

Hetauda City College

Affiliated to Tribhuvan University

LAB MANUAL

ON

Computer Network

BSCIT V

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Lab No: 1

Title: Introduction to Networking Devices and Physical layer connection

Objective:

- To be familiar with basic components of networking.
- To be familiar with cable wiring standards.
- To prepare students to design RG-45 jacks and testing them using multimeter and LAN tester.

Components Required:

- Hub
- Switches
- Cables (Optical Fiber, Coaxial cables, twisted pair cables)
- LAN TESTER
- Clamper

Wiring Standards Used

1. Straight Through cable

The straight-through cable is used to connect

- Host to switch or hub
- Router to switch or hub

2. Cross over cable

The cross over cable is used to connect

- Switch to switch
- Hub to hub
- Host to host
- Hub to switch
- Router direct to host.

Pin Configuration in RJ45 Jack



Pin Configuration:

Straight-Through Cable Standards

TIA/EIA 568A Wiring

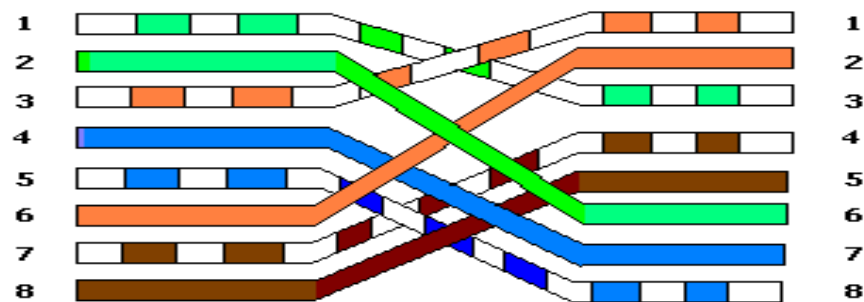


TIA/EIA 568B Wiring

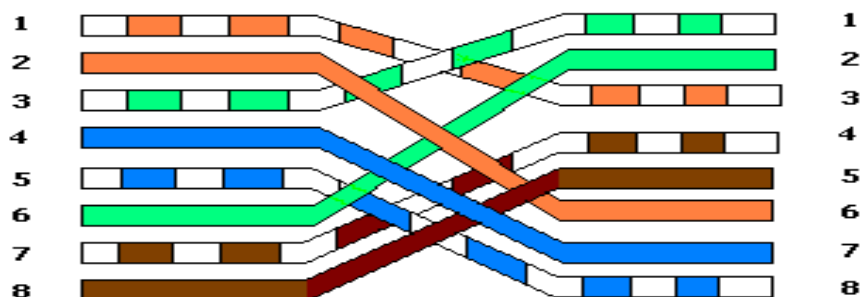


Cross-over Cable Standards

TIA/EIA 568A Crossed Wiring



TIA/EIA 568B Crossed Wiring



Lab No: 2

Title: General commands and applications used in Network

Objectives:

- To know basic commands in Networking
- To know sharing files and devices in network

Theory:

The status of computer and different resources use by the computer for its operation can be viewed through different commands. Some of the basic commands used in computer network are as follows:

- **Hostname:** Display the hostname of the local computer.

Example c:\> hostname

- **Ipconfig/ifconfig:** It resembles to *internet protocol configuration*. It display all current TCP/IP network configuration values. It also allows some control over active TCP/IP connections. *Dynamic Host Control Protocol* DHCP and *Domain Name System* DNS can be refresh through this command.

Example c:\>ipconfig

c:\> ipconfig /all

Modifiers

Ipconfig /all
Ipconfig /renew
Ipconfig /release

- **Ping:** It is the basic network command used to test reachability of remote host computer and use to measure the round trip time and record any packet loss for the messages sent from originating host. It is operated by ICMP echo request packet sent and waits for its reply.

Example c:\>ping 127.0.0.1

c:\> ping localhost

c:\> ping -t www.google.com

c:\> ping -l 100 www.google.com

Note if a ping does fail, you won't receive any information regarding the nature of the failure. This is where the pathping utility comes in.

- **Tracert / traceroute:** It refers to trace route. It is used to track the route and measure transit delays of packet . You can see each host that a packet travels through as it tries to reach its destination. You can see how many "hops" from the Slackware web site you are with this command

Example c:\>tracert www.dotnetnuke.com

Eg. traceroute -w 3 -q 1 -m 16 example.com

Only wait 3 seconds (instead of 5), only send out 1 query to each hop (instead of 3), limit the maximum number of hops to 16 before giving up (instead of 30) with the final host example.com

TTL=Time to Live

- **getmac**
DOS command used to show both local and remote MAC addresses. When run with no parameters (ie. getmac) it displays MAC addresses for the local system. When run with the /s parameter (eg. getmac /s \\foo) it displays MAC addresses for the remote computer
- **Netstat:** This command shows active TCP connections (both incoming and outgoing), ports on which the computer is listening, Ethernet statistic, the IP routing table, IPv4 statistics(for the IP, ICMP,TCP,UDP protocols).

Example c:\> netstat

c:\>netstat -an

c:\>netstat -s -p tcp udp

Netstat provides statistics for the following:

- Proto
The name of the protocol (TCP or UDP).
- Local Address
The IP address of the local computer and the port number being used. The name of the local computer that corresponds to the IP address and the name of the port is shown unless the -n parameter is specified. If the port is not yet established, the port number is shown as an asterisk (*).
- Foreign Address
The IP address and port number of the remote computer to which the socket is connected. The names that corresponds to the IP address and the port are shown unless the -n parameter is specified. If the port is not yet established, the port number is shown as an asterisk (*).
- (state)
Indicates the state of a TCP connection. The possible states are as follows:
CLOSE_WAIT
CLOSED
ESTABLISHED etc

- **Arp:** It resembles to *Address Resolution Protocol*. This protocol is used by network nodes to match IP address to MAC (Media Access Control). It displays, adds and remove ARP cache information from network devices.

Example c:\>arp -a

c:\> arp -a 192.168.10.130

- **Nslookup:** This command is used for querying the Domain Name System DNS to obtain domain name of IP address mapping or for any other specific DNS record.

Example c:\> nslookup

c:\> nslookup www.google.com

- **Nbtstat:** It displays NetBIOS *Network Basic Input/Output System* over TCP/IP protocol statistics, NetBIOS name tables for both local and remote computer.

Example c:\>nbtstat -a 192.168.1.130

c:\>nbtstat -c

c:\>nbtstat -n

Note Help Commands

/? : Displays help at the command prompt.

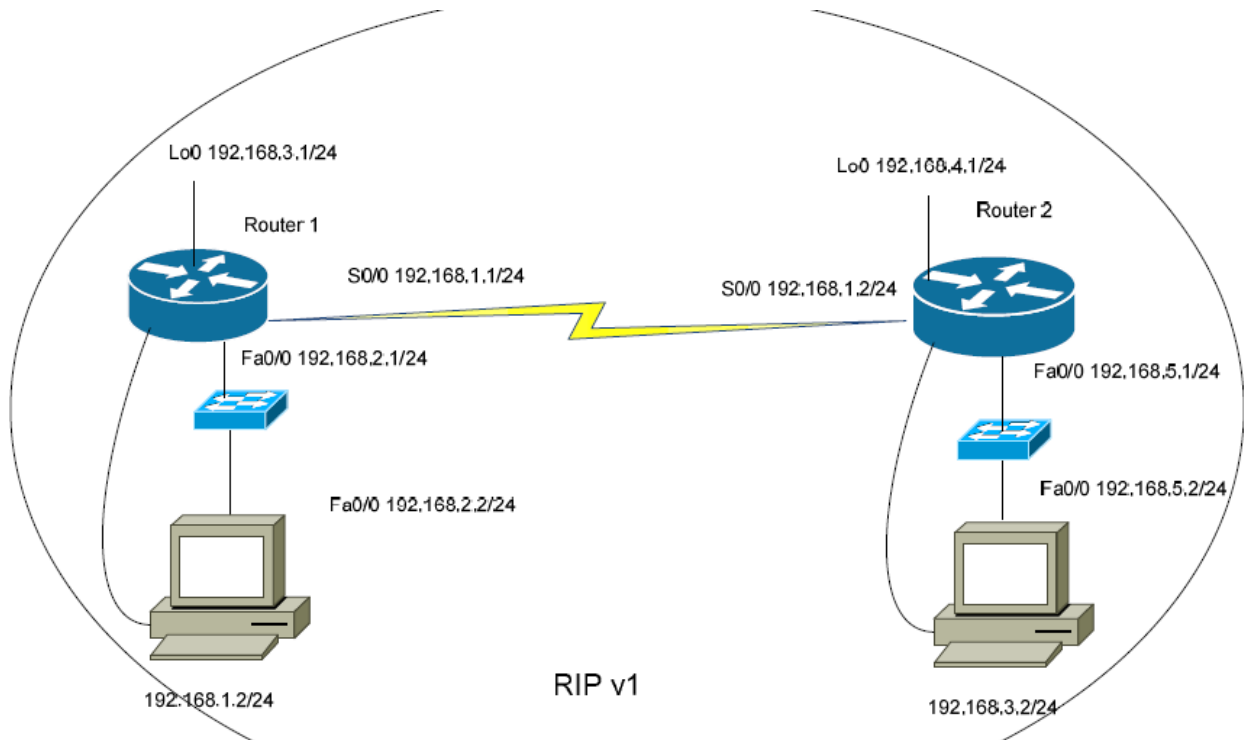
Cls : Clear Screen

Lab 3. LANs and WANs

Title: Setting Up our First Network

In this lab you will build a network which is slightly more complicated than that built by your tutor last week.

You will need to work in groups of 2 to build the network shown below:



Basic Router Configuration:

1. Get consoled into your router – ensure that no other cables are connected other than the console and power cables.
2. Set up your terminal program as per your Cisco notes (TeraTerm/HyperTerm etc.)
3. Press the “enter” key to go into user mode – you should be presented with one of the following:
 - Either you will get the “Someroatername>” prompt. Or
 - You will get a question: “do you wish to enter set up mode” your answer to this should be “NO” as you are going to be setting up your router configuration manually. (If your router offers to exit “autoinstall” then your answer should be “YES”). If this was the router's response then your configuration files are empty and you can skip to stage.
4. Go into privileged mode by typing “enable” and press the enter button – you should end up with the “Someroatername#” prompt.
5. We now need to ensure that there are no existing configuration settings. To erase an existing router configuration we need to carry out the following steps:
 - Type the command “erase startup-config” or “erase start” or “write erase” and press the enter key

- You will be asked if you really want to do this – answer YES
 - Once done, type “reload” and press enter.
 - You will be asked to confirm the reload – say YES
 - The router will then reboot with an empty configuration file.
 -
6. You are now ready to start the configuration of your router. First enter user mode by pressing enter – you should see the “Router>” prompt once again.
 7. Then enter privileged mode by typing the command “enable” and pressing the enter key. This mode is mainly used for diagnostic and monitoring purposes, we will return to this mode shortly to see what we have done. For the moment you should have the “Router#” prompt.
 8. We now need to enter global configuration mode. To do this type “configure terminal” and press enter. At this point it should be mentioned that most Cisco IOS commands can be abbreviated – the router will soon tell you if it does not understand what you have asked it to do. We can therefore shorten the last command to “conf t” and press the enter key. Once more the prompt will change. This time it will be “Router(config)#” to let you know you are in global configuration mode.
 9. Global configuration mode is used to issue configuration commands which affect the whole router – hence the term global. So, let give this router a proper name so it can be better recognised in amongst other routers. To do this type “hostname” followed by a space and then a name which can be a mix of alphanumeric characters, then press the enter key. Once done your router prompt should look like “YourRouterName(config)#” - if this is so, then your router is now correctly named.
 10. Next we can start configuring the router interfaces. You will notice that these routers have 1 serial interface, 1 fast ethernet interface and a loopback interface. Loopbacks are used in these exercises to simulate the existence of more networks than our routers actually have physically connected to them. This allows us to experiment with IP addressing schemes for much larger scale networks within the confines of the Cisco labs. We will find more uses for loopback interfaces later. Go back to the diagram above, and set up the interfaces as follows:
 - Each interface has an interface configuration mode. To get into this, type “interface loopback 0” for the loopback, “int s0/0” for the serial and “int fa0/0” for the fast ethernet and press the enter key.
Let’s start with the loopback interface. Type the appropriate command and you should then have yet another new prompt to let you know you are in the right mode - “routername(config-if)#”
 - Assuming this is router 1, let’s give this interface an IP address. To do this type “ip address 192.168.3.1 255.255.255.0” then press the enter key.
 - We then type “exit” to leave the interface configuration mode and go back to global configuration mode. Use of the exit command will always take you back to the previous mode.
 11. We now need to set up the serial WAN link between your router and your associate’s router.
 - First head into interface configuration mode by typing “interface serial 0/0.
 - Synchronous serial point to point lines need a clock signal to keep each other in step, only one end, the DCE end, needs to be set up as the clock – the other end, the DTE end does not. However, modern IOS’s will ignore a clockrate on the DTE end so it is often better to put on both ends. To set up the clock rate type “clockrate 64000” and then press enter.
 - Then give the serial interface its ip address – in the same way you did in stage 10.2. The IP address will be 192.168.1.1

- Then wake up the serial interface by typing “no shutdown”. All interfaces other than a loopback interface need to be woken up in such a way.
 - type “exit” and press enter which will take us back to global configuration mode and then “exit” again to take us back into privileged mode.
 - Now set up your fact Ethernet interface with an IP address of 192.168.2.1
12. Our interfaces have now been completely set up. We have a number of “show” commands which can be used to check the status of our router configuration. All these commands are executed at the privileged mode prompt. Here are a couple to try:
 - To show the status of the configuration in memory we can use “show running-config”
 - To show the status of your interfaces use “show ip interface brief”
 13. Now you need to set up the second router with the appropriate IP addresses.
 14. Now link the two routers together via their serial interfaces.
 15. Verify the configuration using the show commands above.
 16. You should now have a screen message saying that the serial interface has changed state to up. You can now attempt to use the “ping” command to test if you can reach the other router by typing “ping xxx.xxx.xxx.xxx” where the x's make up the IP address of the serial links at the at the other end.
 17. We can now set up a routing protocol on each router – we will use the most simple - RIP version 1. To start up RIP, you need to enter the global config mode and type “router RIP” and press return. You will see another new prompt “routername(config-router)#”
Next you need to enter the details of each network your router is connected to. For router 1 this will be networks 192.168.1.0, 192,168.2.0 and 192.168.3.0. Enter these one at a time using the command “network 192.168.1.0” and press return. Exit router and global config mode.
 18. Once you have carried out this on both routers, wait 60 seconds and type “show ip route” at the privileged prompt – you should see a list of 3 networks – those connected to your router preceded by a C (for directly connected) and those connected to your colleague preceded by a R (for RIP). The networks representing the fast Ethernet will not be shown because that network will not be active until we plug in the PCs.
 19. Connect a straight through cable to the appropriate port in the patch panel (for the fast Ethernet port of your PC. Connect the other end of this to a switch and then connect another straight through cable from another switch port to your routers fast Ethernet. NOTE you will need to use a separate switch for both of your PC networks – they must be the only two devices plugged into the switch.
 20. Configure your PC with the correct Ethernet address (be careful to only configure the RV208) LAN card. The default gateway for the PC is the IP address of the router interface it is connected to (for router 1 this would be: 192.168.2.1 with the PCs IP address being 192.168.2.2 and a subnet of 255.255.255.0.
 21. Go back to your router and type “sh ip route”. You should now see 5 networks and you should be able to ping from 1 PC to the other.

Abbreviating IOS Commands

The Cisco IOS allows us to shorten commands while configuring our routers and switches at the console session. Feel free to experiment with these – the Cisco IOS will soon let you know if it didn't understand you! Here are a few examples:
Interface Names:

“serial 0/0” can become “s0/0”

“fastethernet 0/0” can become “fa0/0”

“loopback 0” can become “lo0”

Commands:

“show ip interface brief” can become “sh ip int brief”

“show running-config” can become “sh run”

“erase startup-config” can become “erase start”

“configure terminal” can become “conf t” - and so on!

The config for router 1 should be:

```
en
conf t
hostname Router1
enable secret class
no ip domain-lookup
line console 0
password cisco
login
no exec-timeout
line vty 0 4
password cisco
login
int s0/0
ip address 192.168.1.1 255.255.255.0
clockrate 64000
no shut
int fa0/0
ip address 192.168.2.1 255.255.255.0
no shut
int lo0
ip address 192.168.3.1 255.255.255.0
router rip
network 192.168.1.0
network 192.168.2.0
network 192.168.3.0
```

The config for router 2 should be:

```
en
conf t
hostname Router2
enable secret class
no ip domain-lookup
line console 0
password cisco
login
no exec-timeout
line vty 0 4
```

```
password cisco
login
int s0/0
ip address 192.168.1.2 255.255.255.0
clockrate 64000
no shut
int fa0/0
ip address 192.168.5.1 255.255.255.0
no shut
int lo0
ip address 192.168.4.1 255.255.255.0
router rip
network 192.168.1.0
network 192.168.5.0
network 192.168.4.0
```