EL5373

INTERNET ARCHITECTURE AND PROTOCOLS

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Workstation:FENCHI

MAC: 00:16:76:A9:83:A7

LAB REPORT 7

[5 Pages]

Exercise 1

ANS1:

```
[guest@fenchi TengZhang_0536650]$ netstat -rn
Kernel IP routing table
Destination     Gateway         Genmask         Flags   MSS Window  irtt Iface
128.238.66.0    128.238.66.105  255.255.255.0   UG        0 0          0 eth0
128.238.66.0    0.0.0.0         255.255.255.0   U         0 0          0 eth0
169.254.0.0     0.0.0.0         255.255.0.0     U         0 0          0 eth0
127.0.0.0       0.0.0.0         255.0.0.0       U         0 0          0 lo
224.0.0.0       0.0.0.0         240.0.0.0       U         0 0          0 eth0
```

Exercise 2

```
[guest@fenchi TengZhang_0536650]$ netstat -g
IPv6/IPv4 Group Memberships
Interface       RefCnt Group
--------------- ------ ---------------------
lo              1      224.0.0.1
eth0            1      224.0.0.1
```

ANS：

There is only one multicast group that the interface belong to. The group is 224.0.0.1. The group ID is the multicast address for the group.

Exercise 3

```
[guest@fenchi TengZhang_0536650]$ ping 224.0.0.1
PING 224.0.0.1 (224.0.0.1) 56(84) bytes of data.
64 bytes from 128.238.66.105: icmp_seq=1 ttl=64 time=0.052 ms
64 bytes from 128.238.66.102: icmp_seq=1 ttl=64 time=1.13 ms (DUP!)
64 bytes from 128.238.66.104: icmp_seq=1 ttl=64 time=1.46 ms (DUP!)
64 bytes from 128.238.66.107: icmp_seq=1 ttl=64 time=2.05 ms (DUP!)
64 bytes from 128.238.66.101: icmp_seq=1 ttl=64 time=2.21 ms (DUP!)
64 bytes from 128.238.66.103: icmp_seq=1 ttl=64 time=2.53 ms (DUP!)
64 bytes from 128.238.66.100: icmp_seq=1 ttl=64 time=2.78 ms (DUP!)
64 bytes from 128.238.66.106: icmp_seq=1 ttl=64 time=2.88 ms (DUP!)
64 bytes from 128.238.66.105: icmp_seq=2 ttl=64 time=0.038 ms
64 bytes from 128.238.66.103: icmp_seq=2 ttl=64 time=0.338 ms (DUP!)
64 bytes from 128.238.66.104: icmp_seq=2 ttl=64 time=0.522 ms (DUP!)
64 bytes from 128.238.66.106: icmp_seq=2 ttl=64 time=0.739 ms (DUP!)
64 bytes from 128.238.66.101: icmp_seq=2 ttl=64 time=0.838 ms (DUP!)
64 bytes from 128.238.66.102: icmp_seq=2 ttl=64 time=0.939 ms (DUP!)
```

```
64 bytes from 128.238.66.107: icmp_seq=2 ttl=64 time=1.66 ms (DUP!)
64 bytes from 128.238.66.100: icmp_seq=2 ttl=64 time=1.81 ms (DUP!)
64 bytes from 128.238.66.105: icmp_seq=3 ttl=64 time=0.038 ms
64 bytes from 128.238.66.103: icmp_seq=3 ttl=64 time=0.333 ms (DUP!)
64 bytes from 128.238.66.106: icmp_seq=3 ttl=64 time=0.457 ms (DUP!)
64 bytes from 128.238.66.107: icmp_seq=3 ttl=64 time=0.581 ms (DUP!)
64 bytes from 128.238.66.102: icmp_seq=3 ttl=64 time=0.744 ms (DUP!)
64 bytes from 128.238.66.101: icmp_seq=3 ttl=64 time=0.844 ms (DUP!)
64 bytes from 128.238.66.100: icmp_seq=3 ttl=64 time=0.945 ms (DUP!)
64 bytes from 128.238.66.104: icmp_seq=3 ttl=64 time=1.09 ms (DUP!)

--- 224.0.0.1 ping statistics ---
3 packets transmitted, 3 received, +21 duplicates, 0% packet loss,
time 2015ms
rtt min/avg/max/mdev = 0.038/1.127/2.886/0.845 ms
**************************************************************************
[guest@fenchi TengZhang_0536650]$ ping -b 128.238.66.255
WARNING: pinging broadcast address
PING 128.238.66.255 (128.238.66.255) 56(84) bytes of data.
64 bytes from 128.238.66.105: icmp_seq=1 ttl=64 time=0.050 ms
64 bytes from 128.238.66.104: icmp_seq=1 ttl=64 time=0.368 ms (DUP!)
64 bytes from 128.238.66.101: icmp_seq=1 ttl=64 time=0.513 ms (DUP!)
64 bytes from 128.238.66.102: icmp_seq=1 ttl=64 time=0.932 ms (DUP!)
64 bytes from 128.238.66.103: icmp_seq=1 ttl=64 time=1.16 ms (DUP!)
64 bytes from 128.238.66.107: icmp_seq=1 ttl=64 time=1.45 ms (DUP!)
64 bytes from 128.238.66.100: icmp_seq=1 ttl=64 time=1.55 ms (DUP!)
64 bytes from 128.238.66.106: icmp_seq=1 ttl=64 time=2.81 ms (DUP!)
64 bytes from 128.238.66.105: icmp_seq=2 ttl=64 time=0.040 ms
64 bytes from 128.238.66.103: icmp_seq=2 ttl=64 time=0.315 ms (DUP!)
64 bytes from 128.238.66.102: icmp_seq=2 ttl=64 time=0.503 ms (DUP!)
64 bytes from 128.238.66.101: icmp_seq=2 ttl=64 time=0.644 ms (DUP!)
64 bytes from 128.238.66.104: icmp_seq=2 ttl=64 time=0.745 ms (DUP!)
64 bytes from 128.238.66.100: icmp_seq=2 ttl=64 time=0.869 ms (DUP!)
64 bytes from 128.238.66.106: icmp_seq=2 ttl=64 time=1.21 ms (DUP!)
64 bytes from 128.238.66.107: icmp_seq=2 ttl=64 time=1.57 ms (DUP!)
64 bytes from 128.238.66.105: icmp_seq=3 ttl=64 time=0.044 ms
64 bytes from 128.238.66.100: icmp_seq=3 ttl=64 time=0.516 ms (DUP!)
64 bytes from 128.238.66.102: icmp_seq=3 ttl=64 time=0.780 ms (DUP!)
64 bytes from 128.238.66.107: icmp_seq=3 ttl=64 time=0.883 ms (DUP!)
64 bytes from 128.238.66.106: icmp_seq=3 ttl=64 time=1.21 ms (DUP!)
64 bytes from 128.238.66.104: icmp_seq=3 ttl=64 time=1.60 ms (DUP!)
```

```
64 bytes from 128.238.66.103: icmp_seq=3 ttl=64 time=1.74 ms (DUP!)
64 bytes from 128.238.66.101: icmp_seq=3 ttl=64 time=2.22 ms (DUP!)

--- 128.238.66.255 ping statistics ---
3 packets transmitted, 3 received, +21 duplicates, 0% packet loss,
time 2021ms
rtt min/avg/max/mdev = 0.040/0.990/2.817/0.686 ms
```

ANS:
When the multicast address was pinged, all of the hosts in the group replied.(128.238.66.100-128.238.66.107)
When the broadcast address was pinged, all of the hosts in the group replied too.
Yes, there is also a reply from my own host.

Exercise 4

Ethernet unicast frame

```
21:30:59.640727 0:14:6c:2e:66:8 0:9:5b:a:ea:3 0800 1066: 128.238.66.105.32770 >
128.238.66.104.7: udp 1024 (DF)
21:30:59.672936 0:9:5b:a:ea:3 0:14:6c:2e:66:8 0800 1066: 128.238.66.104.7 >
128.238.66.105.32770: udp 1024 (DF)
21:31:04.639159 0:14:6c:2e:66:8 0:9:5b:a:ea:3 0806 42: arp who-has 128.238.66.104
tell 128.238.66.105
21:31:04.639388 0:9:5b:a:ea:3 0:14:6c:2e:66:8 0806 60: arp reply 128.238.66.104
is-at 0:9:5b:a:ea:3
```

Ethernet multicast frame

```
21:34:02.137233 0:14:6c:2e:66:8 1:0:5e:b:6f:a 0800 1066: 128.238.66.105.32770 >
230.11.111.10.2000: udp 1024 (DF) [ttl 1]
-----------------
21:35:41.283680 0:14:6c:2e:66:8 1:0:5e:b:6f:a 0800 1066: 128.238.66.105.32770 >
232.139.111.10.2000: udp 1024 (DF) [ttl 1]
```

Ethernet broadcast frame

```
21:37:54.715051 0:14:6c:2e:66:8 ff:ff:ff:ff:ff:ff 0806 42: arp who-has
128.238.66.155 tell 128.238.66.105
21:37:55.709170 0:14:6c:2e:66:8 ff:ff:ff:ff:ff:ff 0806 42: arp who-has
128.238.66.155 tell 128.238.66.105
```

Frame type	**Ethernet unicast frame**	**Ethernet multicast frame**	**Ethernet broadcast frame**
MAC address	0:9:5b:a:ea:3	1:0:5e:b:6f:a	ff:ff:ff:ff:ff:ff

ANS1:

When there is a multicast packet to send, the multicast destination IP address is directly mapped to an Ethernet multicast address. Only the last 23 bits of the Class D IP address is mapped into the multicast MAC address. As a result, 2^5=32 Class D IP addresses will be mapped to the same Ethernet multicast address. Then the two multicast frames captured have the same destination MAC address, because the last 23 bits in the group address of the two frames are same with each other.

Exercise 5

```
[guest@fenchi TengZhang_0536650]$ sudo tcpdump ip multicast
Password:
tcpdump: listening on eth0
22:22:08.874430 128.238.66.100.1501 > 224.111.111.111.1500: udp 38
(DF) [ttl 1]
22:22:08.874613 128.238.66.100.1501 > 224.111.111.111.1500: udp 38
(DF) [ttl 1]
22:22:08.874614 128.238.66.100.1501 > 224.111.111.111.1500: udp 38
(DF) [ttl 1]
22:22:08.874677 128.238.66.100.1501 > 224.111.111.111.1500: udp 38
(DF) [ttl 1]
22:22:26.927124 128.238.66.100.1501 > 224.111.111.111.1500: udp 38
(DF) [ttl 1]

[guest@fenchi guest]$ netspy 224.111.111.111 1500
Netspy : listening to mgroup 224.111.111.111:1500
   == : guest logged on to shakti at 07:26 PM
   == : guest logged on to shakti at 07:27 PM
   == : guest logged on to shakti at 07:56 PM
   == : guest logged on to shakti at 08:11 PM
   == : guest logged on to shakti at 08:29 PM
   == : guest logged out from shakti at 08:29 PM
```

ANS:

1) 5 messages are sent to each host. 5 messages are received in total.

2) Yes, it is. Because Shakti is also in the same multicast group with others. It is through the interface, Lo, that Shakti receives the datagram.
