**Chapter 6 Network Layer**

1. Convert the IP address whose hexadecimal representation is C22F1582 to dotted decimal notation

194.47.21.130

1. A router has the following (CIDR entries) in its routing table

|  |  |
| --- | --- |
| Address/mask | Next hop |
| 135.46.56.0/22 | 211.90.0.1 |
| 135.46.60.0/22 | 159.48.0.1 |
| 192.53.40.0/23 | 192.188.0.1 |
| default | 220.20.0.1 |

135.46.56.0/22: 135.46.56.0 ~ 135.46.59.255

135.46.60.0/22: 135.46.60.0 ~ 135.46.63.255

192.53.40.0/23: 192.53.40.0 ~ 192.53.41.255

Write correct IP addresses of next hop

|  |  |  |
| --- | --- | --- |
| No. | IP | Next hop |
| (a) | 135.46.63.10 | 159.48.0.1 |
| (b) | 135.46.57.14 | 211.90.0.1 |
| (c) | 135.46.52.2 | 220.20.0.1 |
| (d) | 192.53.40.7 | 192.188.0.1 |
| (e) | 192.53.56.7 | 220.20.0.1 |

1. A network on the Internet has a subnet mask of 255.255.240.0. What is the maximum number of addresses can be used for a single host?

4094 (这里240的二进制表示为11110000)，所以最大可变也就是后四位，以及最后那个8位，总共为12位，所以2^(12) = 4096。但是这里要考虑到全”0”和全”1”是不能作为IP地址的，所以4096 − 2 = 4094。

1. Suppose that host A is connected to a router R1, R1 is connected to another router, R2, and R2 is connected to host B. Suppose that a TCP message that contains 900 bytes of data and 20 bytes of TCP header is passed to the IP code at host A for delivery to B. Show the Total Length, MF, and Fragment offset fields of the IP header in each packet transmitted over the three links. Assume that link A-R1 can support a maximum frame size of 1024 bytes including a 14-byte frame header, link R1-R2 can support a maximum frame size of 512 bytes, including an 8-byte frame header, and link R2-B can support a maximum frame size of 512 bytes including a 12-byte frame header.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Link | Packet# | Total Length | MF | Fragment Offset |
| A->R1 | 1 | 940 | 0 | 0 |
| R1->R2 | 1 | 500 | 1 | 0 |
|  | 2 | 460 | 0 | 60 |
| R2->B | 1 | 500 | 1 | 0 |
|  | 2 | 460 | 0 | 60 |

1）这里总的长度要在TCP包大小的基础上再加上IP头部，所以总长度为900 + 20 + 20 = 940。

2）每个独立分片(Fragment)都要加上IP头部。

3）片偏移就是某片在原分组的相对位置，以8个字节为偏移单位。这就是说，每个分片的长度一定是8字节（64位）的整数倍。

4）MF: All fragments except the last one have this bit set!

5）因为“link R1-R2 can support a maximum frame size of 512 bytes, including an 8-byte frame header”，所以在R1-R2链路上最大能传输的是504字节，但是同时考虑到每个分片的长度一定是8字节的整数倍，所以在R1-R2链路上第一个分片的长度为480，再加上20字节IP头，就变成500；而片偏移量为480/8 = 60。剩下的fragment长度为920 − 480 = 440字节，再加上IP头20字节，总长度为460。

1. A large number of consecutive IP addresses are available starting at 198.16.0.0. Suppose that four organizations, A, B, C, and D, request 4000 2000, 4000, and 8000 addresses, respectively, and in that order. For each of these, give the first IP address assigned, the last IP address assigned, and the mask in w.x.y.z/s notation.

总共需要18000个IP地址，也就是IP的host部分需要15 bits表示，而network部分则为17 bits。

|  |  |  |  |
| --- | --- | --- | --- |
| Org# | First IP | Last IP | Net/mask |
| A | 198.16.0.0 | 198.16.15.255 | 198.16.0.0/20 |
| B | 198.16.16.0 | 198.16.23.255 | 198.16.16.0/21 |
| C | 198.16.32.0 | 198.16.47.255 | 198.16.32.0/20 |
| D | 198.16.64.0 | 198.16.95.255 | 198.16.64.0/19 |

7 6 5 4 3 2 1 0

1. How many bits does the address of IPV6 have?

128

1. Without using IPv6, which can solve the problem of running out of IP addresses?

a) class full address

b) subnetting

c) class addressing

d) NAT √

1. What is the valid host range for subnet 172.16.10.16 mask 255.255.255.240?

a) 172.16.10.20 ~ 172.16.10.22

b) 172.16.10.16 ~ 172.16.10.23

c) 172.16.10.17 ~ 172.16.10.31

d)172.16.10.17 ~ 172.16.10.30 √

注意这道题中IP地址只有最后四位可以变动，理论上讲应该有15种不同IP地址，但是全“0”和全“1”不是有效的IP地址。

9) The checksum in the IP packet covers just the header.

a) just the header √

b) just the data

c) the header and the data

d) just the source and destination addresses

1. A router has two IP interfaces, one IP address is 192.168.11.25/24, and the other IP address is (assume use the same subnet mask).既然路由器有两个界面，则说明这两个IP地址应该属于两个不同子网。另外最后全零和全1是不能作为IP地址的。用排除法最后的选择应该是d。
2. 192.168.13.0
3. 192.168.11.26
4. 192.168.13.255
5. 192.168.13.26 √
6. Suppose two hosts A and B have IP address 10.10.1.10 and 10.10.2.10, respectively. If they are in a same subnet, what is the subnet mask?

255.255.0.0

1. Which IP address is a loopback address?
2. 1.0.0.1
3. 192.168.0.1
4. 127.0.0.1√
5. 172.0.0.1
6. Which is not the private address that will not appear in Internet datagram?
7. 10.3.18.82
8. 192.168.8.3
9. 10.214.0.1
10. 172.33.8.8√

书本上Fig.5-53 IP address formats

1. Which protocol is used in command “ping 10.214.8.9”?
2. ARP
3. ICMP√
4. RARP
5. ECHO
6. Which is not a legal IPV6 address?
7. 8300::1382:4567:89AB:CDEF
8. 1382:4567:89AB:CDEF√
9. ::211.31.20.46
10. 2A43:0000:0000:0000:0123:4567:89AB:CDEF