Chapter 5: Configuring network devices

By the end of the chapter you will be able to:

✓ Configure network devices.

✓ Use telnet.

Overview

We have already looked at ping and Wireshark.

This chapter looks at configuring network devices and telnet.

telnet requires the devices to have IP addresses.

A console port and a RS232 connection is often used to initially give a device an IP address.

The problem with console access is that it normally requires an engineer on site.

Network device configuration options
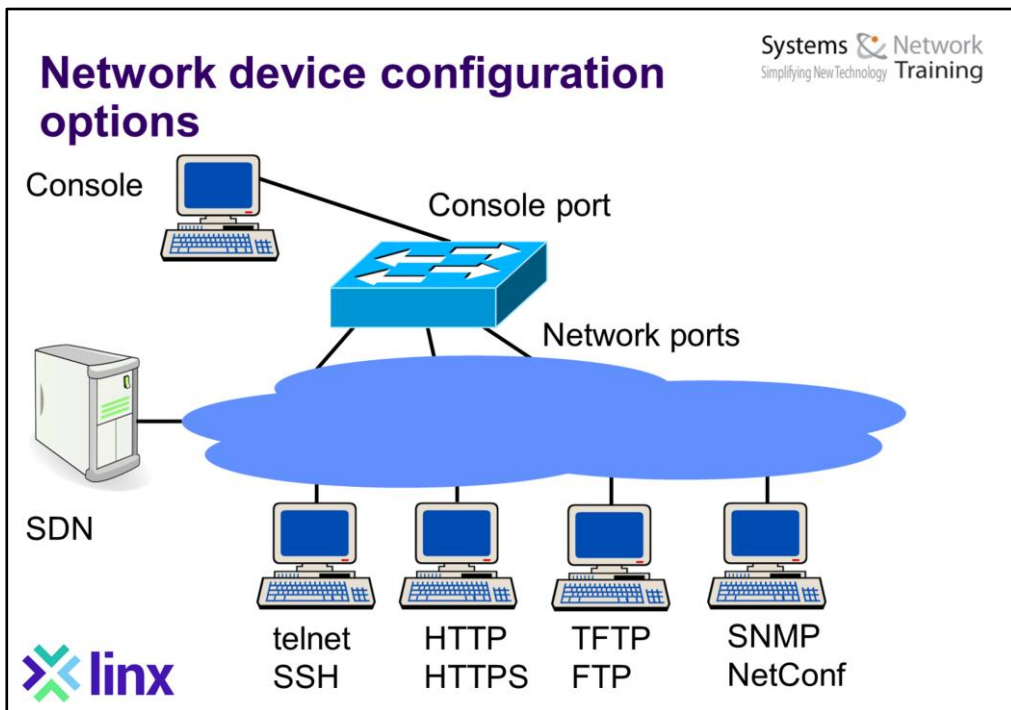
Network device configuration options

After the hardware, has been installed and cabled it is likely that at least a minimal additional configuration would be required.

Until an IP address has been assigned configuration is performed using the console port (usually at the rear of the network device).

Most network device management options require network access and a valid IP address for the device.

If and when the device has a network connection and a valid IP address, then a number of options for switch management are possible:

telnet: Accesses the command line – similar to console port access but over the network. SSH is a Secure version.

HTTP: Hyper Text Transfer Protocol. Web based management. The switch acts as a web server, the administrator just points the browser at the switch. HTTPS is a secure version.

TFTP: Trivial File Transfer Protocol. Used to download configurations.

SDN: Software Defined Networking. SDN controllers can programmatically configure many network devices.

SNMP: Simple Network Management Protocol. Usually to get information but can be used to configure. NetConf is specifically for configuration.

Default IP addresses

These are often seen on network devices designed for small home networks.

The idea is rather than having to use a console connection a normal standard Ethernet connection can be used to provide the initial configuration of the device.

For most home networks the default IP address is left as it is.

For business networks this approach does not works so well – duplicate addresses, wrong network numbers.

Default IP addresses are required for devices without a console port (see over).

Console port
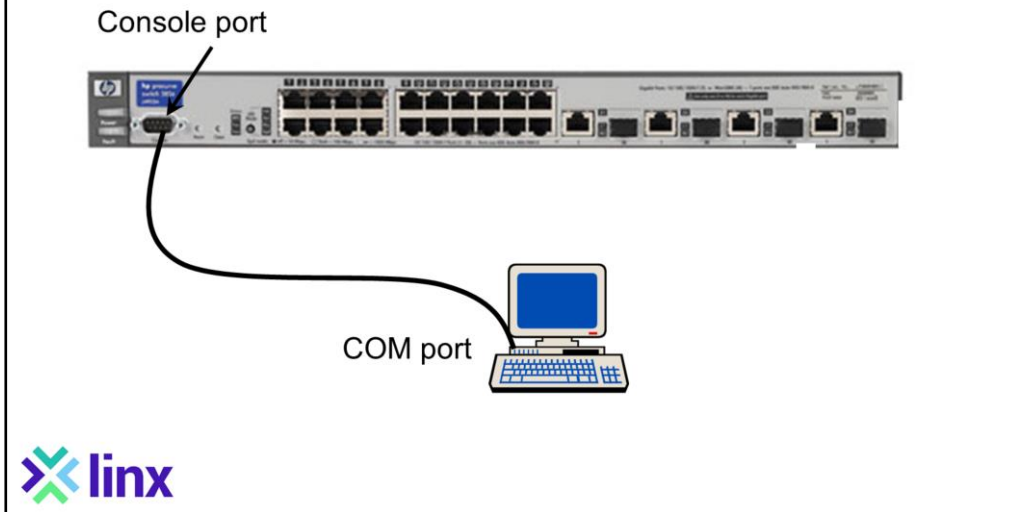
Console port

The normal place to start configuring is via a console port.

Use of the console port requires an engineer "on site"

The console port is the only option if the network device does not have an IP address configured.

Console ports usually use a serial connection.

The cables are normally proprietary to the manufacturer – make sure you have the right cable.

The other end of the console cable will be connected to the COM port of a PC.
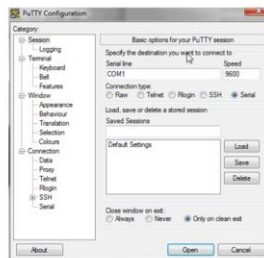
Many laptops no longer come with a COM port.

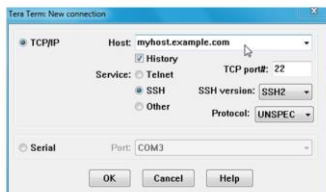A USB to serial convertor is then required.

Some newer network devices are now providing a USB console port.
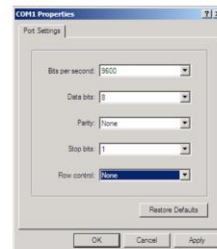
Console port software

Software is required to use the console port hardware.

Any serial port software will do but the two main ones are

PuTTY
Tera Term

Both of these are open source products.

In Windows XP and before Microsoft provided some software called HyperTerminal.

This software is not available in later Windows versions as Microsoft removed it.

Copies can be found on the Internet but you might as well use Tera Term or Putty.

Console port software

Correct COM port?

Correct speed?

Use serial (not TCP/IP)
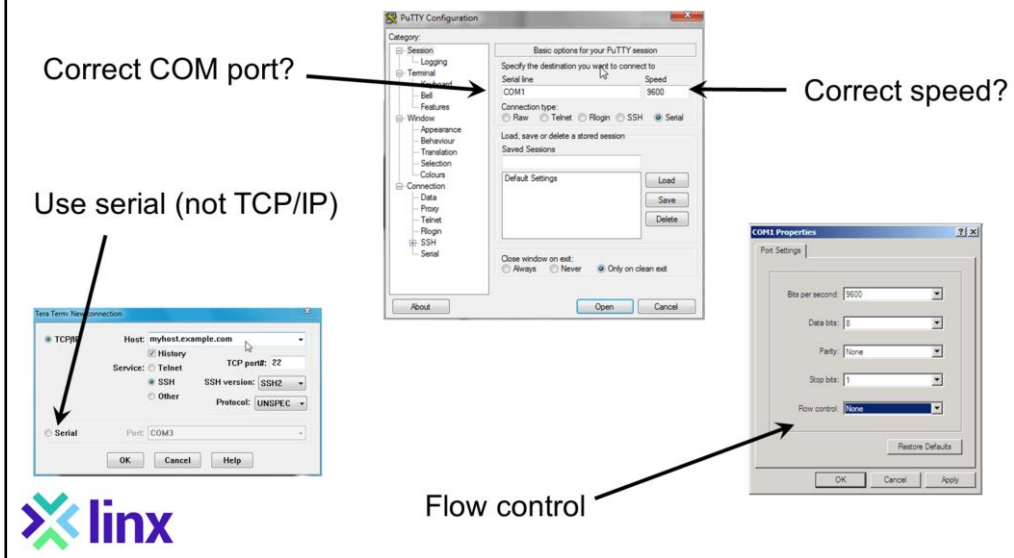
Flow control

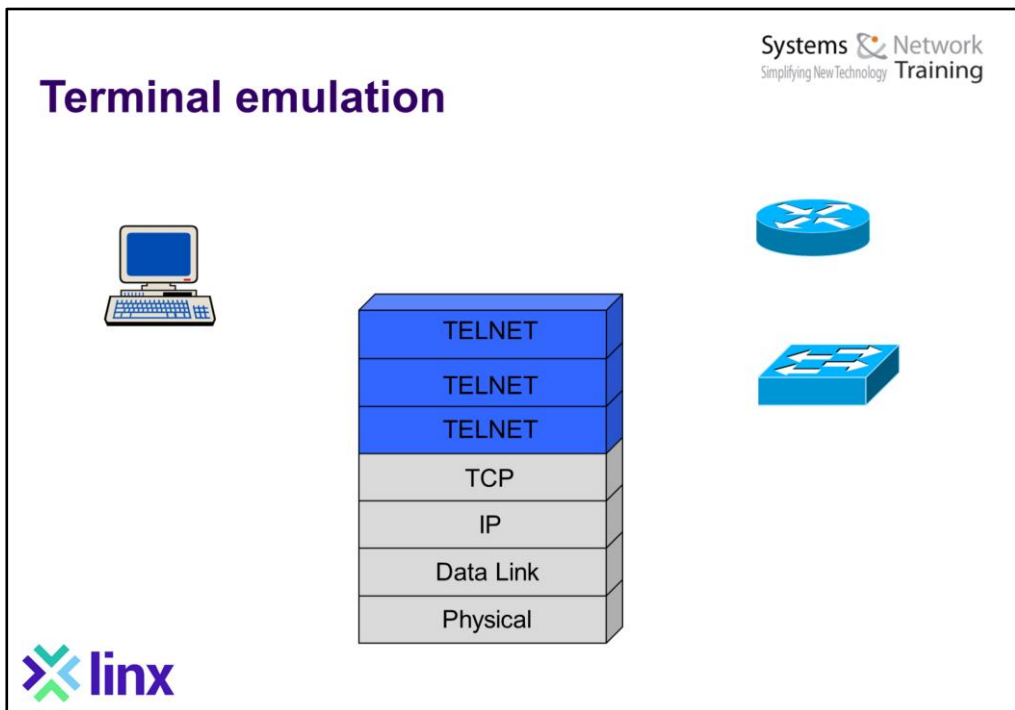## Console port software settings

The settings for the software need to match the console port settings on the managed device.

A typical configuration is:

Speed:		**9600**
Data bits:	8	
Parity:	None	
Stop bits:	1	
Flow control:	**None**	

When using console port software, your PC is effectively acting as a screen and keyboard for the switch.

Terminal emulation

The most common terminal emulation protocol is TELNET, the name stands for Teletype Network.

`telnet` allows a user with a screen and keyboard to access other devices (typically without screens and keyboards).

More formerly `telnet` is used to exchange ASCII text between machines and log into remote IP devices.

```
telnet 10.0.0.33
```

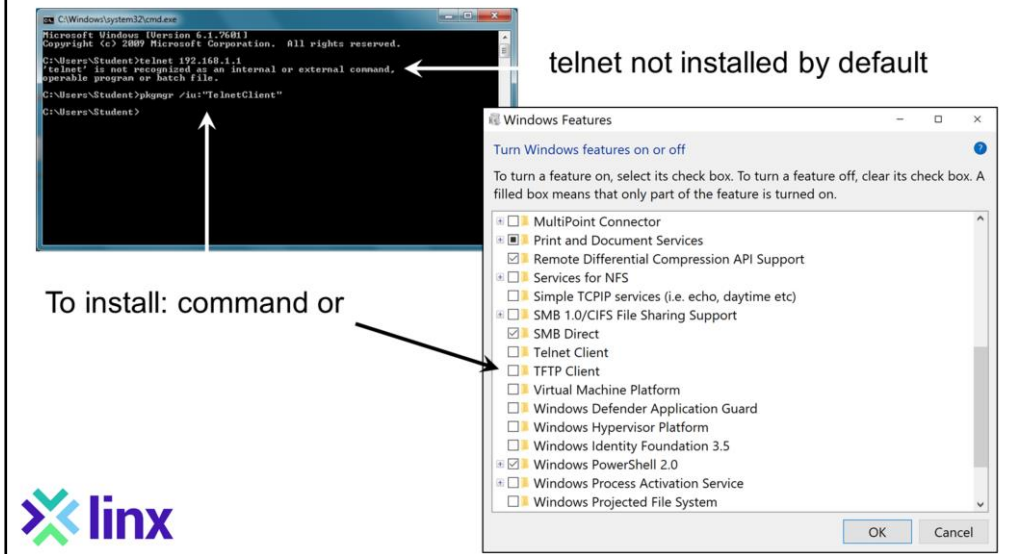> Where *10.0.0.33* is the IP address of the remote IP device.

With `telnet` passwords are sent as plain text.

The Secure Shell is an alternative "telnet" overcoming the security weaknesses of `telnet`.

More specifically the Secure Shell "encrypts" the password as it is sent over the network.

Microsoft telnet client

With Windows XP and before, Microsoft provided a telnet client in the default
Windows install.

Windows 7 onwards the telnet client needs to be installed to be used.

This can be done from the command line

        pkgmgr /iu:"TelnetClient"

It can also be done from the menus.

In Windows 7

        Start --> Control Panel --> Programs and Features
        Click Turn Windows features on or off
        Scroll down and select Telnet Client then click OK

Other telnet clients

It is common to have either PuTTY or Tera Term for console access.

They can also be used for telnet access.

Most engineers will now use these rather than the Microsoft client.

Benefits include:

- Better control of features such as logging, scrolling
- Support of SSH

Quiz

1. If a device has no IP address what configuration method must be used?

2. How close to the device to configure do you have to be in order to use telnet?

3. How close to the device to configure do you have to be in order to use the console port?

4. What port on a PC is used for console access?

5. What software is needed on a PC to use console access?

6. Why is telnet used a lot in the Cisco and UNIX world but not so much in the Microsoft world?
   What does the Windows remote desktop application provide?

7. Name two benefits of giving an IP address to a switch.

Exercise

Configuring switches

In this part of the exercise each student will now use, and configure, his or her own switch. Key points to discover in this part of the exercise are:

- How to use console port access.

- Theoretical knowledge such as bridge tables, covered earlier in the course, is not just theory – bridge tables are real and can be seen.

- Reading the output of commands is an essential part of the job.

Note: The switches that we are using happen to be Cisco switches (they have a large market share). However, this is not a Cisco course. If you have any problems whatsoever with the command line please ask the instructor straight away – the main emphasis of the exercise is on switches in general, not a specific manufacturer's switch.

Please use the quick reference at the back if you wish.

1.   Connect your PC to the console port of the switch. What software needs to be used for this?

_____

If you do not get any output, check the following items:

Correct console cable and connector used?
Check by swapping with known good parts.
Switch powered on?
Check power LED on switch.
Putty/Teraterm settings correct?
9600, no flow control, rest defaults.
Correct COM port used?
COM3 or COM4 or COM6 or COM7 or COMx?

2.   Reboot the switch and text similar to the following should appear. The switch is asking whether you want to set up the switch.

```
Cisco Internetwork Operating System Software
IOS (tm) C2950 Software (C2950-I6Q4L2-M), Version 12.1(22)EA8,
RELEASE SOFTWARE (fc1)
Copyright (c) 1986-2006 by cisco Systems, Inc.
Compiled Fri 12-May-06 17:19 by myl
:
:
Model number: WS-C2950-24
System serial number: FCZ1034Y0GW

        --- System Configuration Dialog ---


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

Alternatively you may have to return the switch to factory defaults as below:

```
Switch2>enable
Password:
Switch2#erase start
Erasing the nvram filesystem will remove all configuration files!
Continue? [confirm]
[OK]
Erase of nvram: complete
Switch2#
00:01:51: %SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
Switch2#
Switch2#reload
Proceed with reload? [confirm]

00:05:26: %SYS-5-RELOAD: Reload requested
Continue with configuration dialog? [yes/no]: no
```

3. On the switch type:

enable

to enter privileged mode. Your prompt should now look something like:

```
switch#
```

Now type the following, noting that what you type is actually being typed on the switch):

```
sh mac-
show interface fa 0/9
        where 0/9 is the port number with the PC attached.
show ip int brief
sh run
```

List what the commands do

```
sh mac-
```

_____

```
show interface fa 0/9
```


_____

```
show ip int brief
```


_____

```
sh run
```

_____

How many machines are connected to the switch?

_____

On what port is (are) the PC(s) attached?

_____

How many broadcasts have there been on port 0/9?

_____

How many ports are in use?

_____

4.   So far we have used the switch and looked at items discussed in the theory
      sessions. We will now configure a name and a password for the switch:

```
conf t
```
                This enters configuration mode. Note the prompt has
                changed.

```
hostname s1
```
                where s1 is the name of your switch. Note the prompt
                has changed as soon as you hit return.
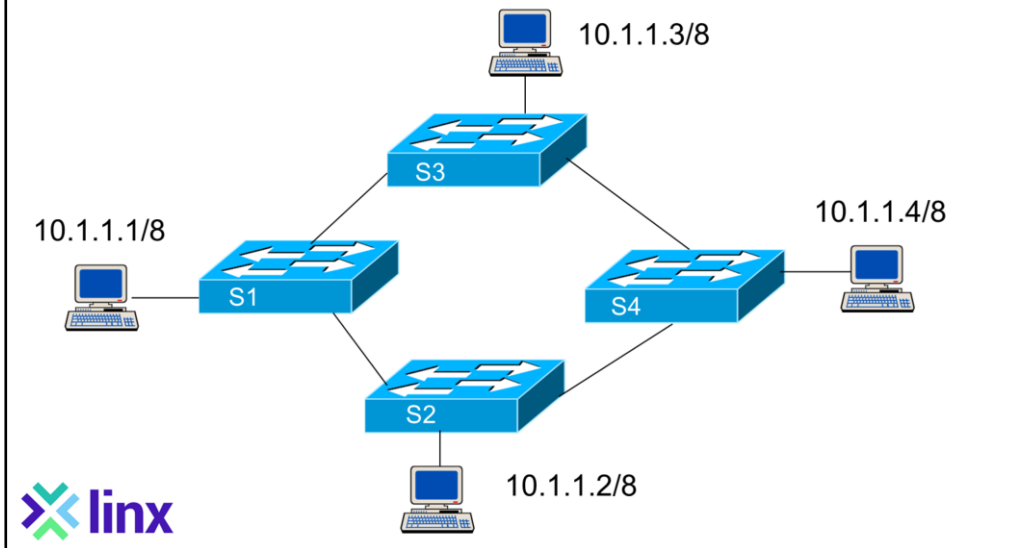
```
enable secret cisco
```
                This sets a password for the switch. For this course
                please make sure the password is cisco.

```
exit
```
                We are now back in privileged mode where we can look
                at things.

Exercise: Full connectivity

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10.1.1.3/8 (S3)
10.1.1.1/8 (S1)
10.1.1.4/8 (S4)
10.1.1.2/8 (S2)

5.   We will now connect all the switches in the class together. Ensure that all
      PCs can ping each other. List any problems encountered here:

      _____

      _____

      _____

      When pinging is it the Ethernet or COM port that is being used?

      _____

      Assuming all the PCs can ping each other, then the switches are working. Do
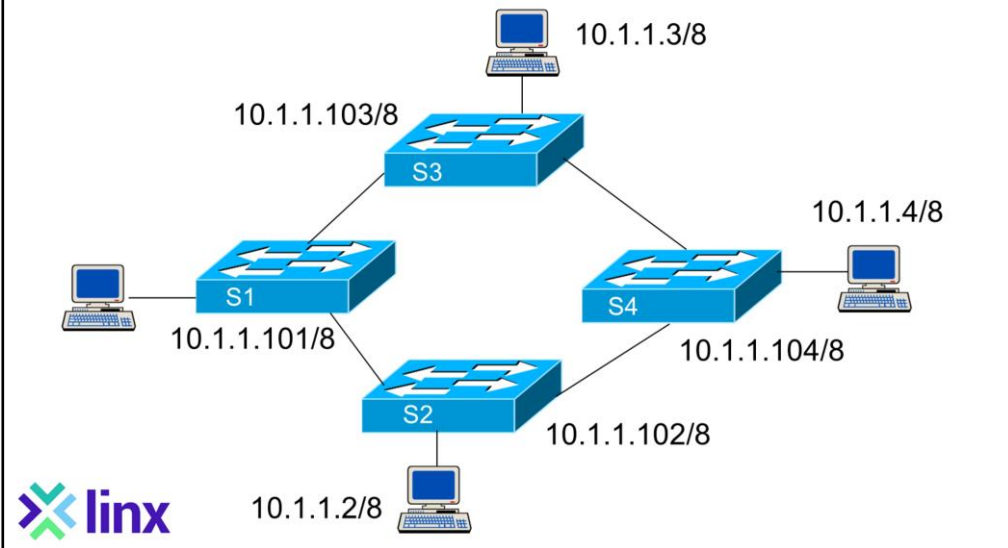   the switches need an IP address in order to be able to switch?

      _____

      To confirm your answer (no), use the console port to access the switch and
      use the following command to confirm that you do not have an IP address.

      ```
      sh ip int brief
      ```

Exercise: IP addresses for switches

6. We will now give the switch an IP address. With end devices, IP addresses are configured on the network card. Switches can be seen to have 12, 24 or more network "cards", but the switch only needs one IP address. The address will be placed on Vlan 1 and can by default be accessed through any of the Ethernet ports on the switch.

    ```
    conf t
    int VLAN 1
    ip address 10.1.1.101 255.0.0.0
    no shut
    end
    ```

    Confirm that you have set the IP address correctly.

    ```
    sh ip int brief
    ```

7. Check that you can ping your switch from your PC. If not then troubleshoot until you can. List any problems here:
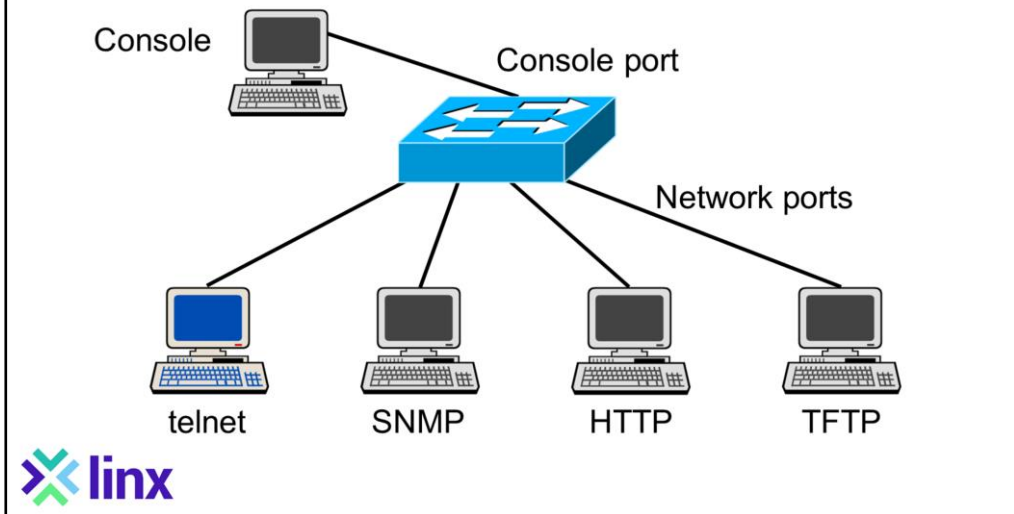
    _____

8. Does the ping command work from your switch? (It should be able to.)

    _____

9. Ensure that you can ping all switches and PCs in the class. (From your PC or from your switch.)

Exercise: telnet into switch

telnet

10. Try to telnet into your switch. Does it work? (It shouldn't)

_____

11. Although your switch has an IP address it is not running a telnet server yet.
    To enable telnet:

```
conf t
line vty 0 15
login
password cisco
end
copy run start
```

12. `telnet` into the switch. It should now work. Login and then type

```
enable
```

to enter privileged mode. Your prompt should now look something like:

```
s1#
Now type sh run
```

What does exit do?

_____

13. Confirm you can telnet into someone else's switch. How do you know which switch you are working on?

   _____

14. `telnet` into the switch whilst running Wireshark. Give the password then logout. Now stop Wireshark. What command terminates a `telnet` session?

   _____

   In Wireshark find a telnet packet and list the protocols found in the second pane

   _____

   _____

   _____

   _____

15. Right click on a telnet packet. Choose "Follow stream". Note that you can now see the password used! **Once done make sure you clear the filter.**

16. Try to `telnet` to someone else's PC. Does it work? Can you `ping` them? What do you think the problem is with the telnet?

   _____

   _____

17. On your machine run `ipconfig /all` and note your MAC address here. Run `sh mac-` and confirm that you can see your PCs MAC address in the switches MAC address table.

   _____

   _____

18. `telnet` back into the switch. Login and then type

   `enable`

   to enter privileged mode. Your prompt should now look something like:

   `s1#`

19.   We will now configure the switch in a simple fashion by shutting down (disabling) a port. Type the following:

```
conf t
```
>   This enters configuration mode. Note the prompt has changed.

```
int fa0/9
```
>   where 0/9 is the name of the port you wish to disable.

```
shut
```
>   This command disables the port.

```
exit
exit
```
>   We are now back in privileged mode where we can look at things.

20.   What has happened to the LED for the port shut down?

_____

21.   Now repeat the `show ip interface brief` command. Before the output would have shown the interface as being "up up". What state is the port now in?

_____

22.   Re-enable the port which was shut down:

```
conf t
int fa0/9
no shut
exit
exit
```

23.   What does this do to the `show ip interface brief` output and the LEDs?

_____

_____

If time permits

24.   From the `telnet` session, `ping` another machine. Analyse the `ping` using
        Wireshark. Why are so many `telnet` packets seen when doing the `ping`?

        _____

25.   Using Wireshark, capture packets for a while. What packets does the switch
        transmit periodically? What source MAC address is used by these packets? If
        you move your PC to another port does the source MAC address change?

        _____

        _____

        _____