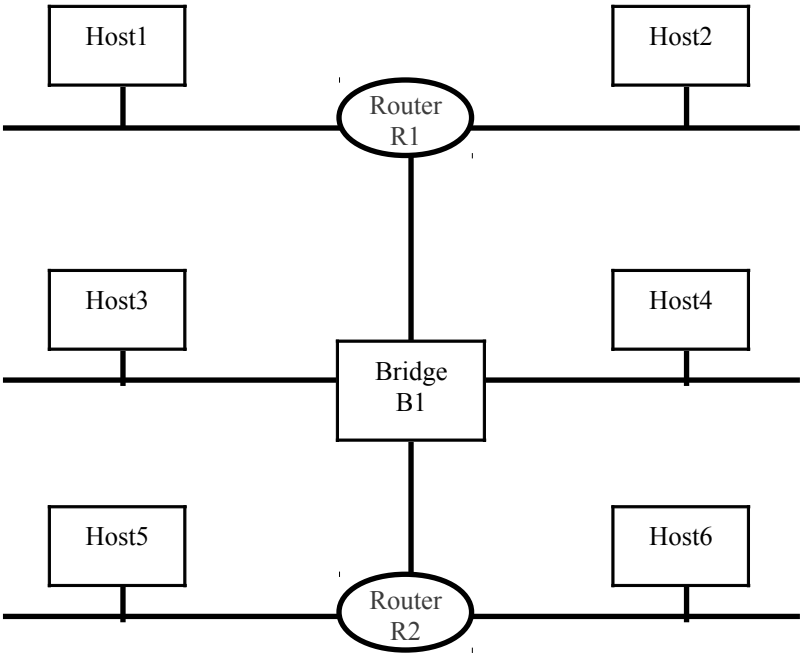
Homework 1
CS530 Advanced Networks

Question 1

A company has the class C address 194.87.18.0 to address its proper network represented in the figure below. Complete on the figure the addresses of each subnet with correspondent masks and the addresses of equipments connected to these subnets. Give the routing table for router R1.



R1 Routing Table

Question 2

The following packets are captured on an Ethernet/IEEE 802.3 network using tcpdump program. Analyze the content of these packets by using IP, ARP, ICMP, UDP, TCP, RIP, OSPF, and BGP packet formats. For each protocol, show the content of all fields using appropriate notation. Don't forget to mention high-level protocol when it is possible.

Packet 1

```
4500 0034 251b 0000 0111 f2eb c0a8 0101
e000 0009 0208 0208 0020 25db 0202 0000
0002 0000 0a0a 2900 ffff ff00 0000 0000
0000 0001
```

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

Packet 2

```
45c0 0054 b837 0000 0159 ed20 0a0a 292a
e000 0005 0201 0040 c0a8 0302 0000 0000
0628 0000 0000 0000 0000 0000 ffff ff00
000a 0201 0000 0028 0a0a 292a 0a0a 2927
c0a8 0101 c0a8 0102 c0a8 0201 c0a8 0202
c0a8 0301
```

.....
.....
.....
.....
.....
.....
.....
.....
.....

.....
.....
.....
.....
.....
.....
.....

Packet 3

```
45c0 00fc 254b 0000 0159 0f4b c0a8 0101
c0a8 0102 0202 00e8 c0a8 0101 0000 0000
4660 0000 0000 0000 0000 0000 05dc 0202
4ecc add0 0271 0201 0a0a 2926 0a0a 2926
8000 0004 4075 0024 0354 0201 c0a8 0101
c0a8 0101 8000 00e2 ae94 0030 0375 0201
c0a8 0102 c0a8 0102 8000 00d7 953a 0024
0329 0201 c0a8 0201 c0a8 0201 8000 00d3
548c 0030 010e 0201 c0a8 0202 c0a8 0202
8000 00d4 6a71 0030 0329 0201 c0a8 0301
c0a8 0301 8000 00cf 944a 0030 010e 0201
c0a8 0302 c0a8 0302 8000 00d4 a233 0030
010e 0202 0a0a 292a c0a8 0302 8000 000c
74d7 002c 0307 0202 c0a8 0201 c0a8 0201
8000 00bf 1fc9 0020 0289 0202 c0a8 0301
c0a8 0301 8000 00bf 23c1 0020
```

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

Packet 4

45c0 0044 ecbd 0000 0159 6582 0a0a 2925
0a0a 2929 0203 0030 c0a8 0101 0000 0000
2d78 0000 0000 0000 0000 0000 0000 0001
c0a8 0301 c0a8 0301 0000 0001 c0a8 0302
c0a8 0302

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

Packet 5

```
45c0 0190 b229 0000 0159 9ecd 0a0a 2926
0a0a 2925 0204 017c c0a8 0102 0000 0000
39ea 0000 0000 0000 0000 0000 0000 0008
01cf 0201 c0a8 0102 c0a8 0102 8000 0071
f84c 0030 0000 0002 0a0a 292a 0a0a 2926
0200 000a c0a8 0101 c0a8 0102 0200 000a
01d1 0201 c0a8 0201 c0a8 0201 8000 006d
2126 0030 0000 0002 0a0a 292a 0a0a 2927
0200 000a c0a8 0201 c0a8 0201 0200 000a
01d2 0201 c0a8 0202 c0a8 0202 8000 006a
3f07 0030 0000 0002 0a0a 292a 0a0a 2928
0200 000a c0a8 0201 c0a8 0202 0200 000a
01d2 0201 c0a8 0301 c0a8 0301 8000 0069
61e3 0030 0000 0002 0a0a 292a 0a0a 2929
0200 000a c0a8 0301 c0a8 0301 0200 000a
01d1 0201 c0a8 0302 c0a8 0302 8000 006a
77c8 0030 0000 0002 0a0a 292a 0a0a 292a
0200 000a c0a8 0301 c0a8 0302 0200 000a
01d1 0202 0a0a 292a c0a8 0302 8000 0065
f988 0030 ffff ff00 c0a8 0101 c0a8 0102
c0a8 0201 c0a8 0202 c0a8 0301 c0a8 0302
0435 0202 c0a8 0201 c0a8 0201 8000 005f
df69 0020 ffff ff00 c0a8 0201 c0a8 0202
03b6 0202 c0a8 0301 c0a8 0301 8000 005f
e361 0020 ffff ff00 c0a8 0301 c0a8 0302
```

Packet 6

```
45c0 0068 6827 0000 0159 3d1f 0a0a 2928
e000 0005 0205 0054 c0a8 0202 0000 0000
0e57 0000 0000 0000 0000 0000 0001 0202
0a0a 292a c0a8 0302 8000 0008 7cd3 002c
0001 0201 c0a8 0302 c0a8 0302 8000 00d0
aa2f 0030 0001 0201 0a0a 2926 0a0a 2926
8000 0002 99aa 0024
```

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

Packet 7

```
4500 0047 2950 4000 0106 e9fe 0a0a 2925
0a0a 292a 00b3 dfaf a9f2 697d 0a0b 7764
8018 8218 a1c5 0000 0101 080a 1508 54b6
1506 f447 ffff ffff ffff ffff ffff ffff
ffff ffff 0013 04
```

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

Question 3

The following two frames were captured over an Ethernet/IEEE 802.3 network using tcpdump respectively on the hosts 10.2.127.11 and 10.2.127.3. The CRCs of the frames are not displayed.

Frame 1 *(received on host 10.2.127.11)*

```
000f fea6 e743 000f fea6 e84c 0800 4510
0040 018d 4000 4006 2709 0a02 7f03 0a02
7f0b f257 0017 918b 996e 0000 0000 b002
ffff 2287 0000 0204 05b4 0103 0301 0101
080a 0658 dea6 0000 0000 0402 0000
```

Frame 2 *(received on host 10.2.127.3)*

```
000f fea6 e84c 000f fea6 e743 0800 4500
0028 55bd 4000 4006 d300 0a02 7f0b 0a02
7f03 0017 f257 0000 0000 918b 996f 5014
0000 8054 0000 0000 0000 0000
```

1) What is the type of the two frames (Ethernet or IEEE 802.3)? Argue your answer.

……
……
……

2) If someone tells you that the Ethernet cards used to send these frames have different constructors, do you agree with him? Argue your answer.

……
……
……

3) If someone tells you that the second frame is an acknowledgement of the first frame at the Ethernet level, do you agree with him? Argue your answer.

……
……
……

4) What is the network protocol transported by these frames?

……
……
……

5) How many padding bytes are there in each frame? Argue your answer.

……
……
……

6) If someone tells you that the network packet transported in the second frame is an acknowledgement of the network packet transported in the first frame at the network level, do you agree with him? Argue your answer.

……
……
……

7) What is the MAC address of the host 10.2.127.11?

……
……
……

8) If someone tells you that the two hosts may have been configured with a netmask of 255.255.255.248, do you agree with him? Argue your answer.

……
……
……

9) What is the transport layer protocol transported by these frames?

……
……
……

10) If someone tells you that the transport segment transported in the second frame is an acknowledgement of the transport segment transported in the first frame at the transport level, do you agree with him? Argue your answer.

……
……
……

11) What is the type of the transport layer segment (Connection Setup, Data transfer, Connection Release) of the first frame? Explain.

……
……
……

12) What is the application layer protocol transported by this frame and how many bytes in the first frame belong to that protocol?

……
……
……

Question 4

The left table below shows the content of a non-optimized routing table. Using CIDR (Classless Inter-Domain Routing), give in the right table the new content of the routing table after aggregation.

Destination	**Next-Hop**
132.11.0.0/16	195.123.2.1
132.12.0.0/16	195.123.2.1
193.26.34.0/24	194.56.42.1
193.26.35.0/24	194.56.42.1
193.26.36.0/24	194.56.42.1
193.26.37.0/24	194.56.42.1
195.12.16.0/24	195.34.62.1
195.12.17.0/24	195.34.62.1
195.12.18.0/24	195.34.62.1
195.12.19.0/24	195.26.43.1
195.12.20.0/24	195.26.43.1
195.12.21.0/24	195.26.43.1
195.12.22.0/24	195.34.62.1
195.12.23.0/24	195.34.62.1
195.12.24.0/24	195.34.62.1

Destination	**Next-Hop**

Question 5

The left table below shows the content of a non-optimized routing table. Using CIDR (Classless Inter-Domain Routing), give in the right table the new content of the routing table after aggregation.

Destination	**Next-Hop**
120.30.0.0/16	193.4.5.1
120.31.0.0/16	193.4.5.1
194.50.64.0/24	194.3.26.1
194.50.65.0/24	194.3.26.1
194.50.66.0/24	194.3.26.1
194.50.67.0/24	194.3.26.1
195.38.32.0/24	195.15.16.1
195.38.33.0/24	195.15.16.1
195.38.34.0/24	195.15.16.1
195.38.35.0/24	195.15.16.1
195.38.36.0/24	195.15.16.2
195.38.37.0/24	195.15.16.2
195.38.38.0/24	195.15.16.2
195.38.39.0/24	195.15.16.2

Destination	**Next-Hop**

Question 6

The following frame was received over an Ethernet/IEEE 802.3 network. The CRC of the frame is not displayed.

Frame

```
ffff ffff ffff 00c0 9fdf 7139 0806 0001
0800 0604 0001 00c0 9fdf 7139 c0a8 fe01
0000 0000 0000 c0a8 0101 0000 0000 0000
0000 0000 0000 0000 0000 0000
```

1) From the given data, can you give the value of the last received bit of the whole frame? Explain.

   ……
   ……
   ……

2) What is the destination MAC address of the frame and what is its type?

   ……
   ……
   ……

3) What is the source MAC address of the frame and what is its type?

   ……
   ……
   ……

4) What is the type of the received frame (Ethernet or IEEE 802.3)?

   ……
   ……
   ……

5) What is the maximal size of an Ethernet/IEEE 802.3 frame?

   ……
   ……
   ……

6) Why an Ethernet/IEEE 802.3 should have a maximal size?

   ……
   ……
   ……

7) What is the next protocol that will process the data field of the frame?

……
……
……

8) What is the most high level protocol transported by this frame and what is its purpose?

……
……
……

9) Are there any padding bytes in this frame? If your response is yes, how many padding bytes are present in the frame?

……
……
……

10) What is the net/subnet id and net/subnetmask of the network? Explain.

……
……
……

11) What is the type of the equipment that had sent this frame?

……
……
……

12) What are the potential receivers of this frame?

……
……
……