

CS 224(M): Tutorial 8

IP Addressing and Allocation

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1. Class D IP: *224.0.0.0 to 239.255.255.255*
2. Class C network addresses: 254 hosts on each of the 2 million networks. (2^8-2 , $2^{21}-2$)
3. The mask field would not be required, because in the class-based addressing, the starting bits that represent the class also represent the (predefined) network and host portion. For example, an address starting in '10' would certainly be a class B address and hence we know that the network portion would be 14 bits and host portion 16 bits.
4. Given that the IP is a public IP, it can be pinpointed like in the postal system and hence they are geographic in a sense. But since IP addresses can be private as well, there is no way of locating a private IP unless the router info is known. Within the same organisation, for example, the IP addresses are geographic.
5. 21 bits used by the prefix/identifier. Hence 11 bits remain for the hosts. Number of hosts = $2^{11}-2$.
6. i) 217.20.12.0/25 for the large department and the remainder split into 4 quarters.
ii) 217.20.12.128/25 for the large department and so on.
7. Looking at the third bit in each:
 1. 224: 11100
 2. 232: 11101
 3. 240: 11110
 4. 248: 11111Thus, the total can be modified/aggregated to 108.25.224.0/19, say.
8. $4000/(16*254) = 98.43\%$

9. a) Entries A–D would be rejected because of mismatch in the second byte (length >16; second byte does not match). Looking at E: Second byte must match 4C (010011|00), but 4B is 010010|11 and hence does not match. Thus it goes to the default of the network with C0.0.0.0/2 and hence F is a match. By longest prefix match, next hop is F.

b) C4.5E has the first 2 bytes matching with A–D and hence we must compare with that. For A, We must have 3rd byte as 0000001|0, but 05 is 00000101 and hence does not match. B has 04, ie 000001|00 and hence there is a match. Next hop is B.

c) A–D can be eliminated by the same argument as in part a). Comparing with E, we must have second byte as 4C: 010011|00 and for the destination is 01001101. This is a match and hence we have the next hop as E.

10. Broadcast & Unicast.

11.

The image displays two side-by-side screenshots of network packet capture analysis tools, likely Wireshark, showing details of a DHCP and Bootstrap Protocol (BOOTP) exchange.

Left Screenshot (Packet 1):

- Ethernet II, Src: 10.2.100.250 (10.2.100.250), Dst: 10.2.96.29 (10.2.96.29)**
- Internet Protocol Version 4, Src: 10.2.100.250 (10.2.100.250), Dst: 10.2.96.29 (10.2.96.29)**
- User Datagram Protocol, Src Port: bootpc (68), Dst Port: bootps (67)**
- Bootstrap Protocol**
 - Message type: Boot Request (1)
 - Hardware type: Ethernet (0x01)
 - Hardware address length: 6
 - Hops: 0
 - Transaction ID: 0xbe870111
 - Seconds elapsed: 0
 - Bootp flags: 0x0000 (Unicast)
 - Client IP address: 0.0.0.0 (0.0.0.0)
 - Your (client) IP address: 0.0.0.0 (0.0.0.0)
 - Next server IP address: 0.0.0.0 (0.0.0.0)
 - Relay agent IP address: 0.0.0.0 (0.0.0.0)
 - Client MAC address: f0:76:1c:c3:66:53 (f0:76:1c:c3:66:53)
 - Client hardware address padding: 000000000000000000000000
 - Server host name not given
 - Boot file name not given
 - Magic cookie: DHCP
 - Option: (53) DHCP Message Type
 - Length: 1
 - DHCP: Request (3)
 - Option: (50) Requested IP Address
 - Length: 4
 - Requested IP Address: 10.2.96.29 (10.2.96.29)
 - Option: (12) Host Name

Right Screenshot (Packet 2):

- Ethernet II, Src: 10.2.96.29 (10.2.96.29), Dst: 10.2.100.250 (10.2.100.250)**
- Internet Protocol Version 4, Src: 10.2.96.29 (10.2.96.29), Dst: 10.2.100.250 (10.2.100.250)**
- User Datagram Protocol, Src Port: bootps (67), Dst Port: bootpc (68)**
- Bootstrap Protocol**
 - Message type: Boot Reply (2)
 - Hardware type: Ethernet (0x01)
 - Hardware address length: 6
 - Hops: 0
 - Transaction ID: 0xbe870111
 - Seconds elapsed: 0
 - Bootp flags: 0x0000 (Unicast)
 - Client IP address: 0.0.0.0 (0.0.0.0)
 - Your (client) IP address: 10.2.96.29 (10.2.96.29)
 - Next server IP address: 0.0.0.0 (0.0.0.0)
 - Relay agent IP address: 0.0.0.0 (0.0.0.0)
 - Client MAC address: f0:76:1c:c3:66:53 (f0:76:1c:c3:66:53)
 - Client hardware address padding: 000000000000000000000000
 - Server host name not given
 - Boot file name not given
 - Magic cookie: DHCP
 - Option: (53) DHCP Message Type
 - Length: 1
 - DHCP: ACK (5)
 - Option: (54) DHCP Server Identifier
 - Length: 4