

## TCP/IP 通訊協定及應用

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## Chapter 12: Broadcasting and Multicasting

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### Introduction

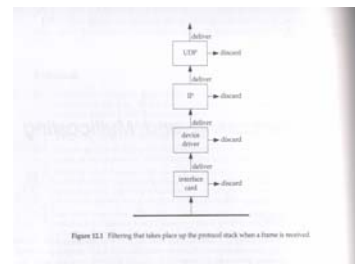
- ◆ Three kinds of IP address :
  - Unicast : the destination address specifies a single interface.
  - Broadcast : a host wants to send a frame to every other host on the cable.
  - Multicast : the frame should be delivered to a set of hosts that belong to a multicast group.
- ◆ Broadcasting and multicasting 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.

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### Introduction

- ◆ Filtering :



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### Broadcasting

- ◆ Limited Broadcast :
  - the *limited broadcasting address* is 255.255.255.255. This can be used 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.

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### 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.

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## 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 badi (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 badi (140.252.13.35): icmp_seq=1. time=52. ms
64 bytes from svr4 (140.252.13.34): icmp_seq=1. time=90. ms
^C
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
badi (140.252.13.35) at 0:0:c0:6f:2d:40
```

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## Multicasting

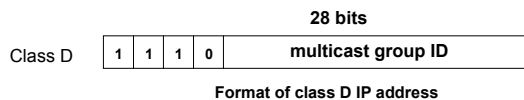
- ♦ Delivery to multiple destinations.
  - There are many application that deliver information to multiple recipients : interactive conferencing and dissemination.
- ♦ Solicitation of servers by clients.
  - A diskless workstation needs to locate a bootstrap server.

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## 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.



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## Multicasting Group Address

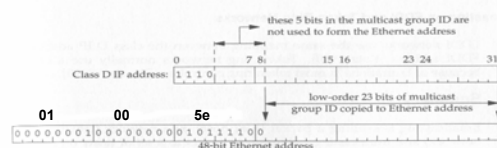
- ♦ The sets of hosts listening to a particular IP multicast address is call a **host group**.
- ♦ Multicast group address are assigned as well-know address are called **permanent host groups**.
  - 224.0.0.1 means "all system on this subnet".
  - 224.0.0.2 means "all routers on this subnets".
  - 224.0.1.1 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 )

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## 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.



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## 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 b one of the protocol modules.

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