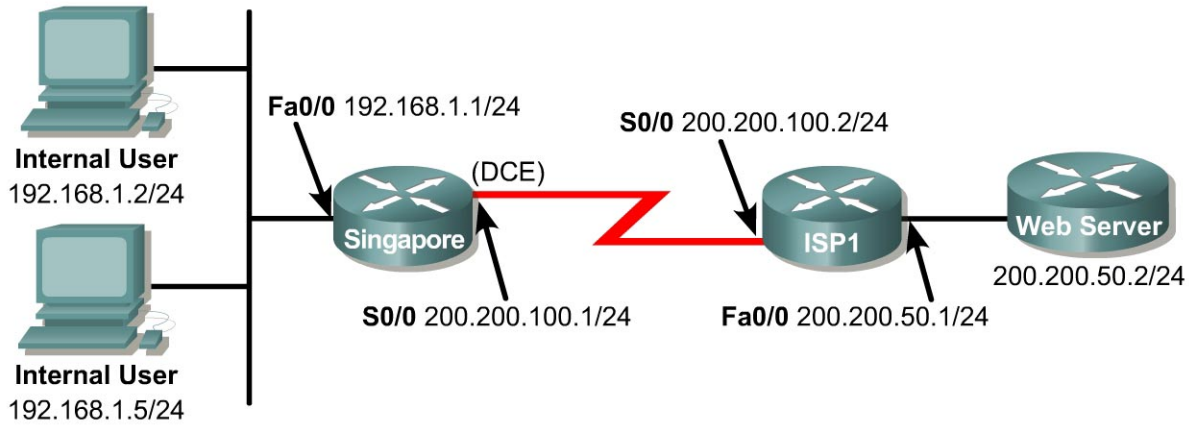
Lab 1.4.4 Implementing Quality of Service with Priority Queuing



Objective

In this lab, the student will implement quality of service by replacing the default queuing method with priority queuing based upon protocol type.

Scenario

The International Travel Agency is planning to launch an informational web site on a local web server for the general public. You have been hired to configure the network so all Internet user traffic to the web server is given the highest priority. Other traffic such as Telnet and e-mail are to be allowed over the WAN link, but are not as important as traffic to the web server. Internet access to the web server is through the standard http port. You decide to use priority queuing.

Step 1

Build and configure the network according to the diagram. If a web server is not available, use a Cisco router with the configuration below to simulate a web server.

```
Router(config)#hostname WebServer
WebServer(config)#ip http server
WebServer(config)#ip route 0.0.0.0 0.0.0.0 200.200.50.1
WebServer(config)#interface fastethernet 0/0
WebServer(config-if)#ip address 200.200.50.2 255.255.255.0
WebServer(config-if)#no shutdown
```

A default route is configured since no routing protocol will be enabled. Use the **ping** command to test connectivity between the Singapore and ISP1 routers and between the workstations and their respective gateways.

Step 2

Since no routing protocol will be enabled, configure a default route to the Internet from the Singapore router and a static route from the ISP1 router to the WebServer network.


```
Singapore(config)#ip route 0.0.0.0 0.0.0.0 200.200.100.2
ISP1(config)#ip route 192.168.1.0 255.255.255.0 200.200.100.1
```

Now, check that the WebServer is accessible by connecting from an Internal User workstation with a browser using the WebServer IP address of 200.200.50.2.

Step 3

Determine which queuing mode is enabled on the Singapore router using the **show interface serial 0/0**. A sample output is shown below.

```
ISP1#show interface s0/0
Serial0/0 is up, line protocol is up
  Hardware is PowerQUICC Serial
  Internet address is 200.200.100.2/24
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
  Keepalive set (10 sec)
  Last input 00:00:05, output 00:00:02, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
     Conversations  0/1/32 (active/max active/max total)
     Reserved Conversations 0/0 (allocated/max allocated)
     Available Bandwidth 96 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     13041 packets input, 877578 bytes, 0 no buffer
     Received 11437 broadcasts, 0 runts, 0 giants, 0 throttles
     3 input errors, 0 CRC, 3 frame, 0 overrun, 0 ignored, 0 abort
     12200 packets output, 808601 bytes, 0 underruns
     0 output errors, 0 collisions, 10 interface resets
     0 output buffer failures, 0 output buffers swapped out
     9 carrier transitions
     DCD=up  DSR=up  DTR=up  RTS=up  CTS=up
```

Weighted Fair Queuing (WFQ) is the default queuing mode on interfaces that run at or below E1 speeds (2.048 Mbps or less) and First In, First Out (FIFO) is the default if the bandwidth is greater than E1 speeds.

1. What is the queuing mode on the Serial 0/0 interface of the Singapore router?

If the bandwidth of your serial interface is 128 K bit and the queuing mode is FIFO (contrary to the statement above) as shown below, it is probably because **no fair-queue** was automatically configured on the interface with the IOS version that is being used. You can use the **show running-config** command to check if fair queuing was disabled by default. (See the partial sample output below.)

```
ISP1#show interface s0/0
Serial0/0 is up, line protocol is up
  Hardware is PowerQUICC Serial
  Internet address is 200.200.100.2/24
  MTU 1500 bytes, BW 128 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
```



```
  Keepalive set (10 sec)
  Last input 00:00:06, output 00:00:09, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo


---output omitted---

ISP1#show running-config

---output omitted---

interface Serial0/0
 ip address 200.200.100.2 255.255.255.0
 no fair-queue
 clockrate 128000

---output omitted---.
```

Step 4

Priority queuing allows traffic types to be associated with one of four priorities: high, medium, normal, and low. Priority queuing will transmit all packets in the high queue first. When the high queue is empty, then packets in the medium queue will be transmitted. When the medium queue is empty, the high queue is again checked for buffered packets. Because the higher priority queue is always checked before lower priority queued packets are sent, it is possible that lower priority packets will never get transmitted causing their sessions to time out.

You will configure priority queuing based on protocol type by designating http traffic as high priority with all other IP traffic as medium priority on both the ISP1 and Singapore routers. The first step is to define a priority list.

```
Singapore(config)#access-list 101 permit tcp any any eq 80
Singapore(config)#priority-list 1 protocol ip high list 101

Singapore(config)#access-list 102 permit ip any any
Singapore(config)#priority-list 1 protocol ip medium list 102

ISP1(config)#access-list 101 permit tcp any any eq 80
ISP1(config)#priority-list 1 protocol ip high list 101

ISP1(config)#access-list 102 permit ip any any
ISP1(config)#priority-list 1 protocol ip medium list 102
```

Step 5

You must now assign the priority list to the appropriate interface. Only one list can be assigned per interface.

```
Singapore(config)#interface serial 0/0
Singapore(config-if)#priority-group 1

ISP1(config)#interface serial 0/0
ISP1(config-if)#priority-group 1
```


Step 6

Verify the queuing mode with the **show interface serial 0/0** command on both the ISP1 and Singapore routers. The output should both show: Queueing strategy: priority-list 1.

There are other **show** commands that can be used to verify the queuing mode: **show queueing priority** and **show queueing interface serial 0/0**. Sample outputs for the commands on the Singapore router are shown below.

```
ISP1#show queueing priority
Current DLCI priority queue configuration:
Current priority queue configuration:

List   Queue  Args
1      high   protocol ip          list 101
1      medium protocol ip          list 102

ISP1#show queueing interface s0/0
Interface Serial0/0 queueing strategy: priority

Output queue utilization (queue/count)
        high/25 medium/0 normal/12248 low/0
```

You have now successfully configured priority queuing based upon protocol type. All traffic destined for WebServer will now be given the highest priority over all other IP traffic. Unfortunately, it is very difficult to test priority queuing in a lab environment since it would be difficult to generate enough non-http traffic from one Internet User workstation to see the effects of priority queuing if the other Internet User is accessing the web server.

Save your configuration files for Singapore, ISP1, and WebServer.

