

Lab 19(b)2. L3 Switch Routed Ports

Rev. 20181113.131419

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G O A L

Configure a routed port on S1 to communicate with R1.

Topology

For simplicity, you can reuse the physical topology of the previous labs, 19a and 19(b)1.

Conceptually, we'll begin looking at this as a hub and spoke network, where our VLANs are access layer (as opposed to distribution or backbone) spokes, and lead only to end devices. The "rest of the world" will be in the direction of the router, R1. This has two effects:

- The IP subnets associated with our VLANs are stub networks that will never lead to routers and other networks. They are directly connected to S1 and automatically appear in its routing table.
- Because the connection from S1 to the rest of the world is L3, those VLANs and their subnets are done. They won't reappear on other switches on the other side of R1 because that would create discontinuous subnets and unreliable routing.

Technically, the VLAN *numbers* 10 and 20 could be reused for different VLANs and subnets on the other side of R1 without S1 finding out, since VTP and DTP aren't routed protocols. In fact someone, somewhere on the internet surely is, but that would be monumentally bad practice if it happened within the same company.

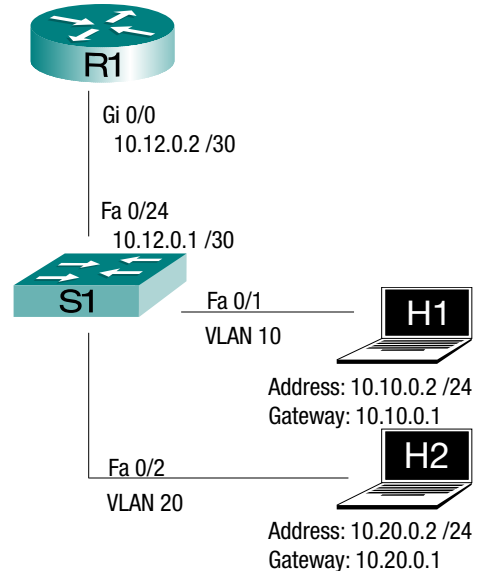
This sets up the perfect use case for a default route on S1 pointing to R1 and a single summary route on R1 pointing to S1.

C O N F I G U R A T I O N S T E P S

Make your starting S1 configuration match the ending configuration of the previous lab, 19(b)1.

- The hosts will be configured with IP addresses and default gateways
- The host switchports will be in the appropriate VLANs
- SVIs provide default gateways for each VLAN
- L3 routing between the VLANs is enabled on the switch and the hosts can ping each other.

It should resemble the configuration on the right.



S1 STARTING CONFIGURATION

```
hostname S1
no ip domain-lookup
line con 0
  exec-timeout 0 0
  logging synchronous
!
interface FastEthernet0/1
  switchport access vlan 10
  switchport mode access
!
interface FastEthernet0/2
  switchport access vlan 20
  switchport mode access
!
interface FastEthernet0/24
  shutdown
!
interface Vlan10
  ip address 10.10.0.1 255.255.255.0
!
interface Vlan20
  ip address 10.20.0.1 255.255.255.0
!
ip routing
```

Configure the router-facing port on S1 as a routed L3 interface with an IP address of 10.12.0.1 /24.

Configure the switch-facing interface on R1 with the IP address 10.12.0.2 /24.

Use a single route on S1 to reach R1 any future networks that may be added beyond R1.

Use a single route on R1 to reach all subnets currently connected to S1, without including any unused subnets that are not mathematically necessary.

Make sure the ports that connect the router and switch are not shutdown and test by inspecting S1's routing table and pinging the R1 address from one of the hosts.

V E R I F I C A T I O N

What route did you need to add to S1's routing table? _____

`ip route 0.0.0.0 0.0.0.0 10.12.0.2`

What route did you need to add to R1's routing table? _____

`ip route 10.0.0.0 255.224.0.0 10.12.0.1`

What range of IP addresses is covered by the summary Route on R1 _____

`From 10.0.0.0 to 10.31.255.255`

If you were allowed two summary routes on R1 to create a single contiguous block of addresses with minimal spillover, what would they be?

`ip route 10.8.0.0 255.248.0.0`

`ip route 10.16.0.0 255.248.0.0`

What range of IP addresses would that cover? _____

`From 10.8.0.0 to 10.23.255.255`

CONFIGURATION WALKTHROUGH

Verify That the Configuration from Lab 19(b)1 is Working

```
S1
1 S1# show interfaces status
2
3 Port      Name          Status      Vlan      Duplex  Speed Type
4 Fa0/1     Fa0/1         connected   10        a-full  a-100 10/100BaseTX
5 Fa0/2     Fa0/2         connected   20        a-full  a-100 10/100BaseTX
6 ...
7 Fa0/24    Trunk to R1   disabled    1         auto    auto  10/100BaseTX
8
9 S1# show ip interf brief
10 Interface      IP-Address      OK? Method Status      Protocol
11 Vlan1           unassigned      YES NVRAM   administratively down down
12 Vlan10         10.10.0.1       YES manual  up          up
13 Vlan20         10.20.0.1       YES manual  up          up
14 FastEthernet0/1 unassigned      YES unset  up          up
15 FastEthernet0/2 unassigned      YES unset  up          up
16 ...
17 FastEthernet0/24 unassigned      YES unset  administratively down down
```

On your switch, make sure that your access interfaces are in the right VLANs [Lines 4-5] and not shutdown [Lines 4-5 and 12-13], your SVIs are configured [Lines 12-13], that L3 IP routing is turned on, and that the link to the router is down [Line 17], guaranteeing that any routing is happening on the switch.

On one of your hosts, try pinging the other.

```
H1
1 H1> ping 10.20.0.2
2
3 Type escape sequence to abort.
4 Sending 5, 100-byte ICMP Echos to 10.20.0.2, timeout is 2 seconds:
5 !!!!!
6 Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms
```

Configure a Layer 3 Routed Link Between S1 and R1

Back to your switch, configure the router-facing port on S1 as a routed L3 interface and give it an IP address of 10.12.0.1 /24.

```
S1
1 S1(config)# interf fa0/24
2 S1(config-if)# no switchport
3 S1(config-if)# ip address 10.12.0.1 255.255.255.252
4 S1(config-if)# no shut
```

I like to think of processes running on interfaces. From that viewpoint, we first turn off the process that was handling L2 switching on our interface [line 2] and start a process to handle L3 routing through the interface [line 3]

Now, we can clean up the router interface's configuration (if needed) and add a fresh IP address in the same subnet.

```

R1
1 R1# show ip interf br
2 Interface                IP-Address      OK? Method Status
3 Protocol
4 GigabitEthernet0/0      unassigned      YES manual up
5 GigabitEthernet0/0.10   10.10.0.1       YES NVRAM up
6 GigabitEthernet0/0.20   10.20.0.1       YES NVRAM up
7
8                               We still have some old subinterfaces from previous labs.
8 R1# conf t
9 R1(config)# no interf gi0/0.10
10 R1(config)# no interf gi0/0.20
11
12                               That should get rid of them.
12 R1(config)# interf gi0/0
13 R1(config-if)# description TO S1
14 R1(config-if)# ip address 10.12.0.2 255.255.255.252
15 R1(config-if)# no shutdown
16 R1(config-if)# end
17 R1# show ip interf br
18 Interface                IP-Address      OK? Method Status
19 Protocol
20 GigabitEthernet0/0      10.12.0.2       YES manual up
21 GigabitEthernet0/0.10   unassigned      YES manual deleted
22 GigabitEthernet0/0.20   unassigned      YES manual deleted

```

The "deleted" subinterfaces [Lines 21-22] are curious but harmless. If you look in the running-config, they're not there.

Now we can test the L3 link from both the switch and one of the hosts

```

S1
S1# ping 10.12.0.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.12.0.2, timeout is 2 seconds:
.!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 1/2/4 ms

H1
H1> ping 10.12.0.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.12.0.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

```

The ping from the host to the router failed and a check of our routing tables shows why

```

S1
1 S1# show ip route
2                               Route source code legend omitted
3 Gateway of last resort is not set
4
5     10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
6 C     10.10.0.0/24 is directly connected, Vlan10
7 C     10.12.0.0/30 is directly connected, FastEthernet0/24
8 C     10.20.0.0/24 is directly connected, Vlan20

```

Switch S1, our host's default gateway, knows how to get to 10.12.0.2 on the router [line 7].

```

R1
1 R1# show ip route
2                               Route source code legend omitted
3 Gateway of last resort is not set
4
5     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
6 C     10.12.0.0/30 is directly connected, GigabitEthernet0/0
7 L     10.12.0.2/32 is directly connected, GigabitEthernet0/0

```

But the router doesn't know how to get its reply back to the source ping's source. It has no route to H1's subnet (10.10.0.0 /24) and has no default route [Line 3]

To make this one ping work, we could just add a route on R1, but we'll fix it more fully by finishing the objectives of the lab

- Add a default route from S1 to R1
- Add a summary route on R1 to S1, covering all the subnets currently in use on S1

```

S1
S1(config)# ip route 0.0.0.0 0.0.0.0 fa0/24 10.12.0.2
R1
R1(config)# ip route 10.0.0.0 255.224.0.0 gi0/0 10.12.0.1

```

The default route was easy and didn't really change anything because all of the routes in that direction are directly connected to the switch and already in its routing table. The summary route on R1 fixes our ping problem and will send all packets destined to the addresses 10.0.0.0 through 10.31.255.255 toward S1 forevermore. Our ping from H1 to the router now works.

R E C A P A N D V E R I F I C A T I O N

To use an interface on a multilayer switch (L3 switch), turn off its L2 switching and give it an IP address.

```

S1(config-if)# no switchport
S1(config-if)# ip address 10.12.0.1 255.255.255.252

```

To verify that the port is now an L3 routed port, don't rely on the "show interfaces" command. On a router, that command will mention an IP address, but might not on a switch. In fact on the switch I'm using, the output doesn't change at all from when it was a switchport.

The "show ip interface" command can be very different between L2 switchports and L3 routed ports.

```

S1
S1#show ip interf fa0/1
FastEthernet0/1 is up, line protocol is up
  Inbound access list is not set
                               That's it for a switchport
S1#show ip interf fa0/24
FastEthernet0/24 is up, line protocol is up
  Internet address is 10.12.0.1/30
  Broadcast address is 255.255.255.255
  Address determined by setup command
  ...
                               31 more lines for a layer 3 routed port

```