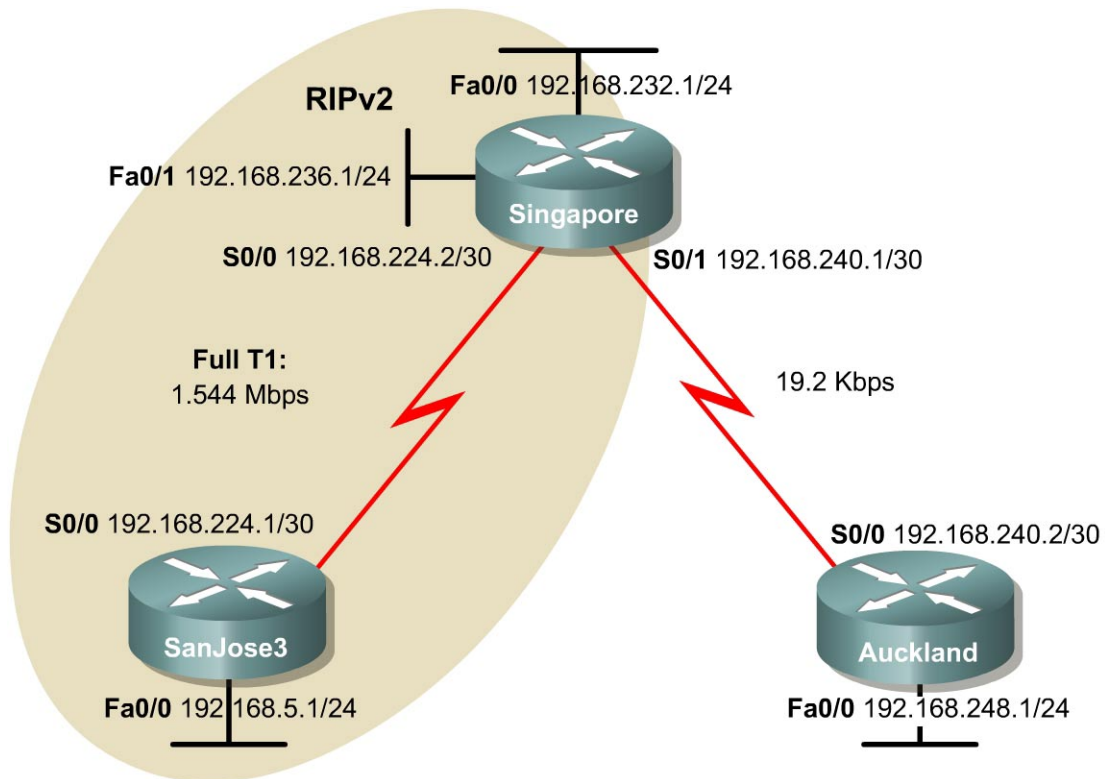## Lab 8.5.1 Configuring Distribute Lists and Passive Interfaces



### Objective

In this lab, a combination of advanced routing features will be used to optimize routing. These features include distribute lists, passive interfaces, default routes, and route redistribution.

### Scenario

International Travel Agency (ITA) uses RIP v2 for dynamic routing. Perform an analysis to determine whether RIP v2 is optimized.

A very slow 19.2 Kbps link is used to connect Singapore and Auckland until a faster link can be provisioned. To reduce traffic, try to avoid dynamic routing on this link.

The LAN connected to SanJose3 is a stub network and is near saturation. To reduce traffic, filter RIP v2 updates from entering the Ethernet LAN 192.168.5.0/24 of router SanJose3, since the updates serve no purpose.

ITA has a large research and development division in Singapore. The R&D engineers are on LAN 192.168.232.0/24. The R&D managers on the 192.168.236.0/24 LAN need access to this experimental network. However, this LAN needs to be 'invisible' to the rest of the company, that is, subnets not attached to the Singapore site. Also, the two R&D LANs have many UNIX hosts that need to exchange RIP v2 updates with the Singapore router.

## Step 1

Build and configure the network according to the diagram, but do not configure RIP v2 yet.

Use CDP to verify Layer 2 connectivity with directly connected neighbors. Use `ping` to verify the work and test connectivity between the serial interfaces. Ping only the other side of the link that is the directly connected neighbor IP address.

**Note:** Auckland should not be able to ping SanJose3 until additional configurations have been made.

## Step 2

On SanJose3, configure RIP v2 to advertise both connected networks, as shown in the following:

```
SanJose3(config)#router rip
SanJose3(config-router)#version 2
SanJose3(config-router)#network 192.168.224.0
SanJose3(config-router)#network 192.168.5.0
```

On the ethernet LAN of SanJose3, no routers or hosts require RIP v2. However, if the 192.168.5.0 network in the RIP v2 configuration is not included, SanJose3 will not advertise the network to Singapore. FastEthernet 0/0 can be configured as a passive interface, keeping the router from sending RIP v2 updates out the FastEthernet 0/0 interface. Use the following commands:

```
SanJose3(config)#router rip
SanJose3(config-router)#passive-interface fastethernet0/0
```

RIP v2 updates will no longer be sent through FastEthernet 0/0.

## Step 3

Now configure RIP v2 on Singapore. At this point, issue the following enable RIP v2 only on the 192.168.224.0/30 network so that Singapore can exchange routing information with SanJose3:

```
Singapore(config)#router rip
Singapore(config-router)#version 2
Singapore(config-router)#network 192.168.224.0
```

After this RIP v2 configuration on Singapore has been entered, check the routing table on SanJose3 with the `show ip route` command as follows:

**Note:** SanJose3 has not learned any routes through RIP v2.

```
SanJose3#show ip route
<output omitted>
C    192.168.5.0/24 is directly connected, FastEthernet0/0
C    192.168.224.0/24 is directly connected, Serial0/0
```

1. SanJose3 has not learned about 192.168.232.0/24 and 192.168.236.0/24. Why not? Issue the `debug ip rip` command on SanJose3 to validate this assumption. Are RIP updates seen coming in through the Serial 0/0 interface?

_____

_____

RIP has not been configured on Singapore to advertise the Ethernet networks. Also, RIP will not advertise a route for 192.168.224.0/30 out interface serial 0/0, where the network resides.

## Step 4

Review the network requirements. Then issue the following to enable RIP v2 on the Ethernet interfaces of Singapore so that UNIX hosts on these LANs can receive routing information:

```
Singapore(config)#router rip
Singapore(config-router)#Version 2
Singapore(config-router)#network 192.168.232.0
Singapore(config-router)#network 192.168.236.0
```

RIP v2 is now sending updates to these networks, as required for the UNIX hosts. Reissue the **show ip route** command recheck the routing table of SanJose3:

**Note:** Turn off the **debug ip rip** before continuing.

```
SanJose3#show ip route

Gateway of last resort is not set

     192.168.224.0/30 is subnetted, 1 subnets
C        192.168.224.0 is directly connected, Serial0/0
C     192.168.5.0/24 is directly connected, FastEthernet0/0
R     192.168.232.0/24 [120/1] via 192.168.224.1, 00:00:13, Serial0/0
R     192.168.236.0/24 [120/1] via 192.168.224.1, 00:00:09, Serial0/0
```

The **network** command enables RIP updates on interfaces within that major network and advertises those networks out all other RIP enabled interfaces. SanJose3 now has routes to 192.168.232.0/24, and 192.168.236.0/24. Having route 192.168.232.0/24 is intended. However, having route 192.168.236.0/24 is a potential problem. Remember that this network is to be kept invisible to the rest of the company.

## Step 5

RIP advertisements regarding the 192.168.236.0/24 network can be omitted from updates in one of two ways. If the **no network 192.168.236.0** command was issued on the Singapore router, this would halt advertisements about this network. However, by using this method, network 192.168.236.0 is no longer visible to the UNIX hosts that are on this network. The preferred method of filtering this network advertisement from reaching the SanJose3 router is to filter routing protocol updates with the **distribute-list** command.

Distribution lists define which networks are permitted or denied when receiving or sending routing updates. Distribution lists require an access list to define which networks are permitted and which networks are denied.

Because 192.168.236.0/24 is to be filtered from outgoing updates to the SanJose3 router, use the following commands:

```
Singapore(config)#access-list 1 deny 192.168.236.0
Singapore(config)#access-list 1 permit any
Singapore(config)#router rip
Singapore(config-router)#distribute-list 1 out serial 0/0
```

It is critical to include the interface at the end of the **distribute-list** command so that this filter is only applied to routing updates sent out to SanJose3. Without the reference to the particular interface, the router will filter out all advertisement of the 192.168.236.0/24 network to all interfaces, including the Unix hosts connected to the 192.168.232.0 LAN on Singapore.

Verify that this filter has been applied by issuing the **show ip protocols** command on Singapore.

```
Singapore#show ip protocol
Routing Protocol is "rip"
```

```
Sending updates every 30 seconds, next due in 4 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
  Serial0/0 filtered by 1 (per-user), default is 1
Incoming update filter list for all interfaces is
Redistributing: rip
Default version control: send version 2, receive version 2
  Interface          Send  Recv  Triggered RIP  Key-chain
  FastEthernet0/0  2     2
  Serial0/0        2     2
  FastEthernet0/1  2     2
Routing for Networks:
  192.168.224.0
  192.168.232.0
  192.168.236.0
Passive Interface(s):
  Serial0/1
Routing Information Sources:
  Gateway          Distance        Last Update
  192.168.224.2        120         00:00:03
Distance: (default is 120)
```

2. According to the output of this command, which interface is the outgoing update filter list applied to?

_____

The list that is applied to all of RIP-enabled interfaces should not be set. Instead notice that the Serial 0/0 interface is being filtered by list 1. List 1 happens to be the access list number that was configured in the previous example.

With the distribute list configured on Singapore, return to SanJose3 and flush the routing table with the **clear ip route \*** command. Wait at least five seconds, and then use the **show ip route** command as follows to check the routing table of SanJose3:

```
SanJose3#show ip route

Gateway of last resort is not set

     192.168.224.0/30 is subnetted, 1 subnets
C       192.168.224.0 is directly connected, Serial0/0
C    192.168.5.0/24 is directly connected, FastEthernet0/0
R    192.168.232.0/24 [120/1] via 192.168.224.1, 00:00:01,
Serial0/0
```

3. Is the route to 192.168.236.0/24 in SanJose3's table? Looking at the routing table of San Jose3, is 192.168.236.0/24 present?

_____

The distribute list should have removed 192.168.236.0/24 from further RIP updates. 192.168.232.0/24 should be the only RIP route in SanJose3 routing table at this point.

## Step 6

The SanJose3 routing table is almost complete, but it does not include a route to 192.168.240.0/30, which is directly connected to Singapore. There are two methods to advertise the link between Singapore and Auckland by way of RIP. The first is very similar to what was done previously with the other routers and the advertisement of their directly connected networks. The process would be to enter a network command in the RIP v2 configuration of router Singapore so that it will advertise the 192.168.240.0/30 network. Of course, RIP v2 updates should not be sent out the 19.2 Kbps link. Therefore S0/1 of Singapore would need to be placed into passive mode. This is done with the **passive-interface serial 0/1** command while at the Singapore RIP router configuration prompt. This network must be advertised using a different approach. The alternative method, is to

configure the Singapore router to redistribute connected networks into RIP v2. Enter the following commands on Singapore:

```
Singapore(config)#router rip
Singapore(config-router)#redistribute connected
Singapore(config-router)#no auto-summary
```

When issuing these commands, Singapore imports all directly connected routes into the RIP process. Therefore, 192.168.240.0/30 will be redistributed into RIP v2 and sent to SanJose3 as part of each RIP v2 update. Verify the configuration by issuing the following command on Singapore:

```
Singapore #show ip route 192.168.240.1
Routing entry for 192.168.240.0/30
  Known via 'connected', distance 0, metric 0 (connected, via interface)
  Redistributing via rip
  Advertised by rip
  Routing Descriptor Blocks:
  * directly connected, via Serial0/1
      Route metric is 0, traffic share count is 1
```

The output of this command should confirm that this connected route is being redistributed and advertised by RIP v2.

Check the routing table of SanJose3 with the `show ip route` command as follows:

```
SanJose3#show ip route
Gateway of last resort is not set
     192.168.224.0/30 is subnetted, 1 subnets
C       192.168.224.0 is directly connected, Serial0/0
     192.168.240.0/30 is subnetted, 1 subnets
R       192.168.240.0 [120/1] via 192.168.224.1, 00:00:02, Serial0/0
R     192.168.240.0/24 [120/1] via 192.168.224.1 00:01:17 Serial 0/0
C     192.168.5.0/24 is directly connected, FastEthernet0/0
R     192.168.232.0/24 [120/1] via 192.168.224.1, 00:00:02, Serial0/0
```

SanJose3 should now have RIP v2 routes to both 192.168.240.0/30 and 192.168.232.0/24.

## Step 7

With routing between Singapore and SanJose3 almost complete, now view Auckland. Avoid dynamic routing on the WAN link of router Auckland, and use a static route.

First, try to ping Auckland serial interface 192.168.240.2. Is this successful?_____

Auckland is a stub network. It has only one exit point to the rest of the world. In this situation, configure a static default route that will work for all non local traffic by using the following command:

```
Auckland(config)#ip route 0.0.0.0 0.0.0.0 192.168.240.1 210
```

The administrative distance of 210 was added so that the static route will not default to one (1). A distance of one (1) would not allow an administrator to override the route if the topology changes in the future. Although this is not required, it is a best practice to avoid routes that end up with administrative distance equal to one (1).

Verify that Auckland is using a default route. From the console of SanJose3, enter the `debug ip packet` command as follows:

```
SanJose3#debug ip packet
```

Leave the SanJose3 router console session open and then return to Auckland. From the Auckland router console, ping the SanJose FastEthernet 0/0 at 192.168.5.1.

The following shows that debug output can be seen on the SanJose3 router:

```
IP packet debugging is on
00:53:31: IP: s=192.168.240.2 (Serial0/0), d=192.168.5.1, len 100,
rcvd 4
00:53:31: IP: s=192.168.5.1 (local), d=192.168.240.2 (Serial0/0),
len 100, sending
```

These pings should be successful.

> **Note:** The debug output of SanJose3 reports that the pings have been received and replied to.

Next, ping SanJose3 using **`extended ping`** commands. Invoke extended ping by typing **`ping`** and pressing **Enter** in privileged mode. Use the extended commands and source the ping from the FastEthernet 0/0 address of Auckland, 192.168.248.1 as follows:

```
Auckland#ping
Protocol [ip]: ip
Target IP address: 192.168.5.1
Repeat count [5]: 5
Datagram size [100]: 100
Timeout in seconds [2]: 2
Extended commands [n]: y
Source address or interface: 192.168.248.1
Type of service [0]: 0
Set DF bit in IP header? [no]: no
Validate reply data? [no]: no
Data pattern [0xABCD]: 0xABCD
Loose, Strict, Record, Timestamp, Verbose[none]: none
Sweep range of sizes [n]: n
```

4. Were these pings successful?

   _____


Check the **`debug ip packet`** output on SanJose3.

The following shows the **`debug`** output as seen on the SanJose3 router:

```
IP packet debugging is on
00:56:53: IP: s=192.168.248.1 (Serial0/0), d=192.168.5.1, len 100,
rcvd 4
00:56:53: IP: s=192.168.5.1 (local), d=192.168.248.1, len 100, unroutable
```

5. The arrival of the ICMP echo requests, or pings, should be able to be seen. SanJose3 did not respond. Why not?

   _____


6. Check the routing table of SanJose3. Does SanJose3 have a route to the 192.168.248.0/24 network?

   _____

At this point, SanJose3 does not have a route to network 192.168.248.0/24 or a default route for unknown destinations.

## Step 8

In order for Singapore and SanJose3 to route to 192.168.248.0/24, it must be configured to a static route. It has been decided to configure the static route on Singapore and then let Singapore propagate this route to other routers, such as SanJose3, dynamically. This will save the task of entering a static route on every router. Enter the following command on Singapore:

```
Singapore(config)#ip route 192.168.248.0 255.255.255.0 192.168.240.2 210
```

This command configures a static route for the 192.168.248.0/24 network using the S0 of Auckland as the next hop with an administrative distance of 210.

In order for Singapore to dynamically update SanJose3 with this information, RIP v2 must be configured to redistribute static routes on Singapore. Issue the following commands:

```
Singapore(config)#router rip
Singapore(config-router)#redistribute static metric 2
```

Although not required when redistributing a static route into RIP, it is a good idea to include a metric. The value of two (2) will indicate to the SanJose3 router that the 192.168.248.0/24 network exists one hop beyond the advertising Singapore router.

Finally, check the routing table on SanJose3 as follows:

```
SanJose3#show ip route
Gateway of last resort is not set
     192.168.224.0/30 is subnetted, 1 subnets
C       192.168.224.0 is directly connected, Serial0/0
     192.168.240.0/30 is subnetted, 1 subnets
R       192.168.240.0 [120/1] via 192.168.224.1, 00:00:01, Serial0/0
C    192.168.5.0/24 is directly connected, FastEthernet0/0
R    192.168.232.0/24 [120/1] via 192.168.224.1, 00:00:02, Serial0/0
R    192.168.248.0/24 [120/2] via 192.168.224.1, 00:00:02, Serial0/0
```

This should now be complete. Verify connectivity with an extended ping from the FastEthernet 0/0 of SanJose3 to the FastEthernet 0/0 of Auckland.