Computer Networks

Class Notes

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2 November 2018

1. Classfull Addressing

They are divided into three types: (a.b.c.d)

a. Class A

b. Class B

c. Class C

An IP Address is 32 bits long,

Class A Networks:

This type of network is reserved for a few very large networks, eg.

MTNL.

The IP addresses in this class of networks are of the type

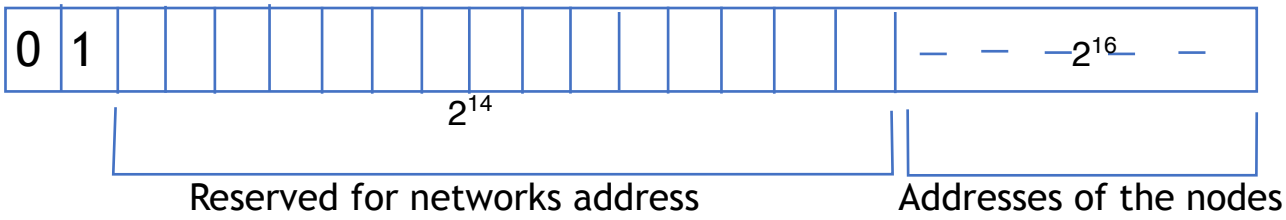
The class thus has 2^{24} nodes for 2^{7} networks, values between 0-127,

0 : 2^{8} -1

Class B Networks:

This is reserved for a few large networks, eg. Airtel.

The IP Addresses in that class are of the type:



The class thus has 2^{24} nodes for 2^{7} networks, values between 128-191

Class C Networks:

The is the network for very larger number of small networks, eg.

LAN

The IP Addresses in that class are of the type start with 0 0 1 and have 21 leading 0s or 1s for the network address, 2^{21} such addresses are possible. Each such network has upto 2^{8} nodes.

2. Communication between Nodes:

Case 1: Network part of the IP address of the 2 nodes is the same. This implies that the two nodes belong to the same network.

In this case, link layer communication is possible. Now we remove the assumption that the MAC address of the nodes is known to each other. The first step thus is to know the MAC address of the receiver node. For this we use ARP (Address Resolution Protocol).

Address Resolution Protocol (ARP)

Every node has an ARP table that resolved IP addresses into MAC addresses. The sender makes an ARP packet that has IP address of the receiver and broadcasts it. The receiver on receiving the packet responds to the query with its own MAC address. The ARP packet of the sender already has its IP and the MAC address, so the receiver updates its ARP table, as soon as it receives the query. The receiver

now has its own MAC address and the one of the sender, a communication link is hence established since the receiver can now send its own MAC address on the link layer.

Sample ARP Table (Sender's)

IP Address	MAC Address	Time Stamp
IP of receiver	MAC of Receiver	Time of relation establishment

The timestamp column is needed because IP Addresses are dynamic, so after a certain period, the IP address of the receiver will change and this new IP address then would then required to be linked to the MAC address.

DHCP (Dynamic Host Configuration Protocol): This protocol gives dynamic IP address to the nodes. Will be discussed later.

Case 2: If the receiver is off the network, or the network part of the IP address of A (sender) and B (receiver) is not the same, the default router is used to send the frames forward. Since B is off the network, we

use connectionless protocol (datagram modelled communication). Each router has a few tables, these tables store the network number and the next hop information. The next hop stores the router address to which the data needs to be sent incase the network is not its own link layer. Incase it is present in its own link layer, the router knows the interface number at which the node can be found.

Sample Example:

In reference with the diagram present in Harshit's notes: R1 looks at B's network number. The index table finds it at N4 and thus sends the message to R2. R2 similarly sends it to R3. R3 then finds the address of B corresponding to interface 1. ARP is then used to send the message to B.

Drawbacks:

1. The number of rows in each table is equal to the number of networks in the internetwork. These tables can thus get too big. We thus need some more structure or hierarchy then network numbers.
2. There may be a lot of internal fragmentation, we might not want to use all of class B nodes but might have more than 64 nodes that can be supported by class C. In this case, we need more flexibility in

terms of addressing. We want addresses to have as many network and host bits as we want. This leads to a problem, till now A was able to figure out if B exists in its network because it knew the class and thus the number of network and host bits in B. Now the admin decides the network bits and needs to inform all the nodes about it. This is done using subnet masks, as discussed in the next class (notes by Pratyush).

Domain and Subdomain: An internetwork under the same admin is a domain. In a domain, each smaller network is called a subdomain.