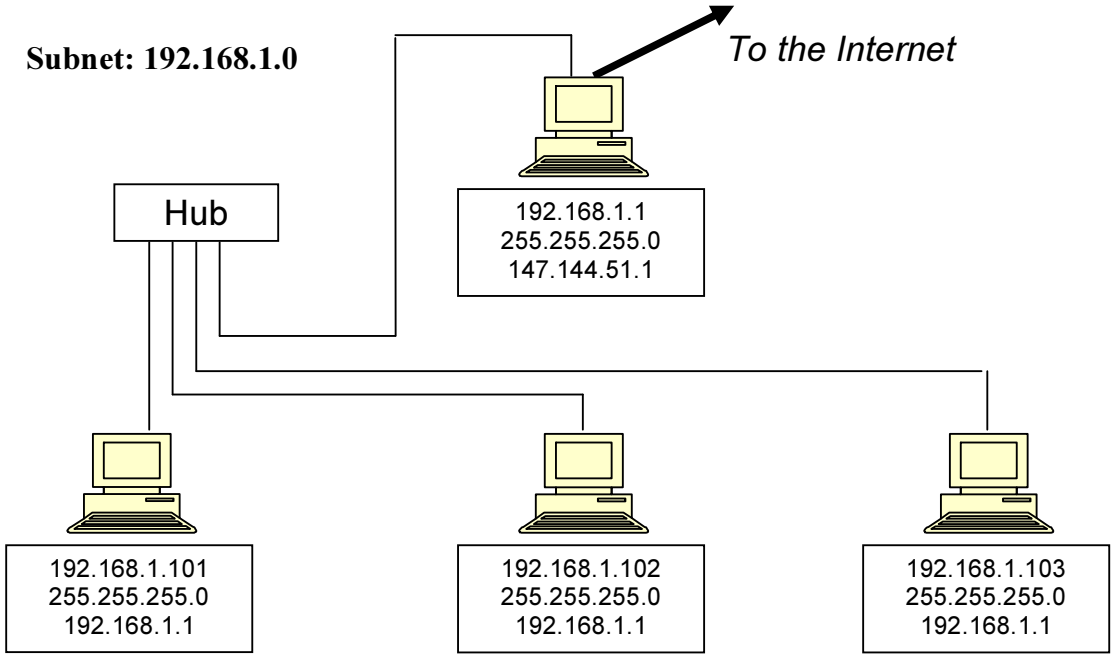
Part I: TCP/IP Configuration

1. Objectives

- Use of **IP address, Subnet mask, Default gateway, MAC address**.
- Identify tools used to discover a **computer network configuration** in Windows.
- Gather information including **connection**, **host name**, **MAC address** and **IP address** information.
- **Compare** network information to other PCs on the network.
- Learn to use the **TCP/IP Packet Internet Groper (ping) command** from a workstation/PC.

2. Background: IP address, Subnet mask, Default gateway, MAC address

Consider the following diagram:



a. **Subnet Masks:** Start at the Gateway Machine (the machine at the top in these diagrams). Find the subnet mask. Make sure every machine has the same subnet mask. In the example below, the subnet mask is 255.255.255.0

b. **Label the Subnet:** Find the network portion of the IP address of the Gateway Machine. Fill in the host portion with 0s. Write that label above the network (in the upper left, in these diagrams). In the example below, the Gateway Machine has an IP address of 192.168.1.101 and since the subnet mask is 255.255.255.0, the network portion includes only the first 3 bytes. To find the subnet label, replace the last byte with zero: 192.168.1.0.

c. **Check the IP Addresses**

Network Portion: Make sure that each NIC on a subnet has the same network address as the label you wrote at the top of the subnet. In the example below, on the left subnet, that means every IP address must start with 192.168.1

Host Portion: Make sure that each NIC on a subnet has a different host address, including the default gateway. In the example below, the Gateway Machine has a host address of 1, and the others are 101, 102, and 103, so there are no duplicates.

d. **Default Gateway:** On each subnet, the default gateway is the Gateway Machine's IP address. It is the same for each NIC on the subnet, except the Gateway Machine itself, which has a default gateway of the network above it, usually an ISP. In the example below, the Gateway Machine has an IP address of 192.168.1.1, so the default gateway must be 192.168.1.1 for all three workstations at the bottom of the chart.

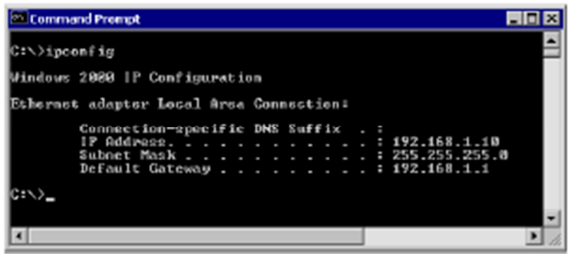
3a. Instructions: Experiment 1

Step 1: Connect into the Network

Establish and verify connectivity to the Network. This ensures the computer has an IP address.

Step 2: Gather TCP/IP configuration information

Use the **Start menu** to open the **Command Prompt**, an MS-DOS-like window. Press **Start** > **Programs** > **Accessories** > **Command Prompt** or **Start** > **Programs** > **Command Prompt**. The following figure shows the Command screen. Type **ipconfig** and press the **Enter** key. The **ipconfig** is used for gathering the IP Configuration information.



Notes:
This first screen shows the **IP address**, **subnet mask**, and **default gateway**. The **IP address** and the **default gateway** should be in the **same network** or **subnet**, otherwise this host would not be able to communicate outside the network. In the figure the **subnet mask** tells us that the **first three octets** must be the same to be in the same network.

Step 3: Record the following TCP/IP information for this computer

IP address: _____
Subnet Mask: _____
Default Gateway: _____

Step 4: Compare the TCP/IP configuration of this computer to another computer on the LAN

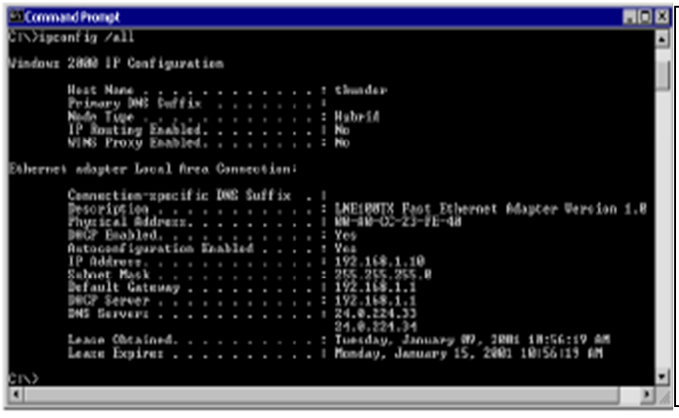
Select another **computer B**. Perform **step 3** for the computer B. **Fill up** the following table.

	Your Computer	Computer B	Are there any similarities? (yes/no)
IP Address:			
Subnet Mask:			
Default Gateway			

The IP addresses should share the **same network portion**. All PCs in the LAN should share the **same default gateway**.

Step 5: Check additional TCP/IP configuration information

To see detailed information, type **ipconfig /all** and press **Enter**. The figure shows the detailed IP config. screen.



Write down the IP addresses of any **servers** listed: _____

Write down the computer **HostName**:_____
Write down the **HostName of another computer**:

_____

Do all of the servers and workstations **share the same network portion** of the IP address as your pc? _____. If some or all of the servers and workstations is in another network, it means that the computer **default gateway** is going to **forward** requests to the other network.

The **host name**, including the computer name should be displayed. Notice the **Physical Address (MAC)** and the **NIC (Network Interface Card) model (Description)**. In the LAN, **what similarities** about the **Physical (MAC) Addresses** are seen?

_____

While not a requirement, most LAN administrators try to standardize components like NICs. Therefore, you may find all machines share the **first three Hex pairs** in the adapter address. These three pairs identify the **manufacturer of the adapter**.

Step 6: Close the screen

Close the screen when finished examining network settings. Repeat the previous steps as necessary. Make sure that it is possible to return to and interpret this screen.

3b. Instructions: Experiment 2

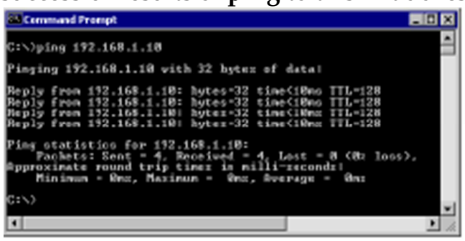
You need the **IP addresses** that were recorded in **experiment 1**.

Step 1: Access the command prompt

Use the Start menu to open the Command Prompt window. Press **Start** > **Programs** > **Accessories** > **Command Prompt** or **Start** > **Programs** > **Command Prompt** or **Start** > **All Programs** > **Command Prompt**.

Step 2: ping the IP address of another computer

In the window, type **ping**, a space, and the **IP address of your computer B**. The following figure shows the successful results of **ping** to this IP address.



Ping uses the **ICMP echo request** and **echo reply** feature to **test physical connectivity**. Since **ping** reports on **four attempts**, it gives an indication of the reliability of the connection. Look over the results and verify that the **ping** was successful. Is the **ping** successful? **(yes/no)** _____.
Now, **ping** the IP address of **Computer B**. Note the results:
Packets: sent = __, **Received =** __, **Lost =** _____

Step 3: ping the IP address of the default gateway

Try to **ping** the **IP address of the default gateway** listed in the last exercise. If the **ping** is successful, it means there is physical connectivity to the router on the local network and probably the rest of the world.

Step 4: ping the Loopback IP address of this computer

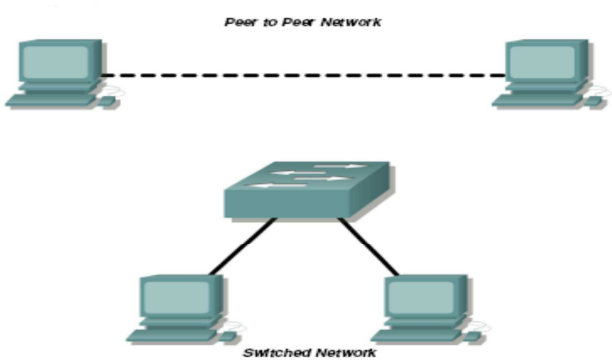
Type the following command**: ping 127.0.0.1** The 127.0.0.0 network is reserved for loopback testing. If the **ping** is successful, then TCP/IP is properly installed and functioning on this computer.
Was the **ping** successful? (yes/no) _____

Step 5: ping the hostname of another computer

Try to **ping** the **hostname** of the **computer B**. If the **ping** was successful, it means that connectivity and discovery of IP addresses can be done with only a hostname. If the **ping** fails, then chances are there is no **name to IP addresses resolution** running. Was the **ping** successful? (yes/no) _____

Demonstrate your work to the instructors before leaving. Signature of the Instructor

Part II: Building A Simple Network (Peer-to-Peer & Switched)



1. Objectives

- **Crossover** and **straight-through** cables
- Create a simple **peer-to-peer network** between **two PCs**.
- Configure workstation **IP address** information.
- **Test connectivity** using the **ping** command.
- Create a simple network using **Switch** between **2/3 PCs**.

2. Crossover and Straight-through Cables

Common Ethernet network cables are straight and crossover cable. This Ethernet network cable is made of **4 pair high performance cable** that consists of **twisted pair conductors** that used for data transmission. Both end of cable is called **RJ45 connector**. Straight and crossover cable can be Cat3, Cat 5, Cat 5e or Cat 6 UTP cable, the only difference is each type will have different wire arrangement in the cable for serving different purposes.

Category 1 (Layer 2 or below)	Category 2 (Layer 3 or above)
Hub Switch	PC/Laptop/Server Router

You usually use **straight cable** to connect **different type of devices (different category)**. This type of cable will be used most of the time and can be used to:

- ✓ Connect a computer to a switch/hub's normal port.
- ✓ Connect a computer to a cable/DSL modem's LAN port.
- ✓ Connect a router's WAN port to a cable/DSL modem's LAN port.
- ✓ Connect a router's LAN port to a switch/hub's uplink port. (normally used for expanding network)

Sometimes you will use **crossover cable**, it's usually used to **connect same type of devices (same category)**. A crossover cable can be used to:

- ✓ Connect 2 computers directly.
- ✓ Connect a router's LAN port to a switch/hub's normal port. (normally used for expanding network)
- ✓ Connect 2 switches/hubs by using normal port in both switches/hubs.

3. Instructions

Task 1: Connect two workstations in the lab.

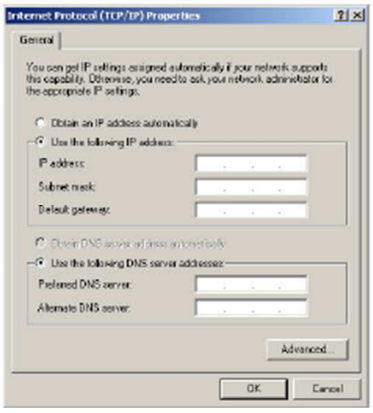
This lab focuses on the ability to connect two PCs to create a **simple peer-to-peer Ethernet LAN** between two workstations. In addition to the **Layer 1 physical** and **Layer 2 data link** connections, the computers must also be configured with the **correct IP network settings**, which is **Layer 3**, so that they can communicate. Choose **two workstations/PCs** with **Ethernet NIC** installed.

Step 1: Verify the physical connection

Turn on the computers. To verify the computer connections, insure that the link lights on both NICs are lit. **Are both link lights lit**? _____

Step 2: Access the IP settings window

Note: Be sure to write down the **existing IP settings**, so that they can be restored at the end of the lab. These include **IP address, subnet mask, default gateway, and DNS servers**. If the workstation is a DHCP client, it is not necessary to record this information.



Step 3: Configure TCP/IP settings for the two PCs

a. Set the **IP address information** for each PC according to the information in the table.

b. Note that the **default gateway IP address is not required**, since these computers are directly connected. The default gateway is only required on local area networks that are connected to a router.

Computer	IP Address	Subnet Mask	Default Gateway
PC-A	192.168.50.11	255.255.255.0	Not Required **(why?)**
PC-B	192.168.50.12	255.255.255.0	Not Required

Step 4: Verify that the PCs can communicate

a. Test connectivity from one PC to the other by pinging the IP address of the opposite computer. Use the following command at the command prompt.

C:>ping 192.168.50.11 (or 192.168.50.12)

b. Look for results. Check the PC connections and **TCP/IP settings** for both PCs. What was the **ping result**?

_____

_____

Step 5: Confirm the TCP/IP network settings

Type the **ipconfig** command from the Command Prompt. Record the results:

_____

Task 2: Connect Your Workstations to the Classroom Lab Switch/Hub.

Step 1: Connect two workstations to switch/Hub.

Using the correct cable, connect one end of the cable to the NIC ports on the workstations and the other ends to a port on the switch. **Which cable** did you use? _____

Step 2: Verify connectivity.

Verify network connectivity by using the **ping** command to reach the other workstations attached to the switch. What is the output of the **ping** command?

_____

_____

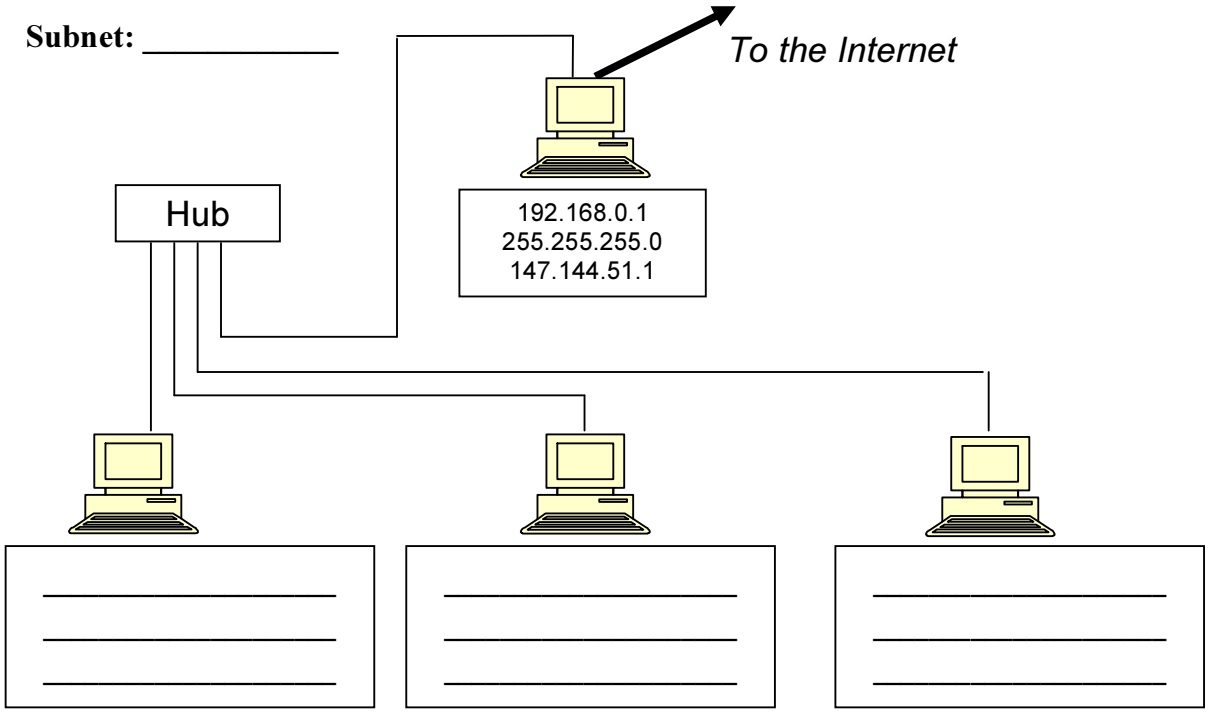
Step 3: Share a document between PCs.

1. On your desktop, create a new folder and name it **myDir**.
2. Right-click the folder and share the folder.
3. Place a file (**myFile.txt**) in the folder.
4. Access the shared file from any other computer.
5. You will be able to access this folder across the network. Once you are able to see it and work with the file, you have access through **all 7 layers of the OSI model**.

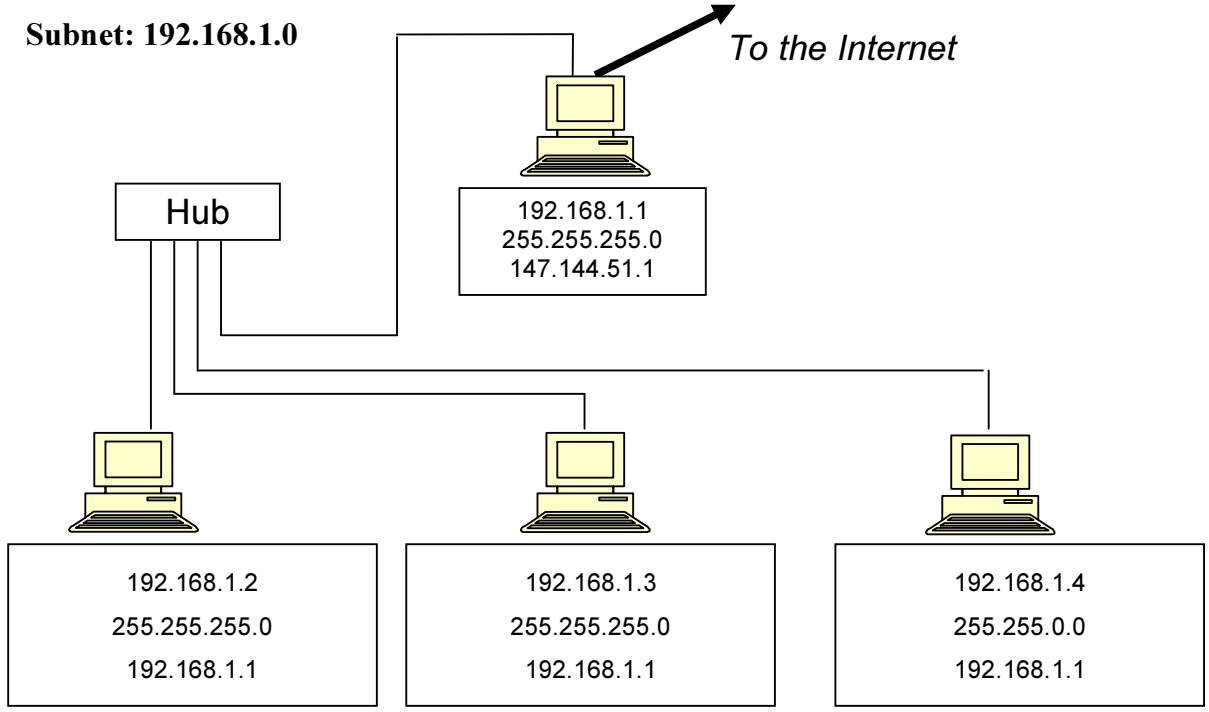
Demonstrate your work to the instructors before leaving. Signature of the Instructor

Solve and Submit

Exercise 1: Fill in the **missing numbers** so this network will **operate correctly**.



Exercise 2: Find the **problem in the following network** and change **one value** so this network will **operate correctly**.



Exercise 3: Based on observations, what can be deduced about the following results taken from three computers connected to one switch?

Computer 1	**Computer 2**	**Computer 3**	
IP Address: 192.168.50.141 Subnet Mask: 255.255.255.0 Default Gateway: 192.168.50.1	IP Address: 192.168.50.205 Subnet Mask: 255.255.255.0 Default Gateway: 192.168.50.1	IP Address: 192.168.150.97 Subnet Mask: 255.255.255.0 Default Gateway: 192.168.50.1	Should they be able to **talk to each other**? Are they all on the **same network**? Why? What is the **problem**?

Computer 1 & 2:	
Computer 2 & 3:	
Computer 3 & 1:	