

TCP/IP 通訊協定及應用

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<http://wmlab.csie.ncu.edu.tw/course/tcp>

We provide
無線網路多媒體實驗室
Wireless
Wireless Network & Multimedia Laboratory
Solution

Chapter 12: Broadcasting and Multicasting

Introduction

- ◆ Three kinds of IP address :
 - Unicast : the destination address specifies a single interface.
 - Broadcast : a host wants to send a frame to every other host on the cable.
 - Multicast : the frame should be delivered to a set of hosts that belong to a multicast group.
- ◆ Broadcasting and multicasting only apply to UDP , where it makes sense for an application to send a single message to multiple recipients.
- ◆ A multicast address has the low-order bit of the high-order byte turned on . In hexadecimal 01:00:00:00:00:00 , broadcast address is ff:ff:ff:ff:ff:ff.

Introduction

◆ Filtering :

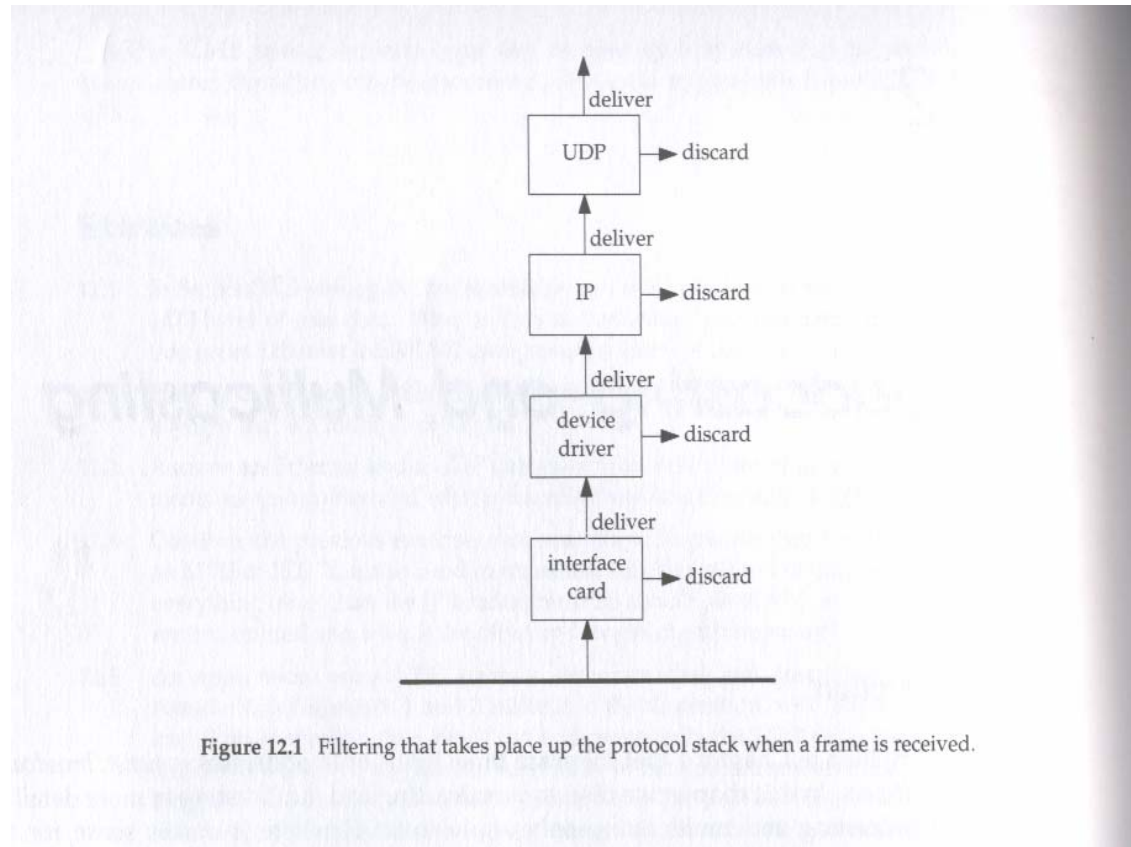


Figure 12.1 Filtering that takes place up the protocol stack when a frame is received.

Broadcasting

◆ Limited Broadcast :

- the *limited broadcasting address* is 255.255.255.255. This can be use as the destination address of an IP datagram during the host configuration process , when the host might not know its subnet mask or even its IP address.

◆ Net-directed Broadcast :

- the *net-directed broadcast address* has a host ID of all one bits.
 - ◆ class A net-directed broadcasting is *netid.255.255.255* , where netid is the class A network ID.

Broadcasting

◆ Subnet-directed Broadcast :

- the *subnet-directed broadcast address* has a host ID of all one bits but a specific subnet ID.
 - ◆ A router receives a datagram destined for 128.1.2.255 , this is a subnet-directed broadcast if the class B network 128.1 has a subnet mask of 255.255.255.0 , but it is not a broadcast if the mask is 255.255.254.0.

◆ All-subnet-directed Broadcast :

- an *all-subnets-directed broadcast address* both the subnet ID and the host ID are all one bits.
 - ◆ The destination's subnet mask is 255.255.255.0 , the class B IP address 128.1.255.255 is an all-subnets-directed broadcast.

Broadcasting Example

```

sun % arp -a                                ARP cache is empty

sun % ping 140.252.13.63
PING 140.252.13.63: 56 data bytes
64 bytes from sun (140.252.13.33): icmp_seq=0. time=4. ms
64 bytes from bsdi (140.252.13.35): icmp_seq=0. time=172. ms
64 bytes from svr4 (140.252.13.34): icmp_seq=0. time=192. ms

64 bytes from sun (140.252.13.33): icmp_seq=1. time=1. ms
64 bytes from bsdi (140.252.13.35): icmp_seq=1. time=52. ms
64 bytes from svr4 (140.252.13.34): icmp_seq=1. time=90. ms

^?                                           type interrupt key to stop
----140.252.13.63 PING Statistics----
2 packets transmitted, 6 packets received, -200% packet loss
round-trip (ms)  min/avg/max = 1/85/192

sun % arp -a                                check ARP cache again
svr4 (140.252.13.34) at 0:0:c0:c2:9b:26
bsdi (140.252.13.35) at 0:0:c0:6f:2d:40

```

Multicasting

- ◆ Delivery to multiple destinations.
 - There are many application that deliver information to multiple recipients : interactive conferencing and dissemination.
- ◆ Solicitation of servers by clients.
 - A diskless workstation needs to locate a bootstrap server.

Multicast Group Address

- ◆ A multicast group address is the combination of the high-order 4 bits of 1110 and the multicast group ID. This are normally written as dotted-decimal numbers and are in the range of 224.0.0.0 through 239.255.255.255.



Format of class D IP address

Multicasting Group Address

- ◆ The sets of hosts listening to a particular IP multicast address is call a ***host group***.
- ◆ Multicast group address are assigned as well-know address are called ***permanent host groups***.
 - 224.0.0.1 means “all system on this subnet “.
 - 224.0.0.2 means “all routers on this subnets”.
 - 224.0.1.1 is for NTP (the Network Time Protocol) .
 - 224.0.0.9 is for RIP-2 .
 - 224.0.1.2 is for SGI’s (silicon Graphics)

Converting Multicast Group Address to Ethernet Address

- ◆ The Ethernet addresses corresponding to IP multicasting are in the range 01:00:5e:00:00:00 through 01:00:5e:7f:ff:ff, this allocation allows for 23 bits in the Ethernet address to correspond to the IP multicast group ID. the mapping places the low-order 23 bits of the multicast group ID into this 23 bits of the Ethernet address.

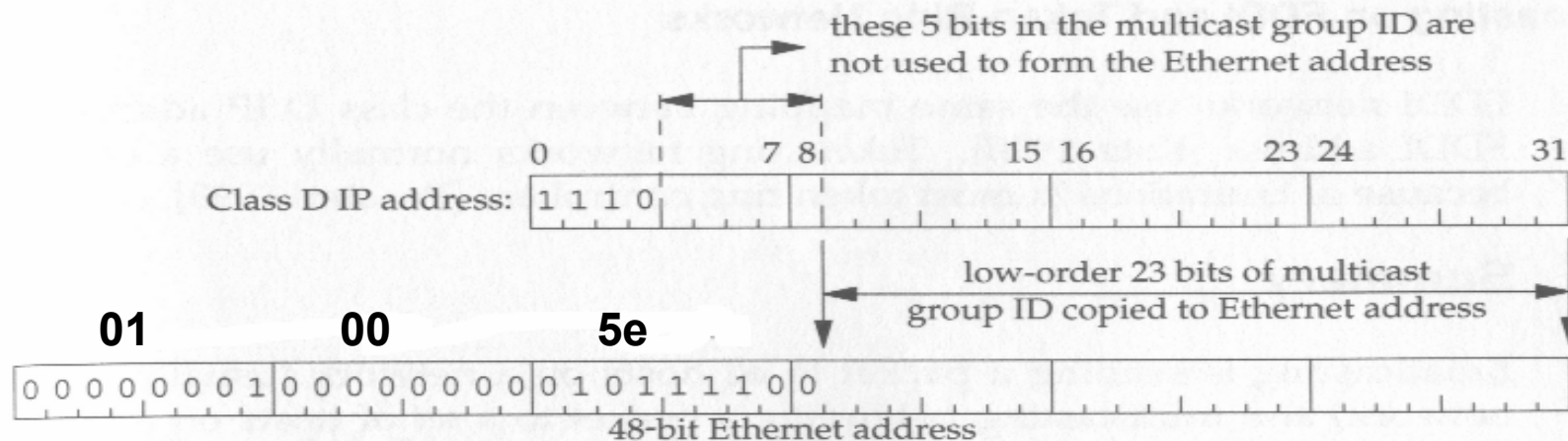


Figure 12.3 Mapping of a class D IP address into Ethernet multicast address.

Summary

- ◆ Broadcasting is sending a packet to all hosts on a network and multicasting is sending a packet to a set of hosts on a network.
- ◆ There are four types of broadcast address : limited, net-directed, subnet-directed and all-subnets-directed.
- ◆ A class D IP address is called a multicast group address. It is converted to an Ethernet address by placing its lower 23 bits into a fixed Ethernet address. The mapping is not unique, requiring additional filtering by one of the protocol modules.