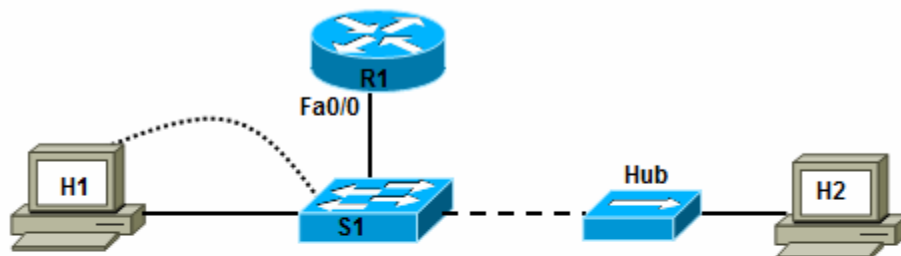# Lab 9.2.4 Troubleshooting LAN Connectivity

Device	Host Name	Interface	IP Address	Subnet Mask	Default Gateway	Switch Port
R1	R1	Fast Ethernet 0/0	192.168.1.1	255.255.255.0	N/A	Fast Ethernet 0/2
S1	S1	VLAN 1	192.168.1.99	255.255.255.0	192.168.1.1	N/A
H1	H1	NIC	192.168.1.11	255.255.255.0	192.168.1.1	Fast Ethernet 0/1
H2	H2	NIC	192.168.1.22	255.255.255.0	192.168.1.1	N/A
Hub	Hub	1	N/A	N/A	N/A	Fast Ethernet 0/3

Objectives:

- Build a simple, switched network and verify connectivity.
- Troubleshoot LAN connectivity using the LEDs and **show** commands to find link problems and duplex and speed mismatches.

Background / Preparation

LAN troubleshooting usually centers on switches, because the majority of LAN users connect to the network via switch ports. Duplex and speed mismatches are more common on switches than on routers. Many devices are set to auto-negotiate speed and duplex settings. If one device on a link is configured to auto-negotiate and the other side is manually configured with speed and duplex settings, mismatches may occur, leading to collisions and dropped packets.

In this lab, you build a small, switched network with a router and a hub, in addition to workstations. You will alter the speed and duplex settings of device interfaces and observe the effects on link lights and interface status.

Set up a network similar to the one in the topology diagram. Any router that meets the interface requirements displayed in that diagram—such as 800, 1600, 1700, 1800, 2500, or 2600 routers, or a combination of these—can be used. See the Router Interface Summary table at the end of the lab to determine which interface identifiers to use based on the equipment in the lab. Depending on the model of the router and switch, output may vary from what is shown in this lab.

Required Resources

The following resources are required:

- One 1841 router or other router with a Fast Ethernet interface
- One 2960 switch or comparable switch with Fast Ethernet interfaces
- One hub with Ethernet interfaces
- Two Windows XP computers
- Three straight-through Category 5 Ethernet cables
- One crossover Category 5 Ethernet cable (optional if hub has an uplink port)
- One console cable
- Access to the command prompts for each host
- Access to the network TCP/IP configuration for each host

From the host computer, start a HyperTerminal session to the router and switch.

Note: Make sure that the routers and switches have been erased and have no startup configurations. Instructions for erasing the switch and router are provided in the Lab Manual, located on Academy Connection in the Tools section. Check with the instructor if you are unsure of how to do this.

Task 1: Build the Network and Configure Devices

Step 1: Configure basic information on the router and switch.

a. Build and configure the network according to the topology diagram and device configuration table. Configure basic settings on router R1. If necessary, see Lab 5.3.5, "Configuring Basic Router Settings with the Cisco IOS CLI," for instructions on setting the host name, passwords, and interface addresses.

b. Configure the basic settings on switch S1 to include the host name, passwords, and VLAN 1 IP address. If necessary, see Lab 5.5.4, "Configuring the Cisco 2960 Switch," for instructions on configuring the switch settings.

c. Save the running configuration on R1 and S1 using the **copy running-config startup-config** command from privileged EXEC mode.

d. Connect the hub to switch S1 using a regular port on the hub and a crossover cable or using the hub uplink port (if present) and a straight-through cable.

Step 2: Configure the hosts.

Configure H1 and H2 with an IP address, subnet mask, and default gateway, according to the device configuration table.

Task 2: Verify Cabling, Interface LEDs, and Link Speed

Step 1: Visually inspect the network connections.

a. After cabling the network devices, verify the connections. Attention to detail now minimizes the time required to troubleshoot network connectivity issues later.

b. Are all cables and terminations in good condition? _____

Step 2: Visually inspect the interface link LEDs.

a. What is the color of the link light for the switch port that H1 is attached to? _____

b. What is the color of the link light on the H1 NIC? _____

Step 3: View the link speed for host H1 with local area connections.

a. On H1, choose **Start > Settings > Control Panel > Network Connections > Local Area Connection.**
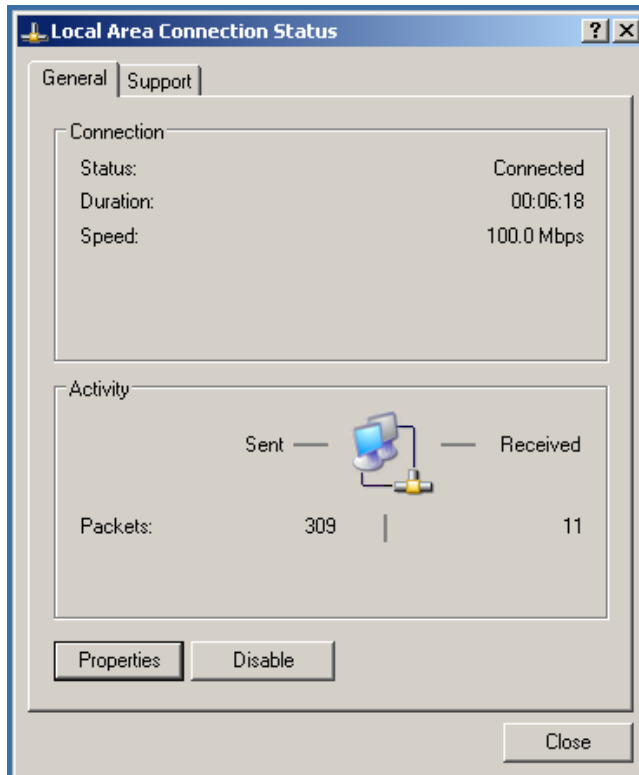
b. What is the connection speed? _____

Task 3: Verify Switch Interface Information

Step 1: Verify interface status.

a. From the HyperTerminal session on S1, use the **show ip interface brief** command to see the status summary of all interfaces.

```
S1#show ip interface brief
Interface        IP-Address      OK? Method Status       Protocol

Vlan1            192.168.1.99    YES manual up           up

FastEthernet0/1  unassigned      YES unset  up           up

FastEthernet0/2  unassigned      YES unset  up           up

FastEthernet0/3  unassigned      YES unset  up           up

FastEthernet0/4  unassigned      YES unset  down         down
```

```
        FastEthernet0/5 unassigned       YES unset  down          down
```

b. Which interfaces have a status of **up** and a protocol that is **up**? _____

Step 2: Verify end-to-end connectivity.

a. On H1, open a Command Prompt window by choosing **Start > Run** and typing **cmd**. Alternatively, you can choose **Start > All programs > Accessories > Command Prompt**.

b. Use the **ping** command to test end-to-end connectivity. Ping from H1 to the default gateway.

    C:\>**ping 192.168.1.1**

c. Ping from host H1 to host H2.

    C:\>**ping 192.168.1.22**

Note: If the pings are not successful, troubleshoot the router and host configurations and connections.

Step 3: Verify interface status and settings.

To view the speed and duplex settings on a port and whether manual or auto-negotiation features were used, use the s**how interface** *port* **status** command.

a. Display the status for port numbers Fast Ethernet 0/1 and Fast Ethernet 0/3.

```
S1#sh interfaces FastEthernet 0/1 status
Port        Name          Status      Vlan    Duplex  Speed   Type
Fa0/1                     connected   1       a-full  a-100   10/100BaseTX

S1#sh int f0/3 status
Port        Name          Status      Vlan    Duplex  Speed   Type
Fa0/3                     connected   1       a-half  a-10    10/100BaseTX
```

b. What is the duplex and speed for port Fast Ethernet 0/1? _____

c. What does the "a-" at the beginning of "full" and "100" mean? _____

d. What is the interface type? _____

e. What is the duplex and speed for port Fast Ethernet 0/3? _____

f. Why is the duplex and speed for Fast Ethernet 0/3 different than Fast Ethernet 0/1? _____

Step 4: View interface error statistics.

a. To get a quick view of switch port error statistics, use the **show interface** *port* **counters errors** command.

```
S1#show int f0/1 counters errors

Port    Align-Err     FCS-Err    Xmit-Err     Rcv-Err UnderSize
Fa0/1           0           0           0           0         0

Port    Single-Col Multi-Col  Late-Col Excess-Col Carri-Sen Runts Giants
Fa0/1           0         0         0          0         0     0     0
```

b. Are there any errors or collisions for Fast Ethernet 0/1? _____

c. Repeat the command for ports Fast Ethernet 0/2 and Fast Ethernet 0/3.

Task 4: Change Duplex Settings

Step 1: Set the duplex setting to full.

a. Change the duplex setting on Fast Ethernet 0/3 to force it to operate at full duplex.

```
S1(config)#interface FastEthernet 0/3
S1(config-if)#duplex full
S1(config-if)#end
S1#
```

b. What is the result of setting the port Fast Ethernet 0/3 duplex to full?

_____

c. Issue the **show ip interface brief** command. What is the status and protocol for interface 0/3?
    _____

d. Why did this happen?

_____

_____

Step 2: Set the duplex setting to half duplex.

a. Change the duplex setting on Fast Ethernet 0/3 to force it to operate at half duplex.

```
S1(config)#interface FastEthernet 0/3
S1(config-if)#duplex half
S1(config-if)#end
S1#
```

b. What is the result of setting the port Fast Ethernet 0/3 duplex to half?

_____

c. Issue the **show ip interface brief** command again. What is the status and protocol for interface Fast
    Ethernet 0/3? _____

d. Why did this happen?

_____

_____

Step 3: Set the duplex setting to auto-negotiate.

a. Change the duplex setting on Fast Ethernet 0/3 back to auto-negotiate.

```
S1(config)#interface FastEthernet 0/3
S1(config-if)#duplex auto
S1(config-if)#end
S1#
```

b. What is the result of setting the port Fast Ethernet 0/3 duplex back to auto?

_____

Task 5: Change Speed Settings

Step 1: Set the speed to 100 Mbps.

    a. Change the speed setting on Fast Ethernet 0/3 to 100 Mbps.

```
S1(config)#interface FastEthernet 0/3
S1(config-if)#speed 100
S1(config-if)#end
S1#
```

    b. What is the result of setting the speed to 100?

        _____

    c. Issue the **show ip interface brief** command. What is the status and protocol for interface Fast Ethernet 0/3? _____

    d. Why did this happen?

        _____

Step 2: Set the speed setting to auto-negotiate.

    a. Change the duplex setting on Fast Ethernet 0/3 back to auto-negotiate.

```
S1(config)#interface FastEthernet 0/3
S1(config-if)#speed auto
S1(config-if)#end
S1#
```

    b. What is the result of setting the port Fast Ethernet 0/3 speed back to auto?

        _____

Task 6: Set Both Duplex and Speed Settings

Step 1: Set the duplex and speed settings for Fast Ethernet 0/1 to full and 100 Mbps.

It is sometimes necessary to set the speed and duplex of a port to ensure that it operates in a particular mode. To force Fast Ethernet port 0/1 to operate at full duplex and 100 Mbps, issue the following commands.

```
S1(config)#interface FastEthernet 0/1
S1(config-if)#duplex full
S1(config-if)#speed 100
S1(config-if)#end
S1#
```

Step 2: Verify the new settings.

    a. When a port is in the default state of auto duplex and auto speed, duplex and speed commands do not appear in the running configuration for the interface. When the duplex and speed are set to force the port to operate in a particular mode, the commands used are displayed. Use the **show run interface** command to view only the portion of the running configuration that is associated with Fast Ethernet 0/1.

```
S1(config)#show run interface FastEthernet 0/1
Building configuration...

Current configuration : 57 bytes
```

```
 !
 interface FastEthernet0/1
  speed 100
  duplex full
 end
```

b. Are there any console messages regarding the link status of Fast Ethernet 0/1? _____

    Why? _____

Task 7: Check Settings and Characteristics of Neighboring Devices and Interfaces

Step 1: Check the characteristics of the neighbor attached to switch port Fast Ethernet 0/2.

a. Issue the **show cdp neighbors** command for the S1 Fast Ethernet 0/2 port.

```
S1#show cdp neighbors FastEthernet 0/2 detail
-------------------------
Device ID: R1
Entry address(es):
  IP address: 192.168.2.1
Platform: Cisco 1841,  Capabilities: Router Switch IGMP
Interface: FastEthernet0/2,  Port ID (outgoing port): FastEthernet0/1
Holdtime : 145 sec

Version :
Cisco IOS Software, 1841 Software (C1841-ADVIPSERVICESK9-M), Version
12.4(10b),
RELEASE SOFTWARE (fc3)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2007 by Cisco Systems, Inc.
Compiled Fri 19-Jan-07 15:15 by prod_rel_team

advertisement version: 2
VTP Management Domain: ''
Duplex: full
Management address(es):
```

b. What is the name and platform of the attached device? _____

c. What is the Cisco IOS version? _____

d. What is the duplex setting for the attached port? _____

e. Issue the **show cdp neighbors** command for S1 Fast Ethernet 0/3.

```
S1#sh cdp neig f0/3
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone
Device ID    Local Intrfce  Holdtme   Capability   Platform   Port ID
```

f. Why is there no information shown for the attached device? _____

    _____

Task 8: Change Router Duplex Settings

Step 1: Set the duplex setting for R1 Fast Ethernet 0/0 to half duplex.

a. To force R1 Fast Ethernet port 0/0 to operate at half duplex, issue the following commands.

```
R1(config)#interface FastEthernet 0/0
R1(config-if)#duplex half
R1(config-if)#end
```

b. Issue the **show ip interface brief** command on R1.

c. What is the status of Fast Ethernet 0/0? _____

d. Issue the **show ip interface brief** command on S1.

e. What is the status of Fast Ethernet 0/2 (the port to which R1 is attached)? _____

f. Can you ping the switch VLAN 1 address (192.168.1.99)? _____

   Why? _____

Task 9: Reflection

When LAN connectivity problems exist, always check link lights first and then check the cabling and terminations. Verify that interfaces are not shutdown. Verify that ports are set to auto-negotiate, if possible. If a device connected to a port cannot auto-negotiate or connectivity problems exist, forcing the port to operate at the specific duplex and speed of the attached device may be required. Check interface errors to determine if there is a problem with the physical interface itself. Always check both ends of the connection, if possible.

Router Interface Summary				
Router Model	Ethernet Interface #1	Ethernet Interface #2	Serial Interface #1	Serial Interface #2
800 (806)	Ethernet 0 (E0)	Ethernet 1 (E1)		
1600	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
1700	Fast Ethernet 0 (FA0)	Fast Ethernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)
1800	Fast Ethernet 0/0 (FA0/0)	Fast Ethernet 0/1 (FA0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
2500	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
2600	Fast Ethernet 0/0 (FA0/0)	Fast Ethernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)

Note: To find out exactly how the router is configured, look at the interfaces. The interface identifies the type of router and how many interfaces the router has. There is no way to effectively list all combinations of configurations for each router class. What is provided are the identifiers for the possible combinations of interfaces in the device. This interface chart does not include any other type of interface, even though a specific router may contain one. An example of this might be an ISDN BRI interface. The information in parenthesis is the legal abbreviation that can be used in Cisco IOS commands to represent the interface.