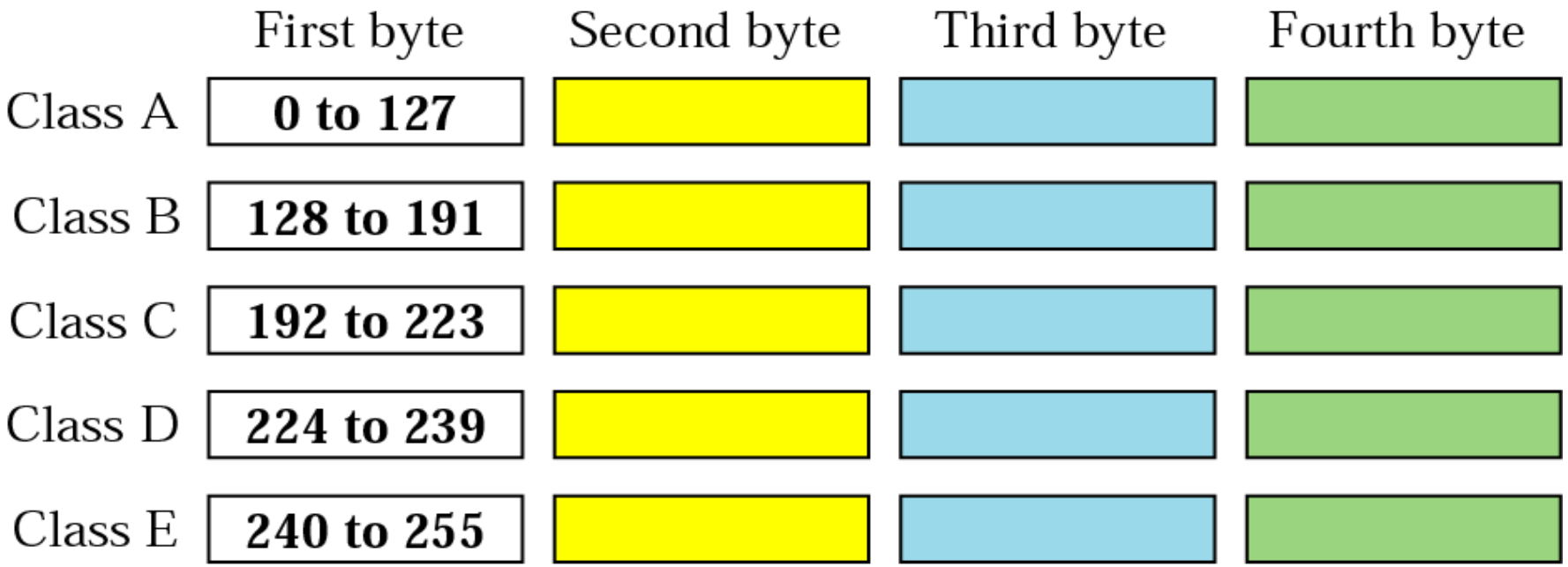
Figure 19.12 Finding the class in decimal notation



Example 4

Find the class of each address:

a. **227**.12.14.87

b. **252**.5.15.111

c. **134**.11.78.56

Solution

a. The first byte is 227 (between 224 and 239); the class is D.
b. The first byte is 252 (between 240 and 255); the class is E.
c. The first byte is 134 (between 128 and 191); the class is B.

Figure 19.13 Netid and hostid

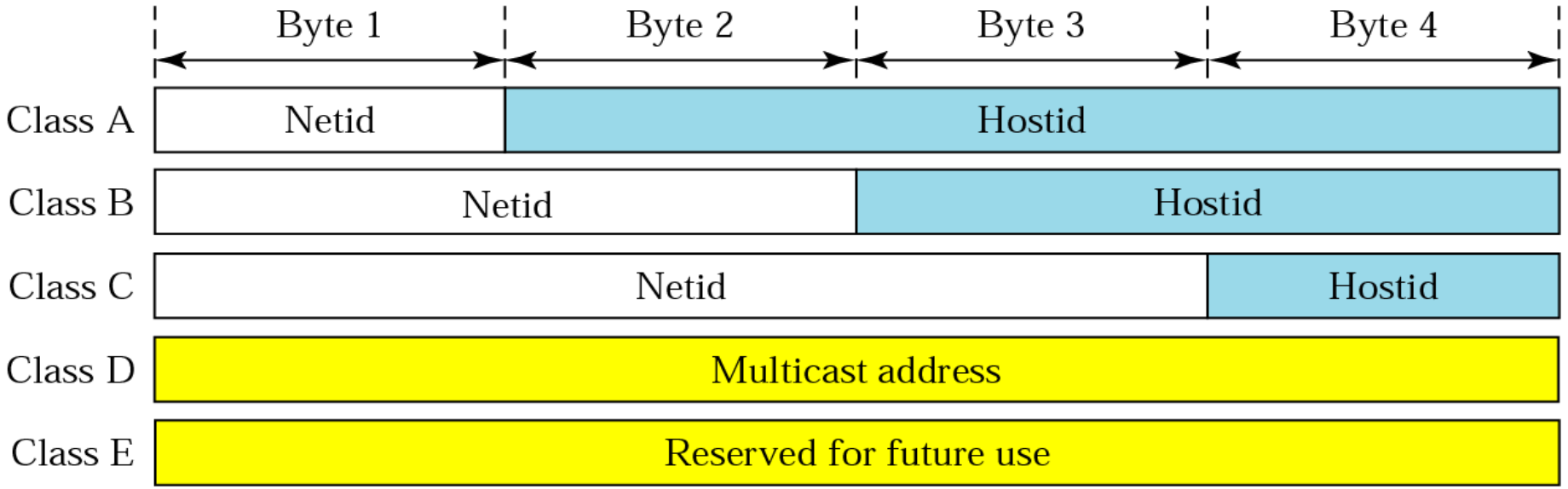
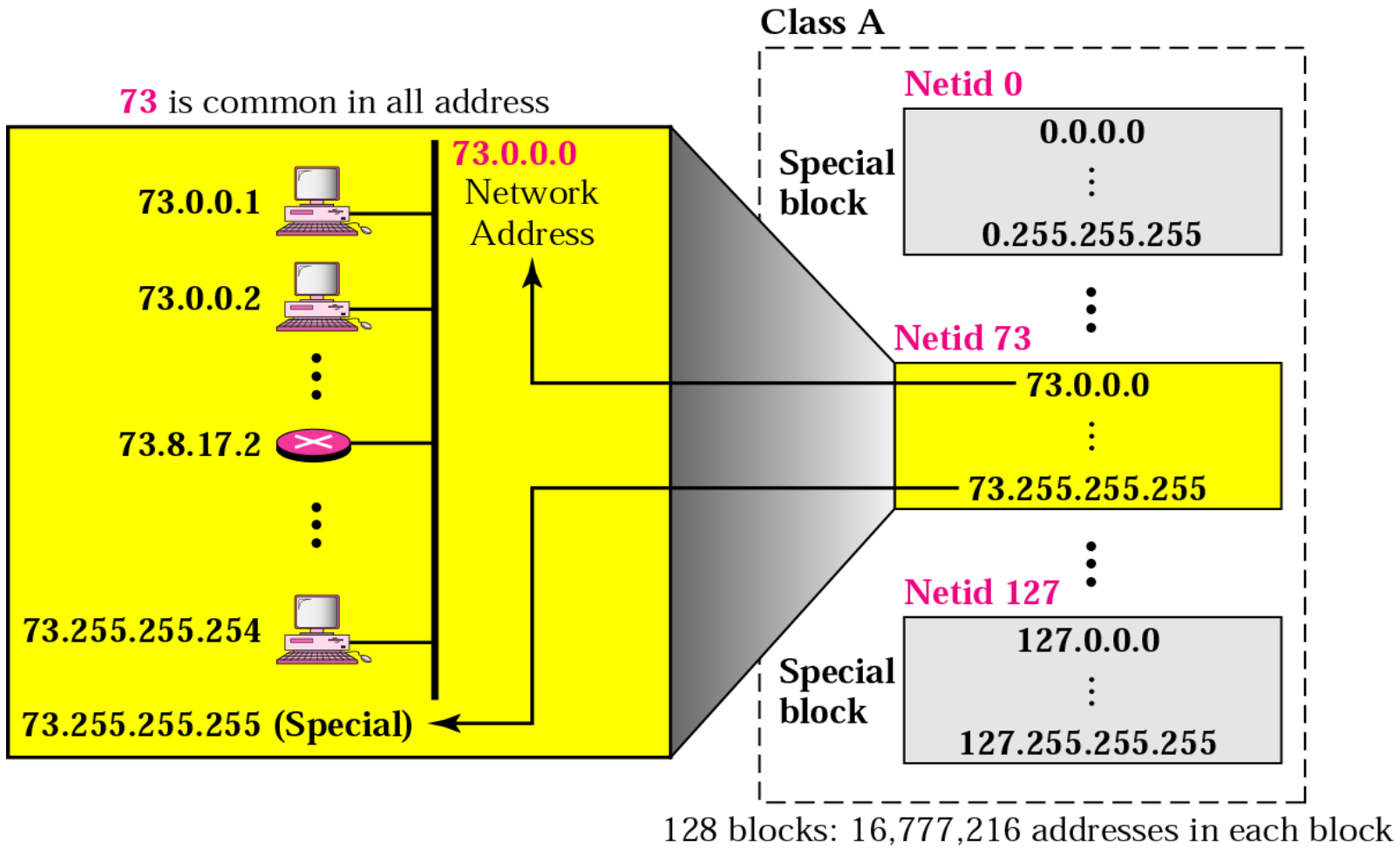
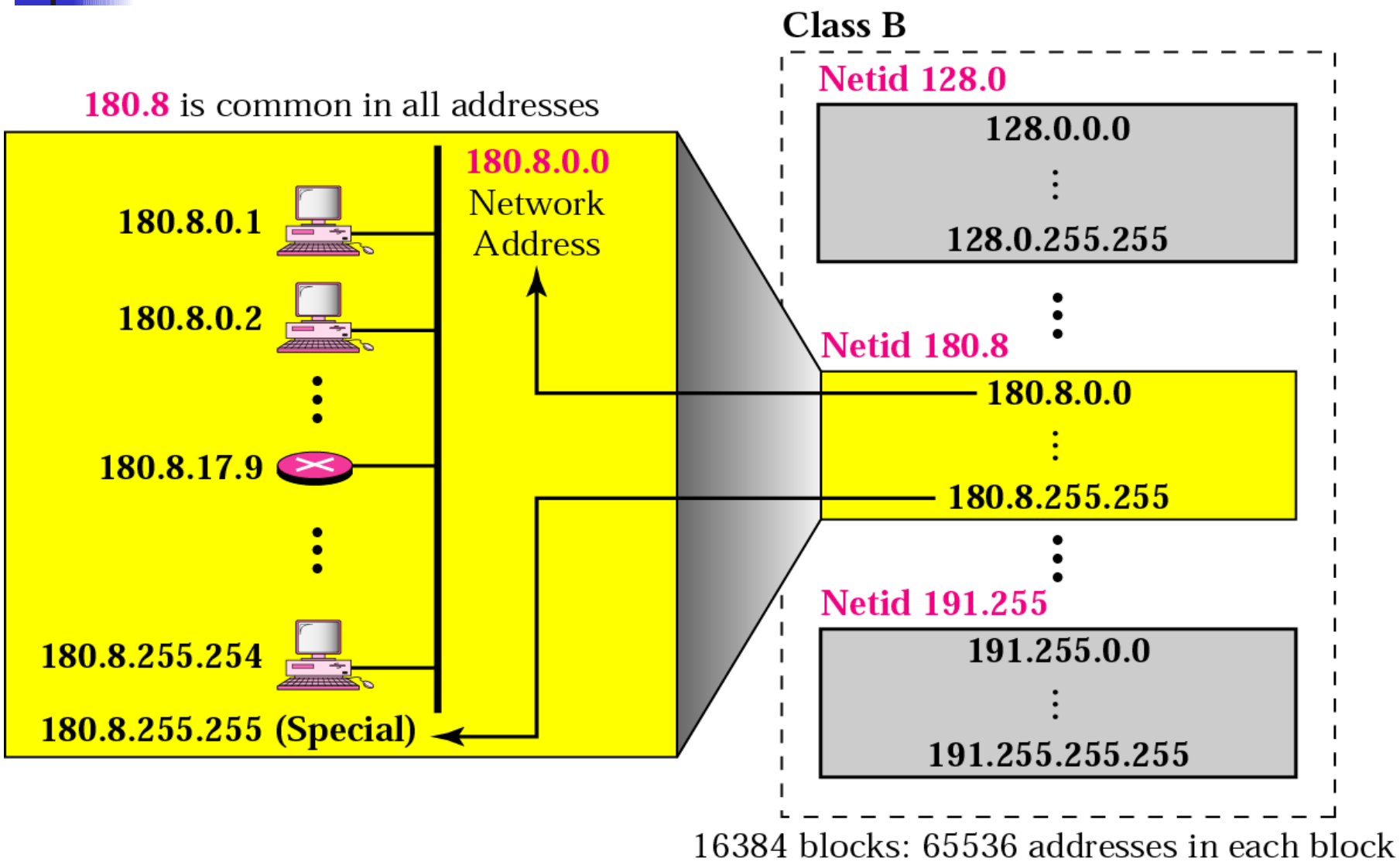


Figure 19.14 Blocks in class A



Millions of class A addresses are wasted.

Figure 19.15 Blocks in class B



Many class B addresses are wasted.

The number of addresses in class C is smaller than the needs of most organizations.

Figure 19.16 Blocks in class C

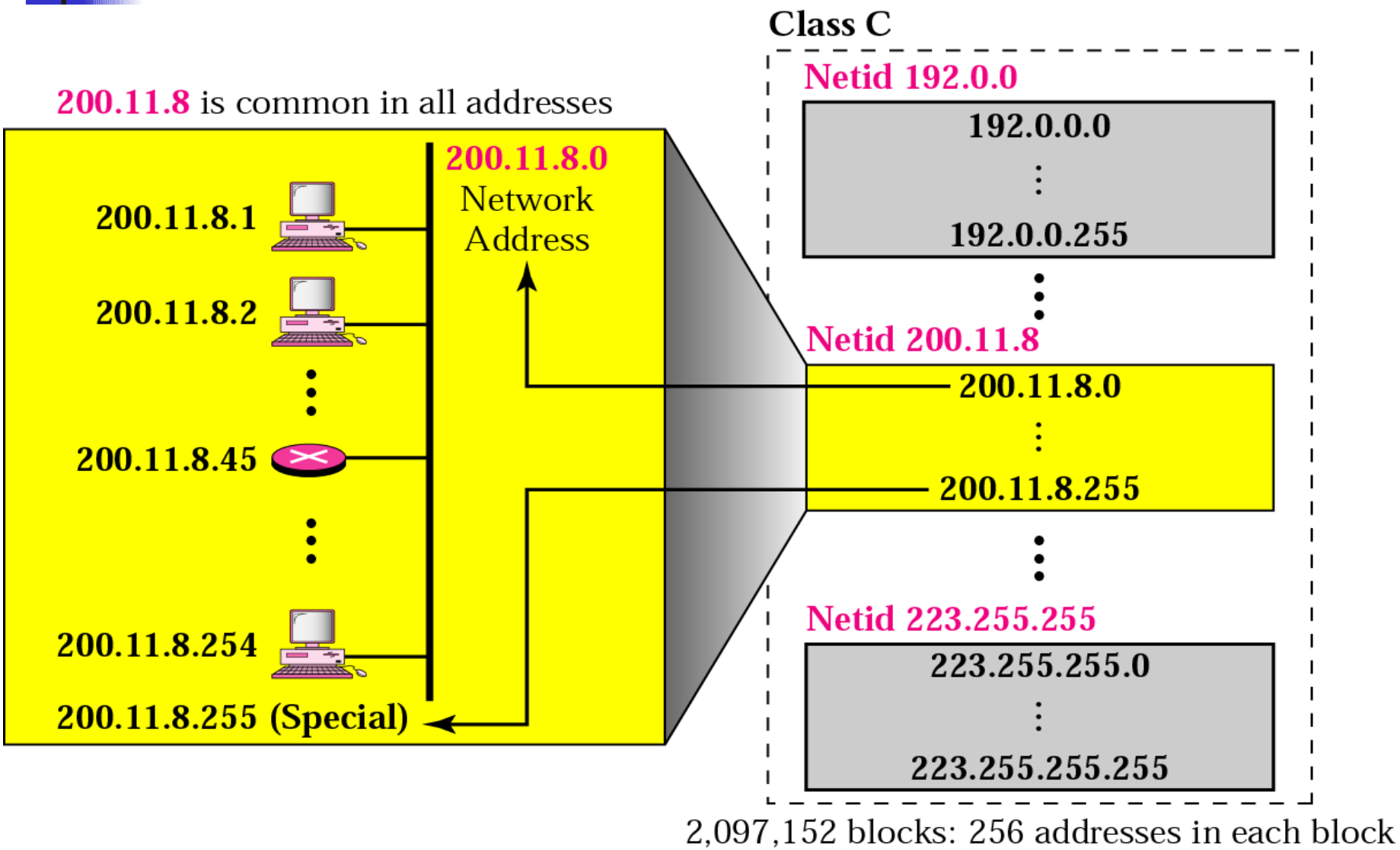
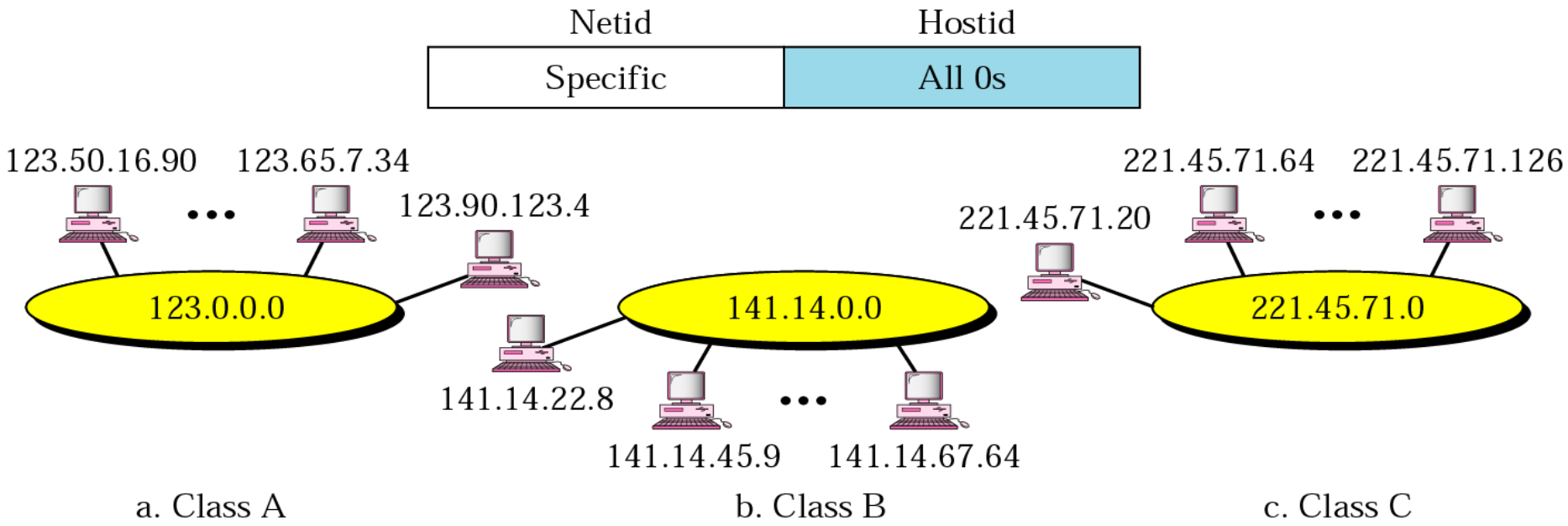


Figure 19.17 Network address



Note:

In classful addressing, the network address is the one that is assigned to the organization.

Example 5

Given the address 23.56.7.91, find the network address.

Solution

The class is A. Only the first byte defines the netid. We can find the network address by replacing the hostid bytes (56.7.91) with 0s. Therefore, the network address is 23.0.0.0.

Example 6

Given the address 132.6.17.85, find the network address.

Solution

The class is B. The first 2 bytes defines the netid. We can find the network address by replacing the hostid bytes (17.85) with 0s. Therefore, the network address is 132.6.0.0.

Example 7

Given the network address 17.0.0.0, find the class.

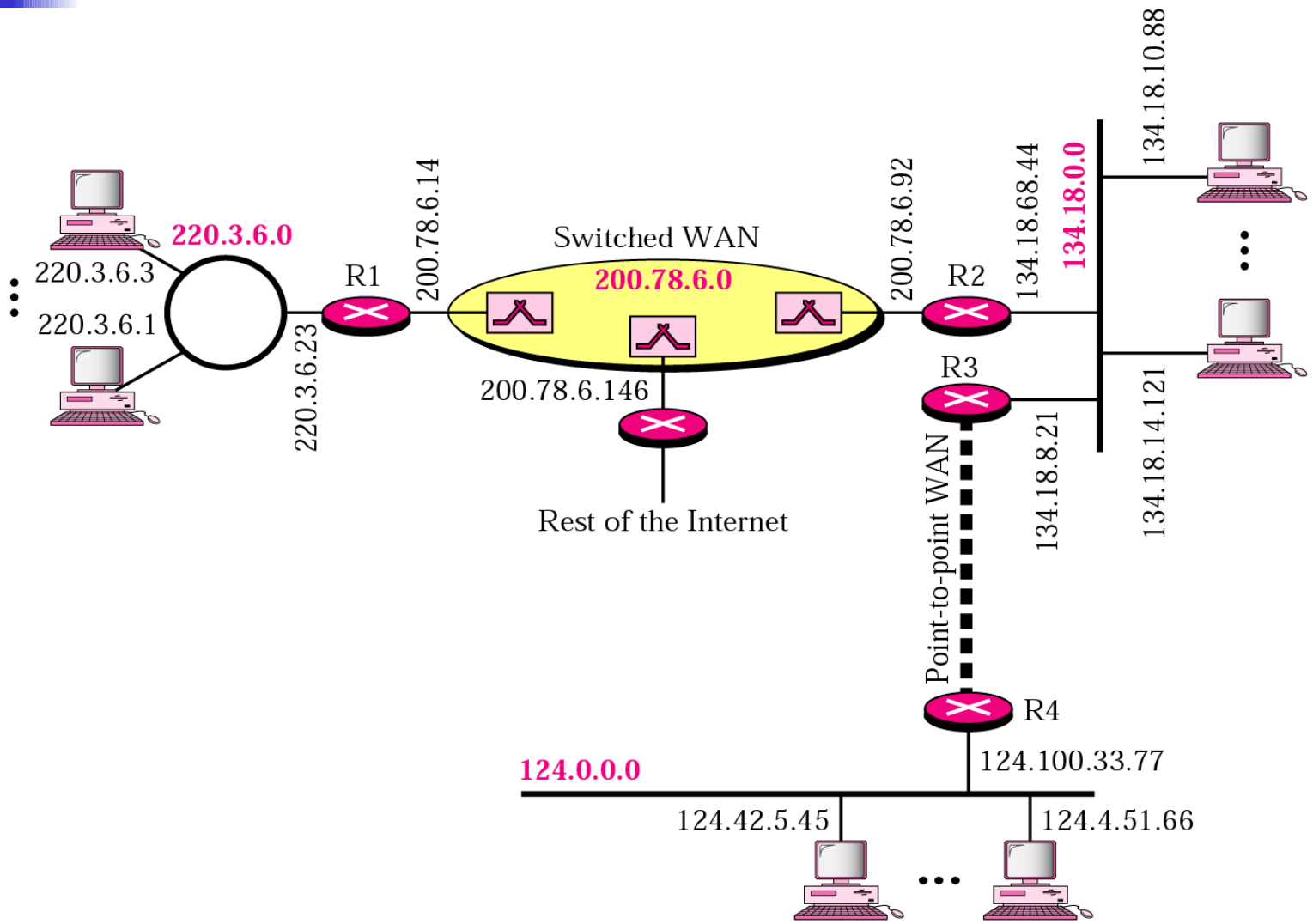
Solution

The class is A because the netid is only 1 byte.

Note:

A network address is different from a netid. A network address has both netid and hostid, with 0s for the hostid.

Figure 19.18 Sample internet



IP addresses are designed with two levels of hierarchy.

Figure 19.19 A network with two levels of hierarchy

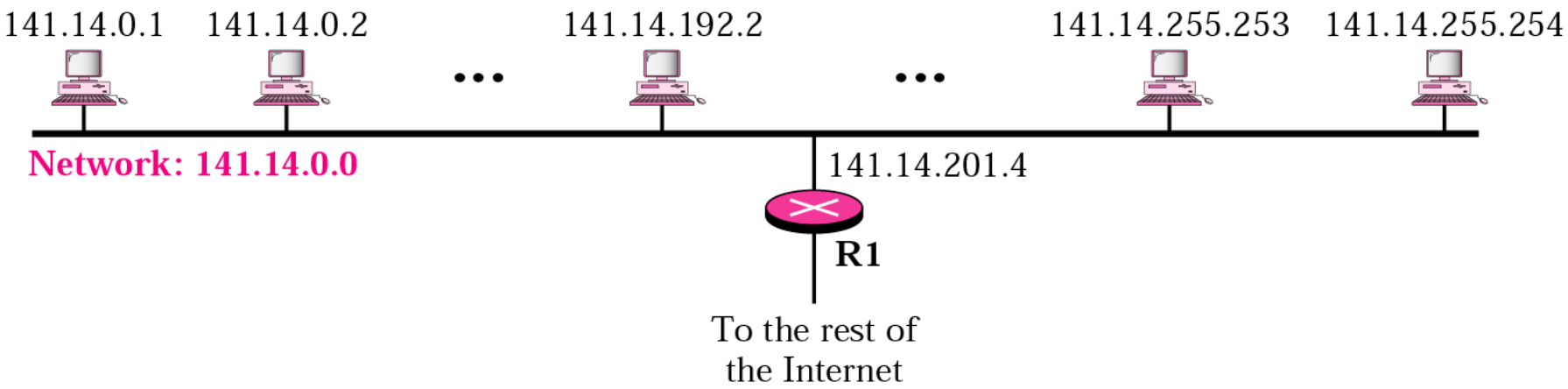


Figure 19.20 A network with three levels of hierarchy (subnetted)

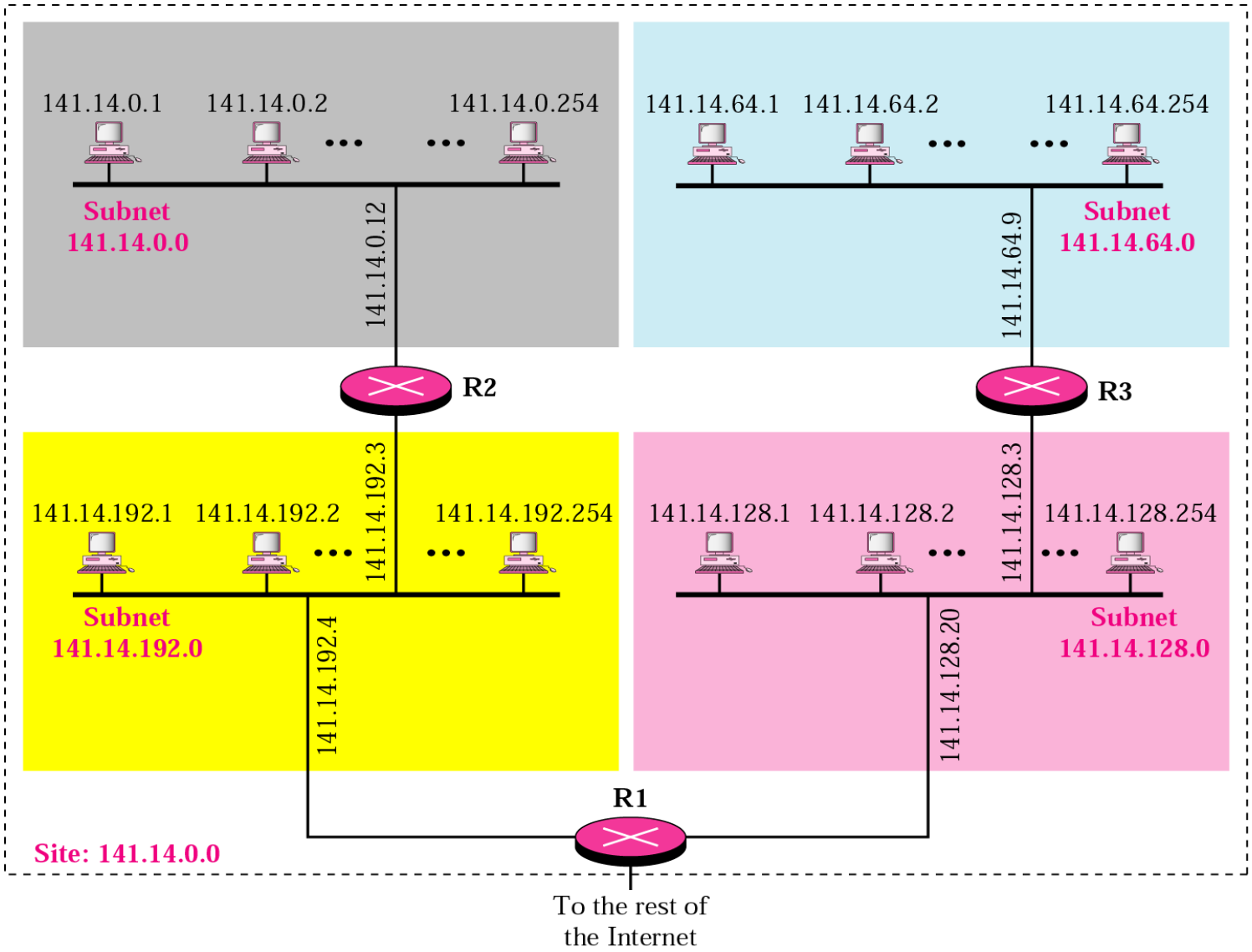


Figure 19.22 Hierarchy concept in a telephone number

Table 19.1 Default masks

Class	In Binary		In Dotted-Decimal	Using Slash
A	11111111 00000000	00000000 00000000	255.0.0.0	/8
B	11111111 11111111	00000000 00000000	255.255.0.0	/16
C	11111111 111111111	11111111 00000000	255.255.255.0	/24

Note:

The network address can be found by applying the default mask to any address in the block (including itself). It retains the netid of the block and sets the hostid to 0s.

Example 8

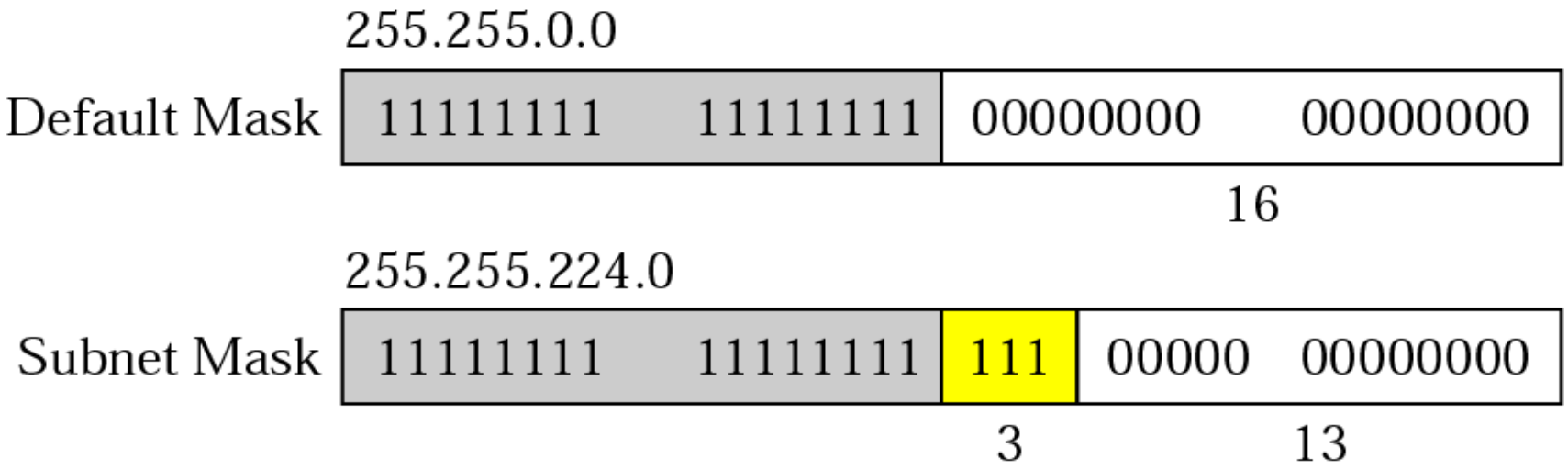
A router outside the organization receives a packet with destination address 190.240.7.91. Show how it finds the network address to route the packet.

Solution

The router follows three steps:

1. The router looks at the first byte of the address to find the class. It is class B.
2. The default mask for class B is 255.255.0.0. The router ANDs this mask with the address to get 190.240.0.0.
3. The router looks in its routing table to find out how to route the packet to this destination. Later, we will see what happens if this destination does not exist.

Figure 19.23 Subnet mask



Example 9

A router inside the organization receives the same packet with destination address 190.240.33.91. Show how it finds the subnetwork address to route the packet.

Solution

The router follows three steps:

1. **The router must know the mask. We assume it is /19, as shown in Figure 19.23.**
2. **The router applies the mask to the address, 190.240.33.91. The subnet address is 190.240.32.0.**
3. **The router looks in its routing table to find how to route the packet to this destination. Later, we will see what happens if this destination does not exist.**