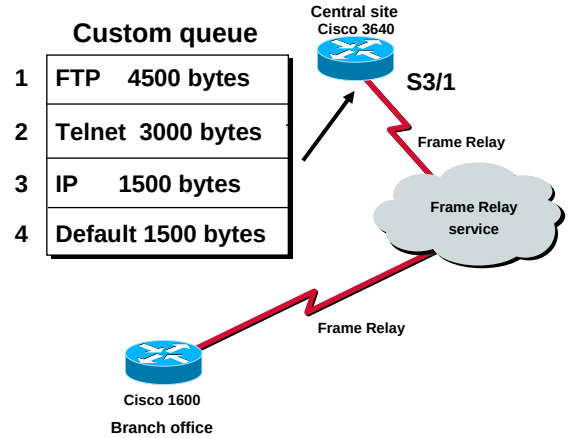
```
Router(config-if)#frame-relay payload-compress
```

- Enables payload compression on a specified interface or subinterface

```
Router(config-if)#ip tcp header compression [ passive ]
```

- Specifies that headers for TCP traffic will be compressed

Laboratory Exercise: Visual Objective



- Configure a custom queue to manage traffic flow on the interface

Summary

After completing this chapter, you should be able to perform the following tasks:

- **Determine why queuing is enabled, identify alternative queuing protocols, and determine the best queuing method**
- **Configure weighted fair, priority, and custom queuing on your network interfaces**
- **Verify proper queuing configuration and troubleshoot an incorrect configuration**
- **Enable data compression**

Review Questions

- **When would you use weighted fair queuing, custom queuing, and priority queuing?**
- **When is it best to use payload compression versus link compression?**