Computer Networks, IT-304

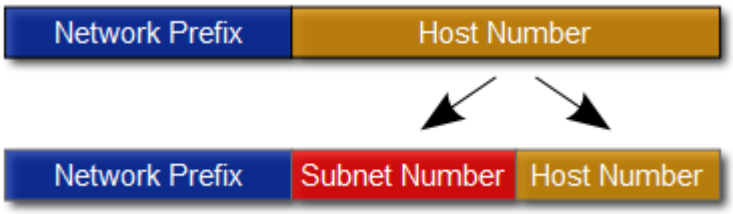
Autumn Semester 2024

Lab-11

Aim: To set up a LAN with 3 computers and understand wireless connection and routing principles

Theory:

Subnetting: A subnetwork, or subnet, is a logically visible, distinctly addressed part of a single Internet Protocol network. The process of subnetting is the division of a computer network into groups of computers that have a common, designated IP address routing prefix.



Subnetting breaks a network into smaller realms that may use existing address space more efficiently, and, when physically separated, may prevent excessive rates of Ethernet packet collision in a larger network. The subnets may be arranged logically in a hierarchical architecture, partitioning the organization's network address space (see also Autonomous System) into a tree-like routing structure.

Routers are used to interchange traffic between subnetworks and constitute logical or physical borders between the subnets. They manage traffic between subnets based on the high-order bit sequence (routing prefix) of the addresses. A routing prefix is the sequence of leading (most-significant) bits of an IP address that precede both the portion of the address used as host identifier and, if applicable, the set of bits that designate the subnet number In IPv4 networks, therouting prefix is traditionally expressed as a subnet mask, which is the prefix bit mask expressed in quad-dotted decimal representation. For example, 255.255.255.0 is the subnet mask for the 192.168.1.0/24 prefix. All hosts within a subnet can be reached in one routing hop, implying that all hosts in a subnet are connected to the same link**.**

Basic commands for Linux Networking

This section will explain some of the basic commands needed for networking in Linux.
1) ***man***- This command is used to display the text manual for Linux. Manual pages for the Linux commands can be viewed by entering the command man followed by the name of the option.

Syn: ***man*** [command]

2) ***ping***- This command is used to check if a particular device on the network is reachable. Ping stands for Packet Internet Groper.

Syn: ***ping*** [address]

3) ***Ifconfig***-This command is used to report all of the network devices recognized and running on the system.

Syn: ***ifconfig***

This command can be also used to change the IP address and assign a network mask

Syn: ***ifconfig*** [cardname] [address] **netmask** [mask id]

Eg: ***ifconfig*** eth0 192.168.12.1 netmask 255.255.255.0

4) ***route***-This command is used to view the routing table.

Syn: ***route***

This command can also be used to add a new route to the routing table

Syn: ***route*** add [dest.IP] gw [ip address]

Eg: ***route*** add 192 .168.0.1 gw 10.100.68.1 #adds a route to 192.168.0.1 through the gateway 10.100.68.1

In order to add a default route we can use the default keyword along with the route command

Syn: ***route*** add default gw [ip address

Static Routing:

When data needs to be sent from one LAN to another say, or if there are different sub-networks in the same LAN, then data transfer is not possible directly. There arises the need for a gateway, which sits between the two networks and acts as the communication link for connections, which span more than one network. This experiment is aimed at creating a gateway between two networks, and configuring it to act as the middleman for communication across the networks.

Some Networking concepts:

1. Routing

Routing is the process of identifying the path through which a particular machine can be reached. At the level of the LAN, it is feasible to specify the routes to the required destinations manually. This is called **Static Routing.** If two machines on the LAN have the same class of IP addresses, then no explicit mentioning is required. The Hub routes the packets without any additional information. However, if two machines belong to different address classes, then a gateway is needed. This is because, the machines are in different networks, and to interconnect them one needs a gateway. A gateway is like any other machine except that it has two NIC's. It belongs to two networks at the same time; it acts as the middleman for the two networks.

2. Routing and Forwarding Tables

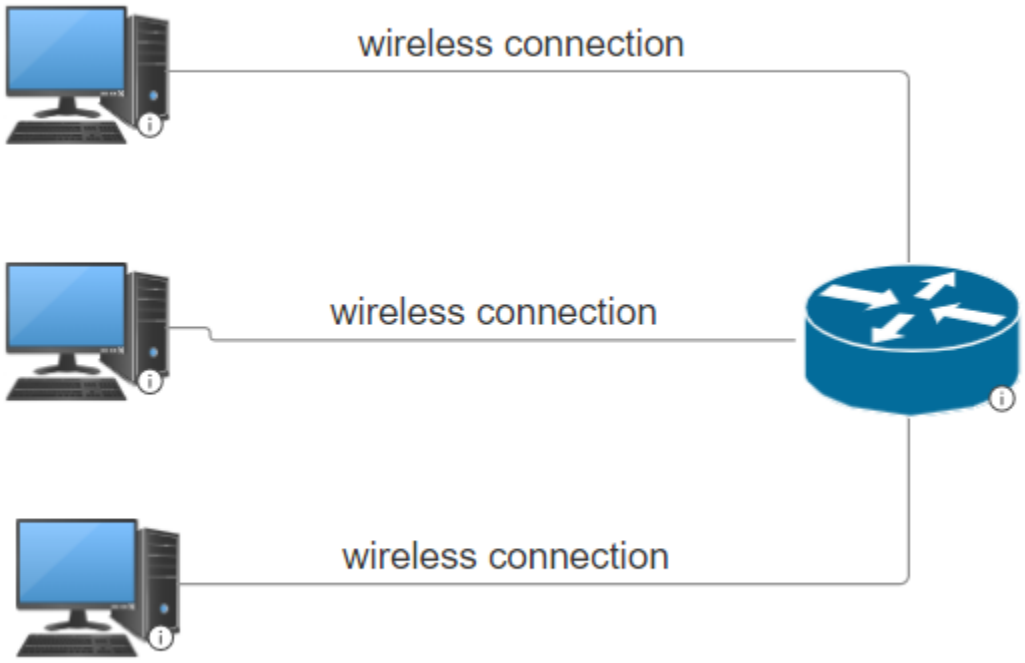
Routing in the Internet is not a static process. Routes keep changing over time in terms of their quality, and links may come up or go down, thus causing some routes to be invalidated. In such a situation, one needs to redo the process of finding routes. A routing algorithm does this job. All the information collected for finding routes is entered into the routing table. Once there is sufficient information, the routing algorithm decides on the actual next hops to be taken for different destinations. This information is entered in the forwarding table

Exercise 1

To create wifi-LAN using router and ping other PC

To do:

1. Start with the Terminal.
2. Configure using the “ifconfig” command, the ip addresses of the computers to reflect the machines in two different LANs.
3. Connect machines wirelessly using Tenda chips with the router and use ping command to check the connection

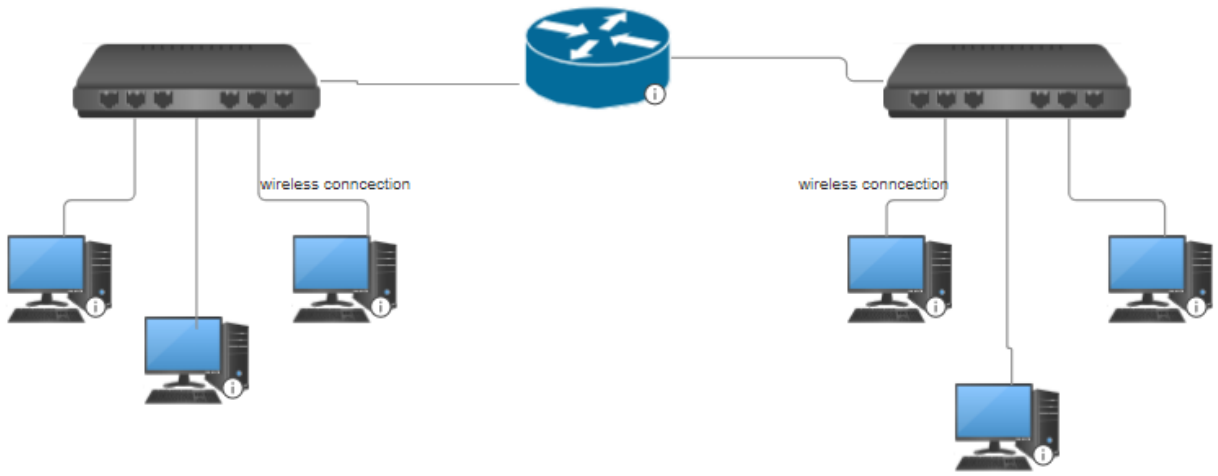


Exercise 2

To connect multiple hubs via router and set up use wired and wireless configurations with hubs. Note that you'll need to do this practical with another group combined.

To do:

1. Connect two of your PC with a wire to a hub and and connect the other one wirelessly. Other group will have the same configurations.
2. Connect both the hubs via a router.
3. Now make observations about pinging wired nodes with wireless, wired nodes to wired nodes, wireless nodes to wireless node.



Exercise 3

To use FTP protocol to transfer files and make observations about throughput parameters when done through a wired connection and when done through a wireless connection.

To do:

1. Use the configuration set up done in exercise 2.
2. Set up a TCP connection in between and, using FTP, transfer a file of size around 50 MB.
3. Make sure you do the transfer once with wired to wired node and once with wireless to wireless node.
4. Now make observations in throughput, delay, and other relevant parameters as well.
5. Plot graphs for both scenarios and state your conclusions along with reasoning.