Internet Protocol

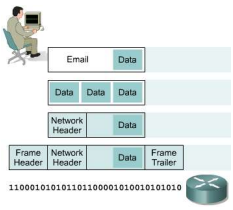
INTERNET PROTOCOL

1

Internet Protocol

IP as a Routed Protocol

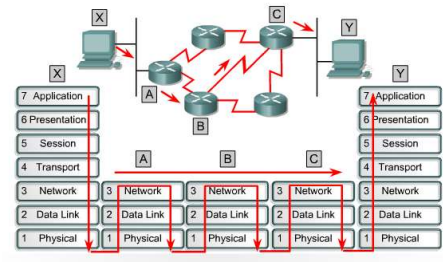
- IP is a connectionless, unreliable, best-effort delivery protocol.
- IP accepts whatever data is passed down to it from the upper layers and forwards the data in the form of IP Packets.
- All the nodes are identified using an IP address.
- Packets are delivered from the source to the destination using IP address



2

Internet Protocol

Packet Propagation



Each router provides its services to support upper-layer functions.

3

Internet Protocol

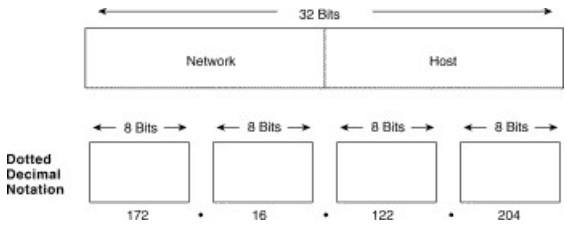
IP Address

- IP address is for the INTERFACE of a host. Multiple interfaces mean multiple IP addresses, i.e., routers.
- 32 bit IP address in dotted-decimal notation for ease of reading, i.e., 193.140.195.66
- Address 0.0.0.0, 127.0.0.1 and 255.255.255.255 carries special meaning.
- IP address is divided into a network number and a host number.
- Also bits in Network or Host Address cannot be all 0 or 1.

4

Internet Protocol

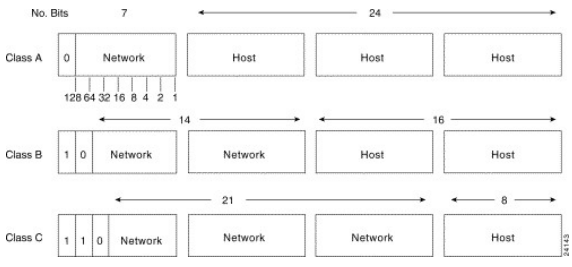
IP Address



5

Internet Protocol

IP Address



6

Internet Protocol

IP Address

- Class A : Address begins with bit 0. It has 8 bit network number (range 0.0.0.0-to-127.255.255.255), 24 bit host number.
- Class B : Address begins with bits 10. It has 16 bit network number (range 128.0.0.0-to-191.255.255.255), 16 bit host number.
- Class C : Address begins with bits 110. It has 24 bit network number (range 192.0.0.0-to-223.255.255.255), 8 bit host number.
- Class D : Begins with 1110, multicast addresses (224.0.0.0-to-239.255.255.255)
- Class E : Begins with 11110, unused

7

Internet Protocol

Subnet Mask

- Consider IP address = 192.168.2.25
  - First few bits (left to right) identify network/subnet
  - Remaining bits identify host/interface
- Number of subnet bits is called subnet mask, e.g.
  - Subnet IP Address range is 192.168.2.0 – 192.168.2.255 or Mask = 255.255.255.0
  - Subnet IP Address range is 192.168.2.0 – 192.168.2.15 or Mask = 255.255.255.240

8

Internet Protocol

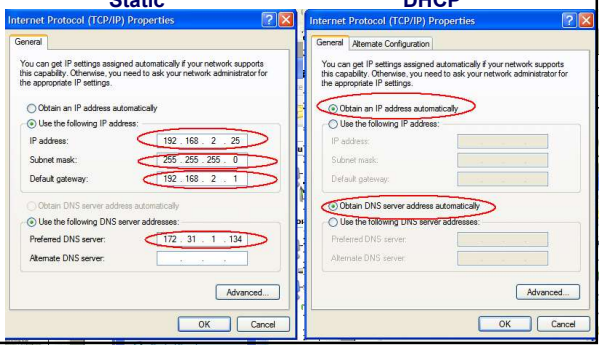
IP Address, Subnet Mask and Gateway

- IP Address and Subnet Mask define the Subnet
- For Example IP address 172.31.1.0 and Subnet Mask of 255.255.240.0 means that the subnet address ranges from 172.31.0.0 to 172.31.15.255
- Another notation is 172.31.1.0/28
- The first Address is the Network Address and the last Address is the Broadcast Address. They are reserved and cannot be assigned to any node.
- The Gateway Address is the Address of the router where the packet should be sent in case the destination host does not belong to the same subnet

9

IP Configuration of an Interface

Static DHCP



10

ARP

- ARP (Address Resolution Protocol) is used in Ethernet Networks to find the MAC address of a node given its IP address.
- Source node (say 192.168.2.32) sends broadcast message (ARP Request) on its subnet asking ``Who is 192.168.2.33''.
- All computers on subnet receive this request
- Destination responds (ARP Reply) since it has 192.168.2.33
  - Provides its MAC address in response

11

IPv6

- Internet Protocol Version 4 is the most popular protocol in use today, although there are some questions about its capability to serve the Internet community much longer.
- IPv4 was finished in the 1970s and has started to show its age.
- The main issue surrounding IPv4 is addressing—or, the lack of addressing—because many experts believe that we are nearly out of the four billion addresses available in IPv4.
- Although this seems like a very large number of addresses, multiple large blocks are given to government agencies and large organizations.
- IPv6 could be the solution to many problems posed by IPv4

12

IPv6

- IPv6 uses 128 bit address instead of 32 bit address.
- The IPv6 addresses are being distributed and are supposed to be used based on geographical location.

13