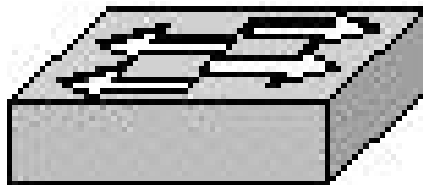# 7.13.1

NETWORK CONFIGURATION:

Cisco Switch

Objective

At the end of this lab students will be able to configure a Cisco 2950 switch for default functionality, and to establish static VLANs (virtual LANs).

Information for Laboratory

A. Students will use Hyperterminal Private Edition to establish a console connection to a switch.
B. Students will assure the switch is operating in default mode.
C. Students will configure network segmentation via VLANs.

Student Preparation

The student will have completed requisite reading. The student will require paper for notes and should be prepared to discuss the exercises upon completion.

Before beginning this lab, erase any configuration already on the switch.

Estimated Completion Time

45 Minutes

Switching

The function of switching is to forward frames. This applies to a variety of data link technologies such as Ethernet, Token Ring, Frame Relay, and ATM. Ethernet, really IEE 802.3, has evolved to become the dominant data link technology for LANs.

At an earlier stage of development, Ethernet LANs used passive hubs and repeaters. These devices functioned as a logical bus where broadcast and collision domains coincided. Repeaters served the added function of reconstituting the signal. The collection of all nodes connected to any common interconnection of hubs and repeaters was called an Ethernet segment, or simply a segment. Bandwidth is completely shared within the segment.

Later, there was very little cost difference between multiport repeaters and passive hubs. As passive hubs were phased out, networking language evolved with the change. Multiport repeaters began to be called "hubs" as well.

With further development of speed and use of remote access to the Internet, switches replaced newer hubs. Switches are intelligent devices that can forward frames based on physical or MAC address. They can also buffer ports and filter frames. Each port can operate at nearly the full bandwidth.

In general, all the ports of a switch may still constitute a broadcast domain, while each port is its own collision domain. Theoretically, each port is a separate Ethernet segment, which is why they are said to provide microsegmentation. But the tendency for newer hubs to be replaced directly by a switch has led to confusion. It is very common for all connections to a switch to be referred as a segment.

With the development of VLAN capability within switches, even broadcast domains are separated, providing even greater functional segmentation.

Switch Configuration

Many of the labs in this course require the use of a simple peer to peer network using a switch. This may require simple switch configurations. Returning the switch to factory defaults is advisable. Otherwise results may be unpredictable.

Step 1:

Connect several PC workstations to a common Cisco 2950 switch using straight through RJ45 to RK45 Cat 5, 5e, or 6 UTP cables. Further, configure each workstation TCP/IP properties to have static IP addresses on a common network. For example,

Workstation1, IP=192.168.1.10 with subnet mask=255.255.255.0,
Workstation2, IP=192.168.1.11 with subnet mask=255.255.255.0,
etc.

Note that the addresses are not initiated with 192.168.1.1. This is commonly reserved for the default gateway, but is not needed for this lab.
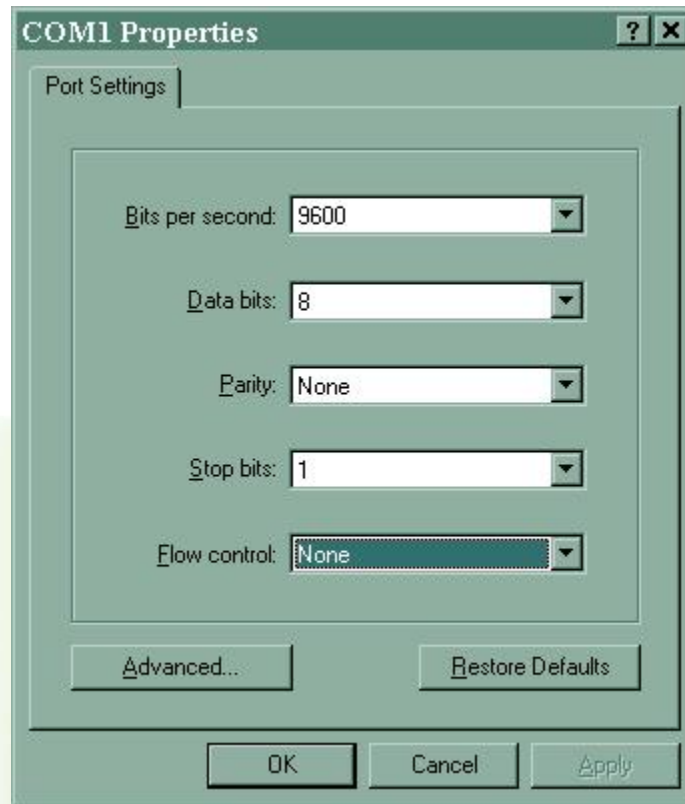
Step 2:

Make an additional connection from the COM1 serial port of one of the PC workstations, to the console port of the switch. There are three possible ways to make this connection.

1. Use an integrated DB9 to RJ45 console cable.
2. Use a DB9 to RJ45 adapter with a RJ45 to RJ45 rollover cable.
3. Use a rollover DB9 to RJ45 adapter with a RJ45 to RJ45 straight through cable.

Step 3:

Execute Hyperterminal Private Edition. Select a script name and icon, and select communications via COM1. The default switch settings match the following graphic:

You should now see output from the connected switch. If not, be sure your Hyperterminal settings are correct, and that the switch is turned on.

Step 4:

After the switch has loaded the Cisco IOS, the console prompt should be,

```
Would you like to enter the initial configuration
dialog? [yes/no]:
```

Answer no and press enter. After some output the following prompt appears.

```
Switch>
```

This prompt signifies the User mode of the command line
interface (CLI). To configure the switch, enter Privileged mode
by executing,

```
Switch>enable
Switch#
```

Switch configurations run out of RAM. They may also be stored
in NVRAM which is commonly loaded into RAM when the
switch is loaded. Configurations loaded in RAM and NVRAM
may be viewed by the following commands, respectively,

```
Switch#show running-config
Switch#show startup-config
```

This lab presumes the absence of a startup-configuration, but
had there been one, the following command would delete it:

```
Switch#erase startup-config
```

Step 5:

In addition to the startup-config, the switch may use a VLAN
database located in flash memory. Use the following command
to view the contents of flash:

```
Switch#show flash:
```

Be sure to include the colon. Should the switch have a VLAN
database file vlan.dat, it should be deleted as part of the
procedure to restore factory defaults.

```
Switch#delete flash:vlan.dat
```

The status of VLANs on the switch can be checked with the
command,

```
Switch#show vlan
```

To store factory defaults, the switch must be restarted. Care should be taken depending on the output of the previous command. If all ports are shown to be associated with the default management VLAN1, then simply reload the switch.

```
Switch#reload
System configuration has been modified. Save?
[yes/no]:
```

Be sure to answer this last question "no". Otherwise the running-config will be saved in NVRAM, and factory defaults will not be restored.

If the **show vlan** command still reveals other VLAN assignments are present, the switch must be power cycled to restore factory defaults. Since the switch does not have a power switch, either cycle the AC power strip (watch what else is plugged in!), or physically unplug the switch power cord, and then plug it back to recycle.

Once the boot cycle is complete, verify factory defaults with the commands already explored.

Now that the factory defaults are restored, verify interconnectivity of all the workstations using the ping command.

Step 6:

Switches, being intelligent devices, generally learn about what is connected to various ports with respect to MAC addresses. If frames are to be set to a particular node, they can be forwarded out to the proper port instead of burdening traffic on other ports. Broadcasts on the other hand are flooded out all ports.

Switches can be configured to further divide network domains through the use of VLANs. The following commands will

produce two new VLANs, and assign one to ports f0/1 and f0/2, and the other to ports f0/3 and f0/4.

```
Switch#vlan database
Switch(vlan)#vlan 2 name SALES
Switch(vlan)#vlan 2 name MKT
Switch(vlan)#exit
Switch#configure terminal
Switch(config)#interface f0/1
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 2
Switch(config-if)#interface f0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 2
Switch(config-if)#interface f0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 3
Switch(config-if)#interface f0/4
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 4
```

Exit out of configuration mode by the sequence CTL-Z. The command **switchport mode access** means just that. The port is for access by nodes, and not a trunk that connects to another switch or router.

Verify that VLANs have been configured by issuing the command,

```
Switch#show vlan
```

Experiment with workstations connected to the ports with new VLAN assignments. Workstations connected to f0/1 and f0/2, or f0/3 or f0/4, should be able to ping each other. Workstations connected to ports on difference VLANs should not be able to ping each other, even if they are configured on the same IP network.

Analysis

1. Why is it important to be able to establish factory defaults on a switch?
2. What type of domain is a VLAN? Is it a collision domain, a broadcast domain, or both?
3. Contrast network designs using VLANs Vs. segmentation via routers. Consider issues of cost, network management, and security.

Summary Discussion

A classroom discussion should follow the lab. Review the lab questions and your analyses as a group. Share your experiences and knowledge with the class.

If You Want To Learn More

Explore the Cisco 2950 switch at www.cisco.com. Follow Technical Support > Software Support
Search for 2950.

Appendix

This lab was done using Hyperterminal Private Edition 6.3 which may be found at http://www.hilgraeve.com/htpe/.
The switch was a Cisco 2950.
The computer operating system was Windows XP Professional version 2002 Service Pack 2 (8/04).