KONARK INSTITUTE OF SCIENCE AND TECHNOLOGY

TECHNO – PARK, JATNI, BHUBANESWAR – 752050

Department of: **Computer Science & Engineering.**

Semester: **6th**

Experiment No. : …… Date: ……..

Aim of Experiment:-

- To study about LAN (Local Area Network)

Theory:

Network Topology: - Computers in a **network** have to be connected in some logical manner. The layout pattern of interconnections between computers in a network is called **Network Topology.** There are different types of network topologies such as Point to Point, Bus, Star, Ring, Mesh, Tree, and Hybrid.

Types of Topologies...

1. Bus Topology

Bus Topology is a network type in which every computer and network device are connected through a single cable. If the bus topology has two endpoints, then it is called **Linear Bus Topology.**

Features of Bus Topology

- It transmits data only in one direction.
- Every device is connected to a single cable.

**Advantages of Bus Topology

- It is cost-effective.
- The number of cables required is less as compared to other topology.
- Used in small networks.
- It is easy to understand.
- Easy to expand by joining to cable together.

** Disadvantages of Bus Topology

- Cable fails then the whole network fails.
- If network traffic is heavy or nodes are more then the performance of network decreases.
- Cables have a limited length.
- It is slower than the ring topology.

2. Ring Topology

It is called 'ring topology' because it forms a ring as each computer is connected to another computer, the last one connected to the first.

**Advantages of Ring Topology

- Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.
- Cheap to install and expand.

** Disadvantages of Ring Topology

- Troubleshooting is difficult in a ring topology.
- Adding or deleting the computer disturbs the network activity.
- Failure of one computer disturbs the whole network.

3. Star Topology

In this type of topology, all the computers are connected to a single hub through a cable. This hub is the central node and all other nodes are connected to the central node.

**Advantages of Ring Topology

- Fast performance with few nodes and low network traffic.
- Hub can be upgraded easily.
- Easy to troubleshoot.
- Easy to set up and modify.
- Only that node is affected which has failed, the rest of the nodes can work smoothly.

** Disadvantages of Ring Topology

- The cost of installation is high.
- Expensive to use.
- If the hub fails then the whole network is stopped because all the nodes depend on the hub.
- Performance is based on the hub (means it depends on its capacity).

4. Mesh Topology

It is the point to point connection to other nodes or devices. All the network nodes are connected to each and every node. Mesh has **n(n-1)/2** physical channels to link n devices.

There are two techniques to transmit the data over the Mesh topology, they are….

- Routing.
- Flooding.

****Advantages of Mesh Topology**

- Each connection can carry its own data load.
- It is robust.
- The fault is diagnosed easily.
- It provides security and privacy.

**** Disadvantages of Ring Topology**

- Installation and configuration are difficult.
- Cabling cost is more.
- Bulk wiring is required.

5. Tree Topology

It has a root node and all other nodes are connected to it and forming a hierarchy. It is also called hierarchical topology. It should have at least three levels of hierarchy.

****Advantages of Tree Topology**

- Extension of bus and star topology.
- Extension of nodes is possible and easy.
- Easy to manage and maintain.
- Error detection is easily done.

****Disadvantages of Tree Topology**

- Heavily cabled.
- Costly.
- If more nodes are added maintenance is difficult.
- Central hub fails, the network fails.

3. Hybrid Topology

It is a mixture of two or more topologies. For example In an office, If one department is using ring topology and another department is using star topology, then connecting these two topologies will result in hybrid topology (ring topology and star topology).

****Advantages of Hybrid Topology**

- Reliable as error detecting and troubleshooting is easy.
- Effective.
- Scalable as size can be increased easily.
- Flexible.

****Disadvantages of Mesh Topology**

- Complex in design.
- Costly.

Conclusion:-

In this experiment, we have studied about local area network (LAN).

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Experiment No. : …… Date: ……..

Aim of Experiment:-

- Configure IP Address LAN (Local Area Network)

Theory:

Configure the Hostname

To configure the hostname of the CISCO RV180/RV180W:

In the **Host Name** field, enter the Host Name of the CISCO RV180/RV180W. You can use only alphanumeric character and the hyphen.

The default hostname (for example, "rout6DE44E") consists of the word "router" followed by the last 3 bytes of the router's LAN MAC address (in hexadecimal form). This format allows the **FindIT** application to use Bonjour to identify the CISCO Small Business device on the LAN. Click **Save.**

Configure the IP Address

You might want to change the default IP address (for example if the default IP address is already assigned to another equipment in your network).

Steps to configure the IP address of CISCO RV180/RV180W:

1. Chose **Networking > LAN (Local Network) >IPV4 LAN (Local Network).**
2. Enter the information.

IP Address	Enter the LAN IP address of RV180/RV180W. Make sure the address is not in use by any other device on the same network. The default IP address is 192.168.1.1
Subnet Mask	Choose the subnet mask of the new IP address from the drop-down menu. The default subnet is 255.255.255.0

Click **Save.**

After changing the CISCO RV180/RV180W LAN IP address, your pc is no longer connected to the CISCO RV180/RV180W.

To reconnect your PC to the CISCO PC180/RV180W:

- ✓ If DHCP is configured on the CISCO RV180/RV180W, release and renew your PC's IP address.
- ✓ If HDCP is not configured on the CISCO RV180/RV180W, manually assign an IP address to your pc. The address must be on the same subnet on the same subnet as the CISCO RV180/RV180W, For example, if you change the CISCO RV180/RV180W's IP address to 10.0.0.1, assign your pc an IP address in the range of 10.0.0.2 to 10.0.0.254.

Open a new browser window and enter the new IP address of the CISCO RV180/RV180W to reconnect.

Configuring DHCP

By default, the CISCO RV180/RV180W functions as a DHCP server to the hosts on the Wireless LAN (WLAN) or LAN network and assigns IP and DNS servers addresses.

With DHCP enabled, the router's IP address serves as the gateway address to your LAN. The PC's in the LAN assigned an IP address from a pool of addresses. Each address is tested before it is assigned to avoid duplicate addresses on the LAN.

For most applications, the default DHCP settings are satisfactory. If you want another PC on your network to be DHCP server, or if you are manually configuring the network settings of all of your PC's disable DHCP.

To configure the DHCP settings of the COSCO RV180/RV180W:

1. Chose **Networking > LAN (Local Network) > IPv4 (Local Network).**
2. From the **DHCP** mode chose one of these options.

None. Chose this option if the CISCO RV180/RV180W is not going to act as a DHCP server.

DHCP Server. Chose this option to configure the CISCO RV180/RV180W to be a DHCP server and enter the information.

Domain Name. (Optional) Enter the domain name of your network.

Starting IP address/Ending IP address. Enter the first and the last of the contiguous address in the IP address pool. Any new DHCP client joining the LAN is assigned an IP address in this range. You can save part of the range for PCs with fixed addresses. These addresses should be in the same IP address subnet as the CISCO RV180/RV180W LAN IP address.

Primary DNS Server / Secondary DNS Server. DNS Servers map internet domain names (for example www.google.com) to IP address. Enter the server IP address in these fields if you want to use a different DNS server than specified in your WAN settings.

Lease time. Enter the duration (in hours) for which the IP address is released to clients.

DHCP Relay. Chose this option to configure the CISCO RV180/RV180W to be a DHCP relay agent and centre the address of the remote DHCP server in the **Remote DHCP Server** field. The relay agent transmits DHCP messages between multiple subnets.

Click **Save.**

3. Click **Save.**

Conclusion:-

In this experiment, we have studied how to configure **IP Address LAN (Local Network) Settings.**

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Experiment No. : …… Date: ……..

Aim of Experiment:-

- Build Class A, B and C Network using router in Network tool.

Theory:

IP Address Classes (Classful Addressing)

Class	Leading bits	Size of *network*	Size of *rest* bit	Number of networks	Addresses per network	Total addresses in class	Start address	End address
A	0	8	24	128 (2^7)	16,777,216 (2^{24})	2,147,483,648 (2^{31})	*0.0.0.0*	*127.255.255.255*
B	10	16	16	16,384 (2^{14})	65,536 (2^{16})	1,073,741,824 (2^{30})	*128.0.0.0*	*191.255.255.255*
C	110	24	8	2,097,152 (2^{21})	256 (2^8)	536,870,912 (2^{29})	*192.0.0.0*	*223.255.255.255*

The IPv4 address space is divided into 5 classes, that is A, B, C, D, and E. Here we will discuss three of them.

Class A.

In a Class A network, the first 8 bits, or the first dotted decimal, is a network part of the address, while the remaining 24 bits of the address represents the host part of the address.

The highest order bit is always set to 0. The remaining 7 bits in are used to determine the host in a network. There are 128 possible network ID in in class A network.

0.0.0.0 to 127.0.0.0

However any address beginning with 127…… is considered as a loopback address.

Example: 2.134.23.2

Class B.

In class B network, the first 16 bits are the network part of the address. All class B networks have their first bit set to 1 and the second bit is set to 0 in doted decimal notation, that makes **128.0.0.0 to 191.255.0.0** as a Class B network.

Example: 192.168.178.1

Class C.

In class c network, the first two bits are set to 1, and the third bit is set to 0. That makes the first 24 bits of the address as the network address and remaining as the host address. Class C network ranges from **192.0.0.0 to 223.255.255.0.** There are 2 million possible class c networks.

Example: 192.168.178.1

Class A	
0.0.0.0	= 0000000.00000000.00000000.00000000
127.255.255.255	= 01111111.11111111.11111111.11111111
	0nnnnnnn.HHHHHHHH.HHHHHHHH.HHHHHHHH
Class B	
128.0.0.0	= 1000000.00000000.00000000.00000000
191.255.255.255	= 10111111.11111111.11111111.11111111
	10nnnnnn.nnnnnnnn.HHHHHHHH.HHHHHHHH
Class C	
192.0.0.0	= 11000000.00000000.00000000.00000000
223.255.255.255	= 11011111.11111111.11111111.11111111
	110nnnnn.nnnnnnnn.nnnnnnnn.HHHHHHHH

Conclusion:-

In this experiment, we have studied about IP classes.

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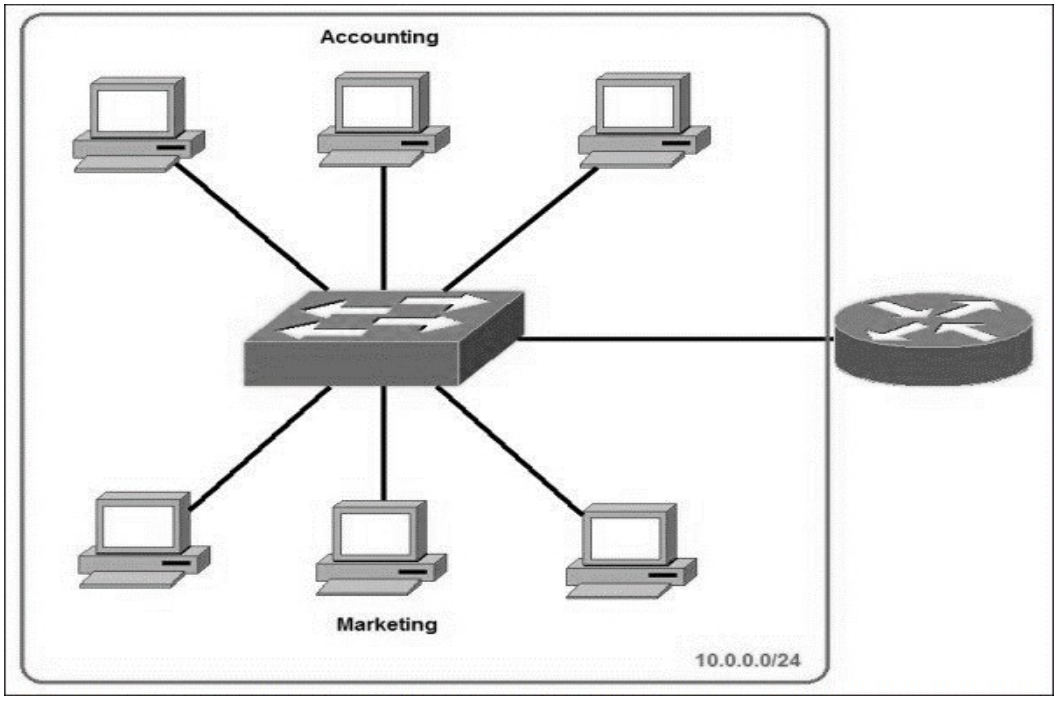
Experiment No. : …… Date: ……..

Aim of Experiment:-

- Study about Sub-netting.

Theory:

Sub-netting is the practice of dividing a network into two or more small networks. It increases routing efficiency, enhance the security of the network and reduces the size of the broadcast domain.

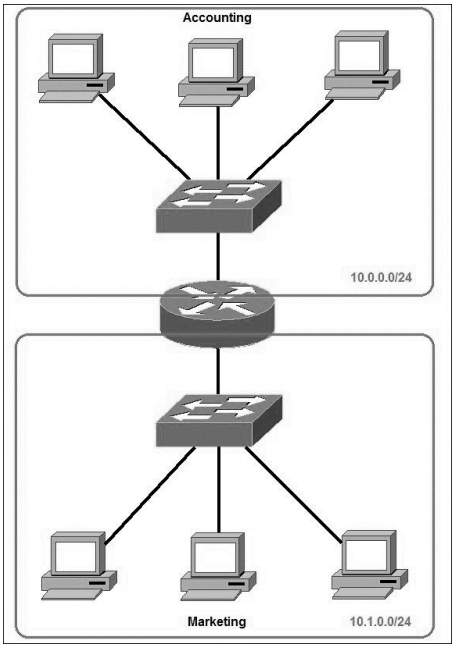


In the picture above we have one huge network: 10.0.0.0/24. All hosts on the network are in the same subnet, which has following disadvantages:

- ✓ **A single Broadcast domain –** All hosts are in the same broadcast domain. A broadcast sent by any device on the network will be processed by all hosts.

- ✓ **Network Security –** Each can reach any other device on the sub-net, which can present security problem. For example, a server containing sensitive information would be in the same network as an ordinary end user workstation.
- ✓ **Organizational Problems –** In a large network, different departments are usually grouped into different sub-nets. For example, you can group all devices from the **Accounting** department in the same sub-net and then gives access to sensitive financial data only to hosts from that sub-net.

The network above could be sub-netted like this:



Now, two subnets were created for different departments: **10.0.0.0/24** for Accounting and **10.1.0.0/24** for Marketing. Devices in each subnet are now in a different broadcast domain. This will reduce the amount of traffic flowing on the network and allow us to implement packet filtering on the router.

Conclusion:-

In this experiment, we have studied about sub-netting. How sub-netting technique works.

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Experiment No. : …… Date: ……..

Aim of Experiment:-

- Installation and Configuration of NS2 in Linux.

Theory:

1. Introduction.

Network simulators are tools used to simulate discrete events in a network and which helps to predict the behaviours of a computer network. Generally the simulated networks have entities like links, switches, hubs, applications, etc. Once the simulation model is complete, it is executed to analyse the performance. Administrators can then customize the simulator to suit their needs. Network simulators typically come with support for the most popular protocols and networks in use today, such as **WLAN, UDP, TCP, IP, WAN**, etc. Most simulators that are available today are based on a GUI application like the **NCTUNS** while some others including **NS2** are **CLI** based. Simulating the network involves configuring the state elements like links, switches, hubs, terminals, etc. and also the events like packet drop rate, delivery status and so on. The most important output of the simulations are the trace files. Trace files log every packet, every event that occurred in the simulation and are used for analysis. Network simulators can also provide other tools to facilitate visual analysis of trends and potential trouble spots. Most of the simulation is performed in discrete time intervals where events that are in the queue are processed one after the other in an order.
Since simulation is a complex task, we cannot guarantee that all the simulators can provide exact or accurate results for all the different type of information.
Examples of network simulators are: **NS, NCTUNS, NetSim,** etc.
ns2 is a name for series of discrete event network simulators like ns-1, ns-2 and ns-3. All of them are discrete-event network simulators, primarily used in research and teaching. ns2 is free software, publicly available under the GNU GPLv2 license for research, development, and use.

Now we will focus on the installation of "ns2" also called the "network simulator 2" in Ubuntu.

Note: - NS2 is no longer developed and maintained by the developer it is very outdated. Now NS3 is the latest version of Network simulator and it is actively being developed and maintained, and it is available on its official site https://www.nsnam.org .

2. Downloading NS2.

For installing NS2 first we have to download the setup or package of NS2. Here is a website to download NS2. http://sourceforge.net/projects/nsnam/files/latest/download . After downloading you will get a file called **"ns-allinone-2.35.tar.gz"** Copy or Move the file to your desired location in your Linux operating system. In my case I will move it to Desktop.
Now open your terminal and type the following command to extract the content of this file.

```
cd Desktop
tar -xvzf ns-allinone-2.35.tar.gz
```

All the files will be extracted into a folder called **"ns-allinone-2.35".**

3. Installing the Required dependencies for NS2.

To run NS2 correctly we require some dependencies as well as gcc 4.4 version to be installed. Use the following command to install all the required to be installed.

```
sudo apt install build-essential autoconf automake libxmu-dev
sudo apt install gcc-4.4
```

Once the installation is over we have to make some changes in **"ls.h"** file. Use the following steps to make changes in the file.

Navigate to the folder were the file was extracted and follow the steps.

```
cd Desktop/ns-allinone-2.35/ns-2.35/linkstate
```

Now open the file named "ls.h" and scroll to the 137th line. In that change the word **"erase"** to **"this->erase"**. To open the file use the following command:

```
sudo gedit ls.h
```

After changing the file save it and close it.
There is one more step has to be done before installing NS2. We have to tell NS which version of GCC will be used. To do that use the following command:

```
cd Desktop/ns-allinone-2.35/otcl-1.14
sudo gedit Makefile.in
```

In the file, change **CC= @CC@** to **CC=gcc-4.4**.

4. Installation.

Now we are ready to install ns2 before that we require root access to the computer to do so use the following command.

```
cd Desktop/ns-allinone-2.35
sudo su
./install
```

It will take some time to install. Before running NS2 we have to setup the path.

5. Setting the Environment Path

The final step is to tell the system, where the files for ns2 are installed or present. To do that, we have to set the environment path using the **".bashrc"** file. In that file, we need to add a few lines at the bottom. The things to be added are given below. But for the path indicated below, many of those lines have **"/home/akshay/ns-allinone-2.35/...."** , but that is where I have my extracted folder. Make sure you replace them with your path. For example, if you have installed it in a folder **"/home/abc"**, then replace **"/home/akshay/ns-allinone-2.35/otcl-1.14"** with **"/home/abc/ns-allinone-2.35/otcl-1.14"**.

Here is the command:

```
sudo gedit ~/.bashrc
```

6. Running NS2.

Once the system has restarted, open the terminal and start ns2 by typing NS2 commad.

If NS2 is successfully installed in your compute then you will see a **"%"** in the terminal. That's it.

7. Bonus.

Apart from all these lengthy steps you can directly install NS2 in your Linux by following commands. Try it by your own.

```
sudo apt install ns2          (for installing)
ns2                             (for running the NS2).
```

Conclusion:-

In this experiment we have studied about Installation and Configuration of NS2 on Linux Environment.