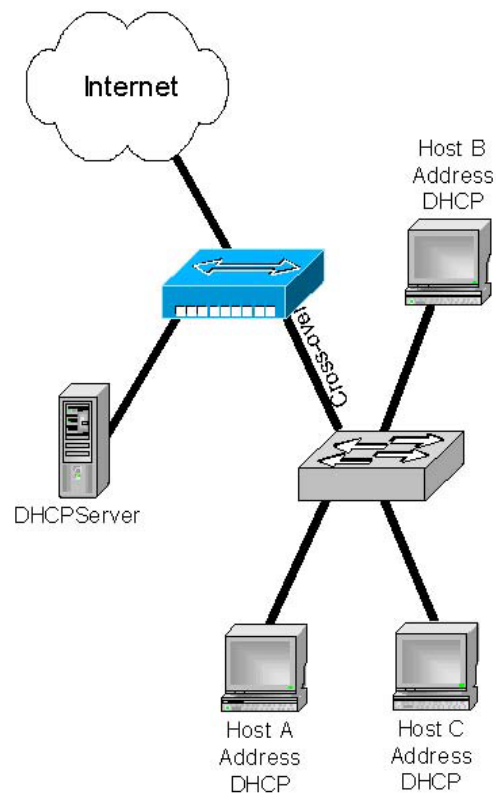


Computer Networks I

Laboratory Exercise 1

The lab is divided into two parts where the first part is a basic PC network TCP/IP configuration and connection to the Internet. The second part is building a simple peer-to-peer network, and be familiar with the different cable types. Ping, tracet and the ARP table will be investigated.

1.1 PC Configuration and Connecting to the Internet



Objective

In this laboratory exercise, you will build an Ethernet LAN and connect your LAN to the Internet. You will also configure your computer to obtain an IP address automatically using Dynamic Host Configuration Protocol (DHCP). Once the stations obtain IP addresses, they will be able to communicate with each other and the Internet. You will use the Windows's **ping** and **tracert** utilities to test connectivity, and the **arp** program to view the hosts ARP table.

The following steps are included in this exercise:

- Identify tools used to discover a computer network configuration
- Gather information of Layer 2 MAC address and Layer 3 TCP/IP network information
- Learn to use the TCP/IP Packet Internet Groper (ping) command
- Learn to use the Tracerouter (tracert) command
- Observe name resolution occurrences using DNS servers
- Introduce Dynamic Host Configuration Protocol (DHCP)
- Introduce Address Resolution Protocol (ARP)

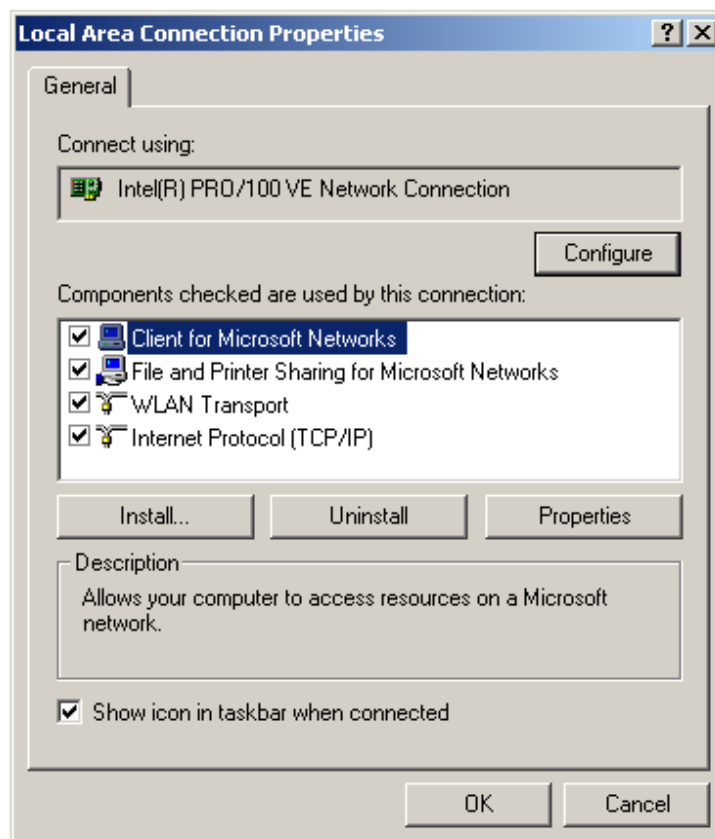
Step 1 Wire your pod

You will first need to wire your pod according to the map above and connect your Ethernet switch to the Internet hub. In D515, the Internet hub will be replaced by a switch. Locate your assigned pod and its corresponding three computers. If you have trouble, ask a lab aid for assistance.

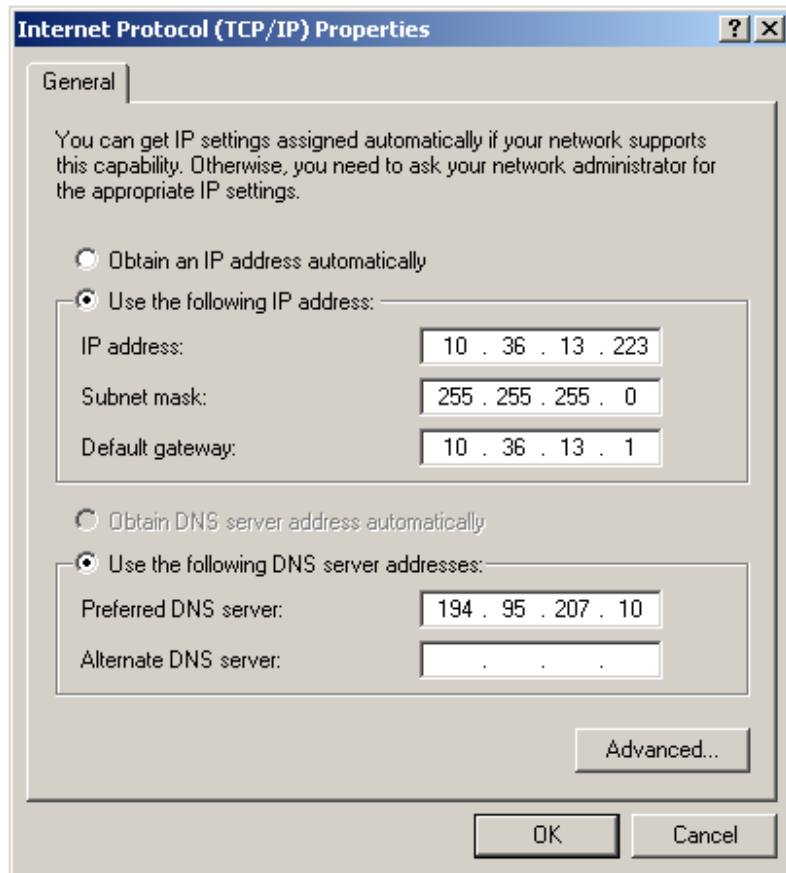
1. To connect the PCs to the switch, you will need three straight-through patch cables. To connect your Ethernet switch to the Internet hub/switch, you will need one cross-over cable.
2. Use the straight-through cables to connect the three PCs to the first three ports of the Ethernet switch, and use the cross-over cable to connect port 4 on the Ethernet switch to the Internet hub. A green light should appear above the first four switch ports. It means the ports is up and functioning. Make sure that the Internet hub/switch is connected to the Internet.

Step 2 Assign IP address dynamically

1. On the desktop right click on the **Network Neighborhood** or **My Network Places** icon and choose **Properties**.
2. Right click on **Local Area Connection** and choose **Properties**. That will bring up a window similar to the one shown below.



3. Select the appropriate TCP/IP entry and click on the **Properties** button, or double click directly on the TCP/IP entry.



4. To enable DHCP, select **Obtain an IP address automatically**, and click **OK**. This will make the host to get an IP address dynamically from a DHCP server, and the host will be able to access the Internet. When you returns to the Local Area Connection Properties window, click **OK** again.

Step 3 Check your TCP/IP configuration

At this point, you have built the physical layer of your Ethernet LAN, connected it to the Internet, and set your computer to obtain an IP address automatically.

1. To check your new IP address, use ipconfig. To access the command line click the **Start Menu**, select **Run**, and then type **cmd** in the run box. Click **OK**.
2. Once you have the command box, also called the MS-DOS prompt, you can run the ipconfig by typing **ipconfig** and press enter.

```
Microsoft(R) Windows 98
(C)Copyright Microsoft Corp 1981-1999.

C:\WINDOWS\Desktop>ipconfig

Windows 98 IP Configuration

0 Ethernet adapter :

    IP Address. . . . . : 0.0.0.0
    Subnet Mask . . . . . : 0.0.0.0
    Default Gateway . . . . . :

1 Ethernet adapter :

    IP Address. . . . . : 172.24.0.58
    Subnet Mask . . . . . : 255.255.0.0
    Default Gateway . . . . . : 172.24.0.1

C:\WINDOWS\Desktop>_
```

What is your hosts IP address according to the output?

What is the default gateway?

3. You can also use the **/all** option with the ipconfig command, so you can get expanded information on your systems IP configuration. In the MS-DOS prompt type **ipconfig /all** .

What is the DHCP servers IP address?

What is your hosts MAC address (physical address)?

What is the DNS servers IP address?

Step 4 Test the connectivity

You can test your automatic configuration by using the ping program. Ping is used to send a very small “test” packet to a TCP/IP device to determine if a working connection between hosts exists. Ping uses a protocol called Internet Control Message Protocol (ICMP). Ping works by sending an ICMP echo request to a destination IP address. Under normal circumstances, a host that receives the echo request will send back an “echo reply” immediately.

1. From each hosts MS-DOS prompt type: **ping 194.47.13.65** , where the IP address after the ping command is the IP address to the default gateway. This will test the connectivity between the PC and the default gateway.
2. From Host A, ping Host B's IP address and Host C's IP address. Also try pinging from Host B and Host C to Host A.
3. As a final test, try pinging a website on the Internet. Type **ping www.cisco.com** . This will test the connectivity between the PC and a website on the Internet.

Step 5 Ping the Loopback IP address

1. Type **ping 127.0.0.1** in the MS-DOS prompt. Was the ping successful? _____

The 127.0.0.0 network is reserved for loopback testing. If the ping is successful, then TCP/IP is properly installed and functioning on the computer.

Step 6 Display the ARP table

ARP is used as a tool for confirming that a computer is successfully resolving network Layer 3 addresses to Media Access Control (MAC) Layer 2 addresses. The TCP/IP network protocol relies on IP addresses like 192.168.14.211 to identify individual devices and to assist in navigating data packets between networks. While the IP address is essential to move data from one LAN to another, it cannot deliver the data in the destination LAN by itself. Local network protocols, like Ethernet or Token Ring, use the MAC, or Layer 2, address to identify local devices and deliver all data.

ARP maintains a table in the computer of IP and MAC address combinations. In other words, it keeps track of which MAC address is associated with an IP address. If ARP does not know the MAC address of a local device, it issues a broadcast using the IP address. This broadcast searches for the MAC address that corresponds to the IP address. If the IP address is active on the LAN, it will send a reply from which ARP will extract the MAC address. ARP will then add the address combination to the local ARP table of the requesting computer. MAC addresses and therefore ARP are only used within the LAN.

1. In the MS-DOS prompt type **arp -a** and press **Enter**. Are there any entries in the ARP table? _____

Do not be surprised if there are no entries. Any addresses that are unused will be removed after a couple of minutes.

2. Try pinging a couple of local addresses and a website. Then re-run the arp command. Which addresses are listed?

Why is the default gateway listed?

3. Try the command **arp -?** to see the help feature and look over the options. If you want to see the help feature options for ping and tracert, type **ping -?** or **tracert -?** .

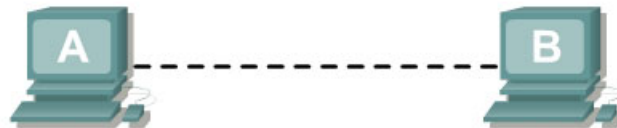
Step 7 Troubleshoot the path of a packet

The ping program is incredibly useful for testing IP connectivity between hosts. In some cases, you may need to troubleshoot the path IP packets take to reach a particular destination. IP packets travel through routers to reach other networks. If a certain destination

network is far away, IP packets may have to be routed through dozens of routers to reach their destination. Each time an IP packet passes through a router is called a “hop.”

1. You can use a trace utility to identify the addresses of the routers along the path IP packets take to a destination. Trace programs are typically called traceroute, but in Windows the trace program is called tracert. In the MS-DOS prompt type **tracert** www.cisco.com
2. The tracert output will take a couple of minutes to generate. What is happening while you wait? Where do the IP addresses that appear in the output comes from?

1.2 Peer-to-Peer Network



Straight-through cable	—————
Serial cable	————— ⚡
Rollover (console)
Crossover cable	- - - - -

Objective

In this lab, you will build a simple Peer-to-Peer network between two PCs. You will also configure an address so that each station can communicate using TCP/IP. Finally, you will use a TCP/IP program called *ping* to test your network.

Step 1 Wire your pod

You will first need to wire your hosts according to the map above.

1. Locate your assigned pod and its corresponding computers. Turn the PCs on. If you have trouble, ask a lab aid for assistance
2. In order to connect the PCs to each other, you will need one crossover patch cable. Connect the crossover patch cable from Host A to Host B. .

Step 2 Assign an IP address manually

Now that you have built the physical layer of your Ethernet LAN, you will configure TCP/IP on each computer. Each PC will need an IP address in order to communicate using TCP/IP.

1. Examine your computers IP (Layer 3) and MAC (Layer 2) addresses. Use the command `ipconfig /all` in the MS-DOS prompt.

2. This time you need to configure your computer with an IP address manually. In the previous laboration, the IP address was assigned dynamically from a DHCP server. Configure your host with the appropriate IP address and subnet mask.

Computer	IP address	Subnetmask	
Host A	192.168.1.2	255.255.255.0	
Host B	192.168.1.3	255.255.255.0	

Step 3 Test the connectivity

To test your newly configured network, you will use the ping utility.

1. From Host A, ping the other station in your network, Host B.
2. From Host B, ping Host A.

Which cable do you use to connect a PC to a PC? _____

Which cable do you use to connect a switch to a switch? _____

Which cable do you use to connect a PC to a switch? _____

When you are finished, please replace the cables, change the TCP/IP settings to DHCP and shut down your PCs.