Lecture-2

Network Terminologies

Introduction to Networks Network Protocols Ip address Ip subnets Nat Dhcp Server

Internet :- Network of networks

What is Network ?

It is a connection of devices connected together with peripheral devices to share information is known as a network.

nodes=computers=hops

Packet :-

Packets are envelopes of information that carry your data in pieces over a network

Network Interface :-

It is point of connection or an interface in machine or any device through which the device is able to connect

Example:-

WIFI CARD OR LAN CABLE/ETHERNET

Types of Network:-

LAN -> Local Area Network MAN -> MetroPloitan Area Network WAN -> Wide Area Network PAN -> Personal Area Network

Network Topologies:-

Topologies is a logical sequence which define or depict how devices/nodes are connected in a network

BUS TOPOLOGY-> serial connection
RING TOPOLOGY-> circular connection(serial)
STAR TOPOLOGY-> star shaped (one node has other node and that node is the only connection point)
MESH OR HYBRID TOPOLOGY-> Interconnected nodes does not have a parent node.

Network Protocols :-

Internet Protocol Suite/TCP/Ip- A set of data transfer protocol used by modern networks. TCP --> Transmission Control Protocol HTTP --> Hyper Text Transfer Protocol **UDP** --> User Datagram Protocol (used for establishing latency free and loss tolerating connection) FTP --> File Transfer Protocol SSH --> Secure Shell Protocol SMTP --> Simple Mail Transfer Protocol **DHCP** --> Dynamic Host Configuration Protocol VoIP --> Voice Over Internet Protocol **POP3** --> Post Office Protocol 3 HTTP :- 80 HTTPS :- 443 SMTP :- 25 FTP:- 21 VoIp:- 465 POP3:- 110

TCP -> Transmission Control Protocol

TCP is a Connection oriented protocol It means that it is responsible for connection establishment and maintaining that connection until the applications at each end have finished exchanging messages.

-breaks application data into packets so that they can flow through network

-sends and receives packets to maintain flow control

tcp requires a handshake

client sync --> server

client <- sync/ack server</pre>

client ack -> server

HTTP ->Hyper Text Transfer Protocol

It is protocol used by world wide web and it defines how messages are formatted and transmitted and what action webserver and browsers should take in response to various commands

Example-->A user enters a url in browser-> what it does is the browser sends http command to webserver inorder to request/get the webpage webpage.

HTTPS:- Hyper Text Transfer Protocol Secure

UDP:- User datagram protocol

UDP is used to establish a latency free network and it is used in in data transfer the problem with UDP is that it is a stateless protocol now stateless means that it does not acknowledge that packets which are being sent and received (it is used in media streaming)

FTP:- File Transfer Protocol

It is a standard protocol which is used for transferring file in a client server computer network.

SSH:- Secure Shell Protocol

It is a protocol which enables secure remote login from one computer to another computer It works on client server model.

SMTP:- Simple Mail Transfer Protocol

It is standard protocol for delivering emails form one email server to another.

Pop3 -> Post office Protocol

It enables client to download email from an email sever.

DHCP:- Dynamic Host Configuration Protocol

It is network management protocol that assigns ip address to device on a network so that it can communicate with other Ip networks

Eg:- Home Router gives an Ip address to a device whenever it connects to wifi router

NOTE->

DHCP can be implemented on Home Networks

It can also be implemented on Campus

It can also be implemented by ISP on regional networks

Homework -> Go and study DHCP starvation attack (Yersinia)

Volp :- Voice over Ip

used for voice based communications on the internet Eg-skype

WHAT IS AN IP ADDRESS ?

An

8bit.8bit.8bit.8bit

NOW kya hen ye 8 bit ?

kya hen ye bit

bit stands for binary digit now what is binary digit it is the smallest unit of data in a computer.

A bit can either have value of 0 or 1 *8 bits = 1 byte* 1 kilobyte = 1000 bytes *192 = 1100000 in binary* how $1 \times 2^{7} + 1 \times 2^{6} + 0x2^{5} + 0x2^{4} + 0x2^{3} + 0x2^{2} + 0x2^{1} + 0x2^{0} = 192$ 0 1 0 0 0 0 0 1 or 192.168.32.1 (Binary form)so we have 192=128+64 = 11000000 168=128+32+8= = 10101000 32= = 00100000 1= = 00000001

So we have

1100000.10101000.00100000.00000001

128	64	32	16	8	4	2	1
1	1	0	0	0	0	0	0
1	0	1	0	1	0	0	0
0	0	1	0	0	0	0	0
0	0	0	0	0	0	0	1

Now Ip address

->IPv4-> 32 bit - Relies on DHCP (Only 4.29 billion unique addresses)

->IPv6-> 128 bit -> Auto Configured (340 undecillion unique addresses= 340 Trillion Trillions Trillion addresses)

Now the question is -> How 4 billion ip address are enough or were enough for today's world and how did we even we make it so far with only 4 billion ip address and That is with help of NAT or NETWORK ADDRESS TRANSLATION

What is Nat ??

Network Address Translation (NAT) is designed for IP address conservation. It enables private IP networks that use unregistered IP addresses(common personal computers) to connect to the Internet. NAT operates on a router, usually connecting two networks together, and translates the private (not globally unique) addresses in the internal network into legal addresses, before packets are forwarded to another network. Basically, NAT allows a single device, such as a router, to act as an agent between the Internet (or public network) and a local network (or private network), which means that only a single unique IP address is required to represent an entire group of computers to anything outside their network.

An ip address is of two types

1 Private 2 Public

Private Ip address

-> Internal IP address valid on LAN but not on the internet for example

All the devices connected to your wifi network have recieved a private ip address

There are three Different blocks of ipv4 addresses

Class	Address range
Class A	1.0.0.1 to 126.255.255.254
Class B	128.1.0.1 to 191.255.255.254
Class C	192.0.1.1 to 223.255.254.254
Class D	224.0.0.0 to 239.255.255.255

Public Ip address:-

->Public ip address on the other-hand are globally unique and valid on the internet

Example the ip address assigned to my WAN interface wireless router by ISP

eg 42.111.108.97

->www.whatismyip.com---will show global ip |

->ipchicken

->ipcow

IP SUBNETS:-

A subnetwork or subnet is a logical subdivision of an IP network. The practice of dividing a network into two or more networks is called sub-netting. One network into many networks so that it can be easily managed and be secured

DHCP Server:-

Dynamic Host Configuration Protocol Server

SO

every time some device is connected to wifi router an ip address is assigned to the device

and that assigning of the task is done by dhcp server in wifi router

The ip address is assigned with a lease (Time limit) to which the ip address will remain functional for a device

Example

Router Ip address =192.168.15.1

Eg:-

The router can assign ip address to the devices from 192.168.15.2 to 192.168.15.255 And This Assigning is done with the help of DHCP server > ipconfig

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