IP Addresses

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INTRODUCTION

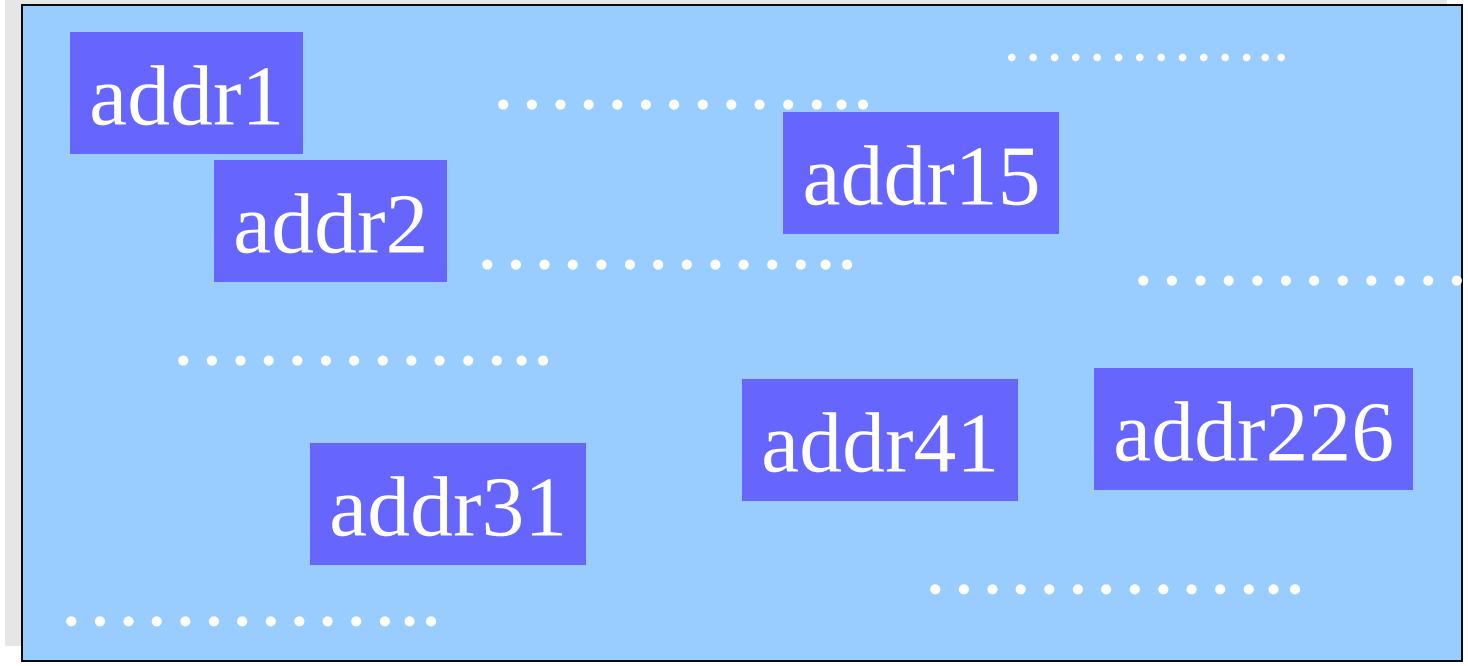
What is an IP Address?

An IP address is a 32-bit address.

Note

The IP addresses are unique.

Address Space



Address space rule

The address space in a protocol That uses N-bits to define an Address is:

$$2^N$$

IPv4 address space

The address space of IPv4 is

2^{32}

or

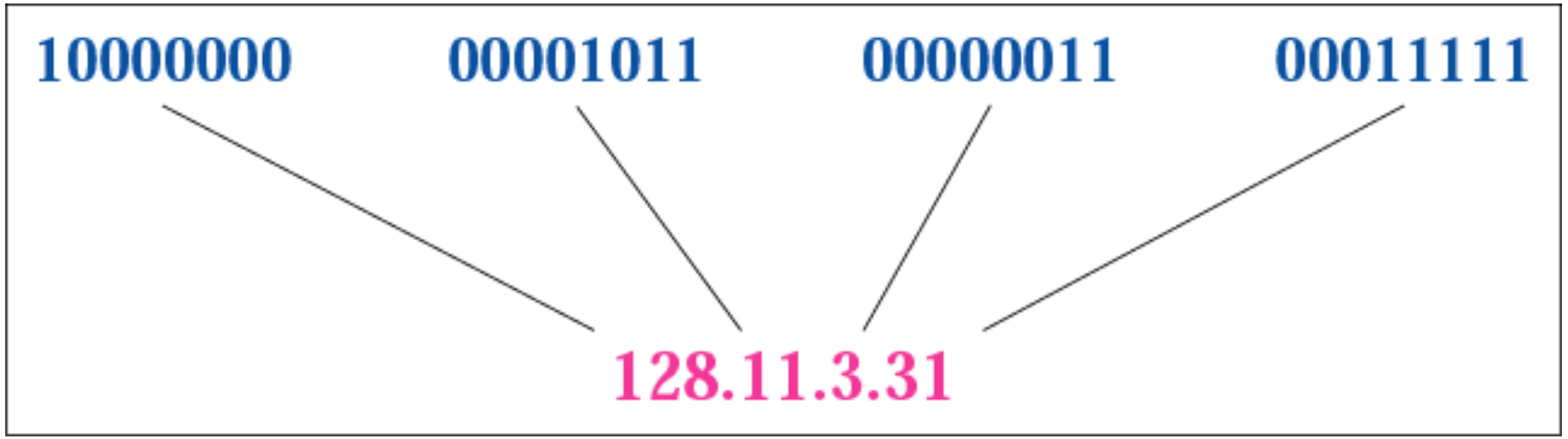
4,294,967,296.

Binary Notation

01110101 10010101 00011101 11101010

Figure 4-1

Dotted-decimal notation



Hexadecimal Notation

0111 0101 1001 0101 0001 1101 1110 1010

75 95 1D EA

0x75951DEA

Example 1

Change the following IP address from binary notation to dotted-decimal notation.

10000001 00001011 00001011 11101111

Solution

129.11.11.239

Example 2

Change the following IP address from dotted-decimal notation to binary notation:

111.56.45.78

Solution

01101111 00111000 00101101 01001110

Example 3

Find the error in the following IP Address
111.56.045.78

Solution

There are no leading zeroes in
Dotted-decimal notation (045)

Example 3 (continued)

Find the error in the following IP Address
75.45.301.14

Solution

In decimal notation each number <= 255
301 is out of the range

Example 4

Change the following binary IP address
Hexadecimal notation
10000001 00001011 00001011 11101111

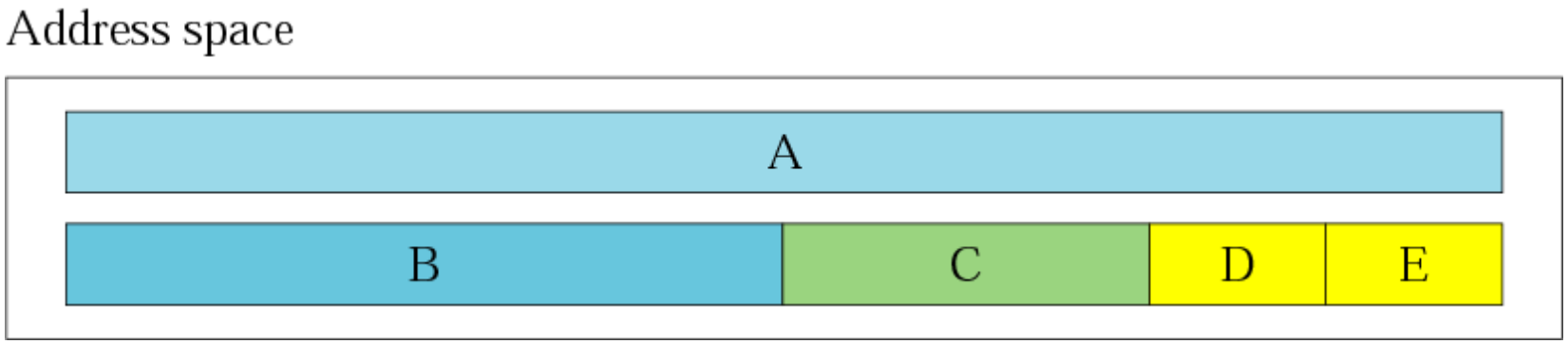
Solution

0X810B0BEF or 810B0BEF16

CLASSFUL ADDRESSING

Figure 4-2

Occupation of the address space



In classful addressing the address space is divided into 5 classes:

A, B, C, D, and E.

Figure 4-3

Finding the class in binary notation

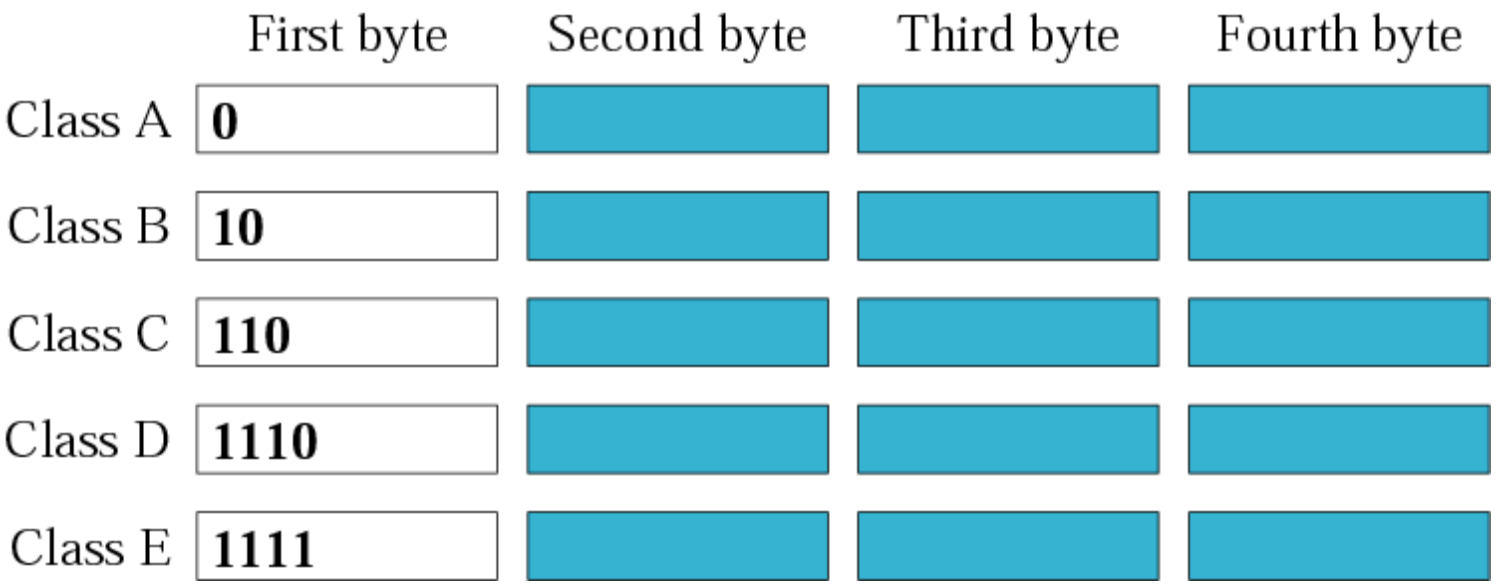
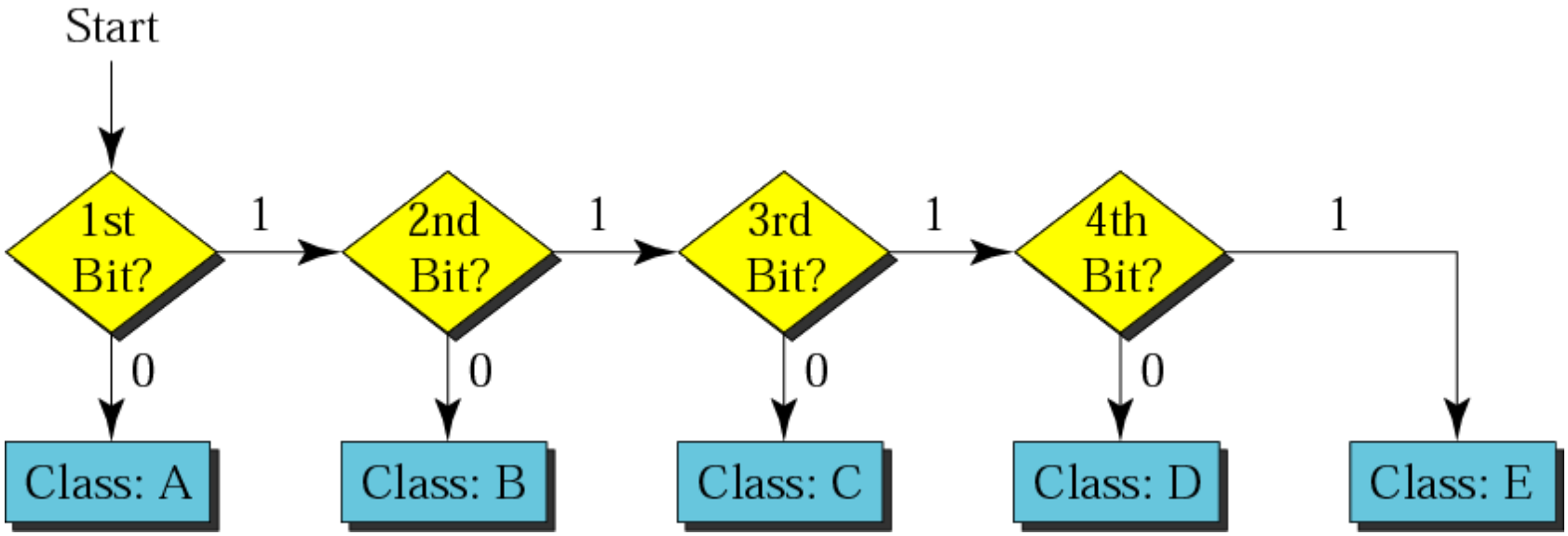


Figure 4-4

Finding the address class



Example 5

Show that Class ***A*** *has*
2^{31} = 2,147,483,648 addresses

Example 6

Find the class of the following IP addresses

00000001 00001011 00001011 11101111

11000001 00001011 00001011 11101111

Solution

- **0**0000001 00001011 00001011 11101111

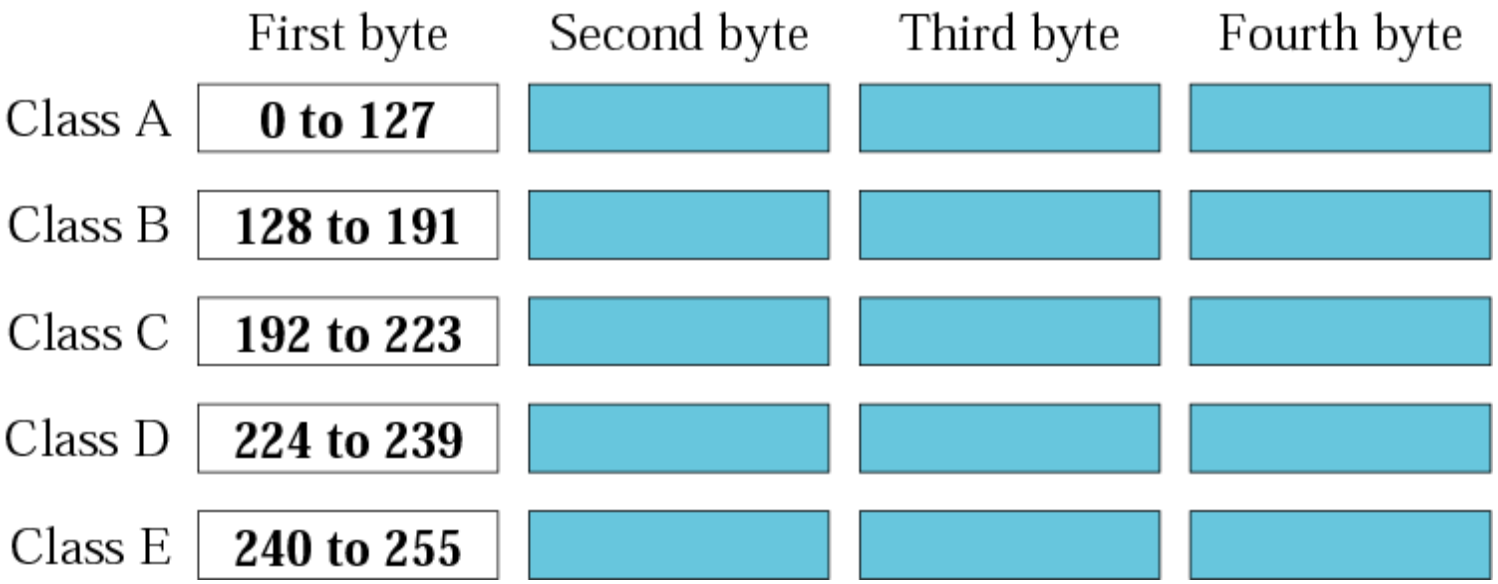
  1st is 0, hence it is Class A

- 11000001 00001011 00001011 11101111

  1st and 2nd bits are 1, and 3rd bit is 0 hence, Class C

Figure 4-5

Finding the class in decimal notation



Example 7

Find the class of the following addresses

158.223.1.108

227.13.14.88

Solution

- 158.223.1.108

1st byte = 158 (128<158<191) class B

- 227.13.14.88

1st byte = 227 (224<227<239) class D

IP address with appending port number

- 158.128.1.108:25
- the for octet before colon is the IP address
- The number of colon (25) is the port number

Figure 4-6

Netid and hostid

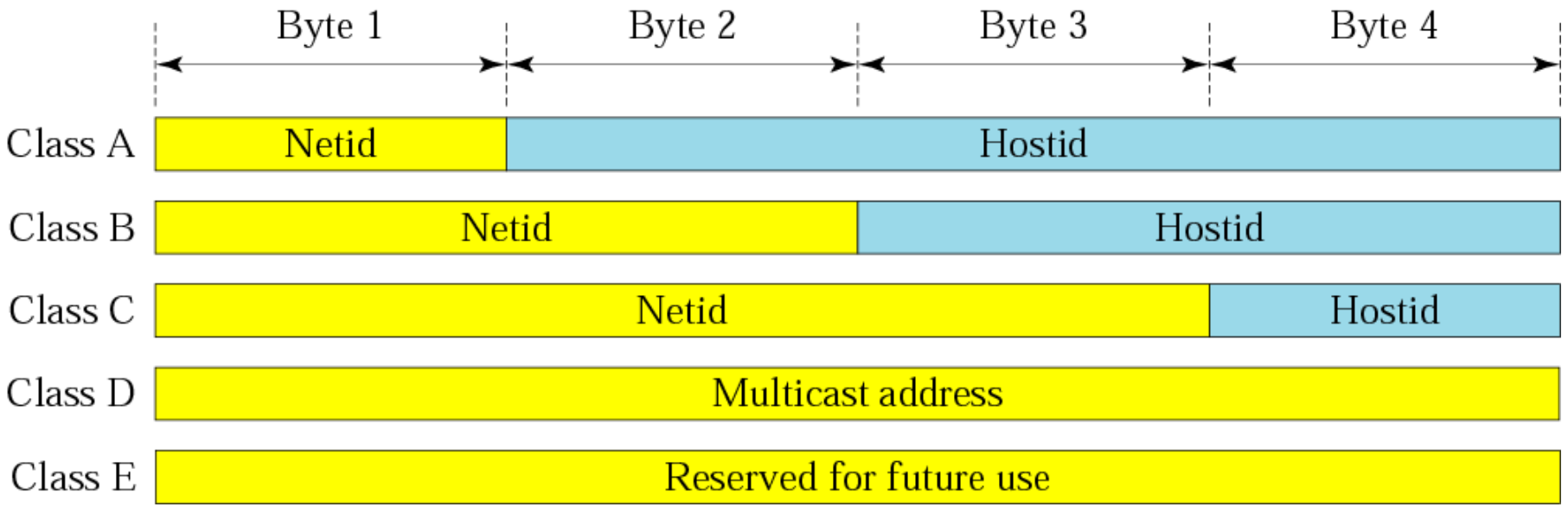
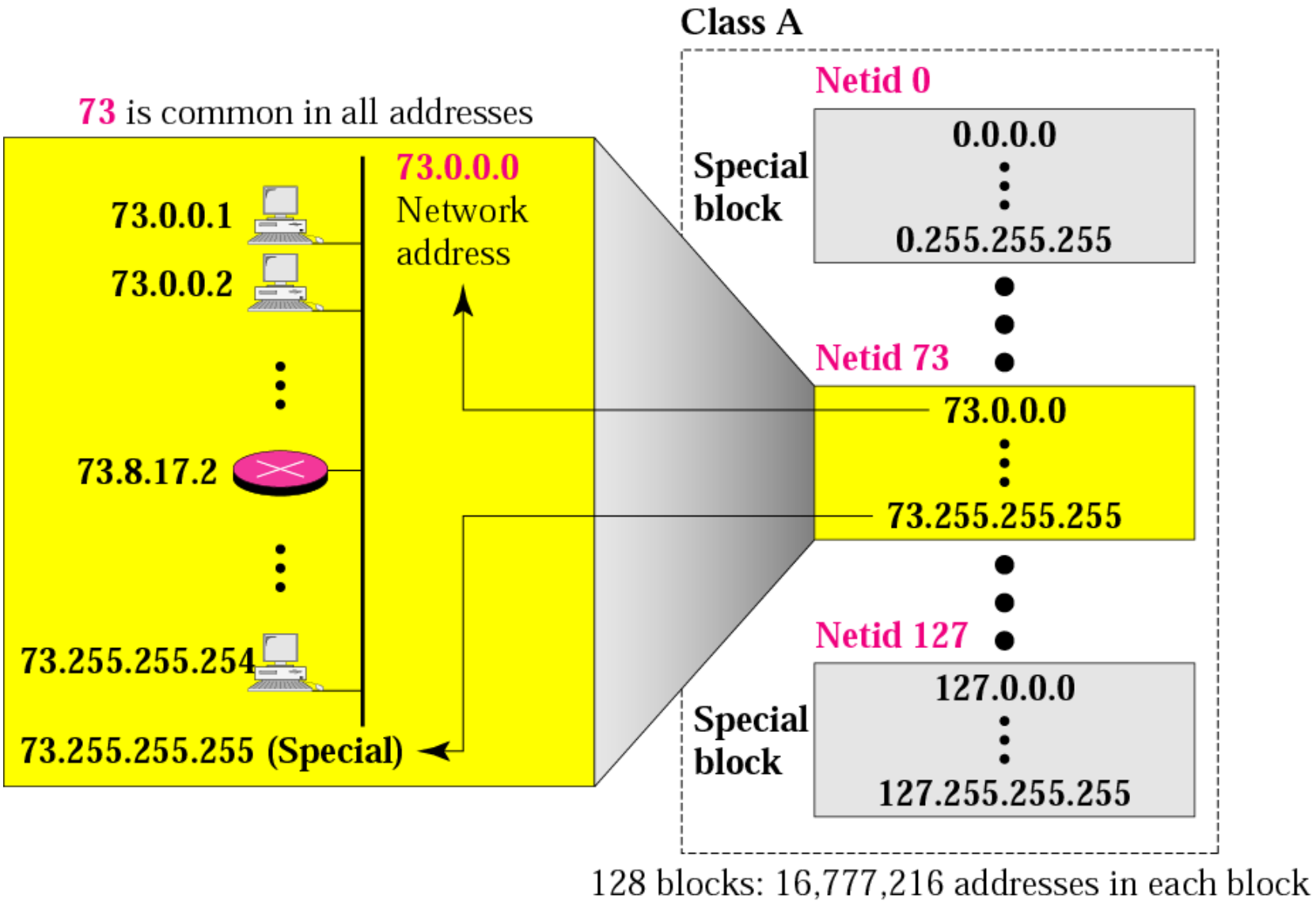


Figure 4-7

Blocks in class A

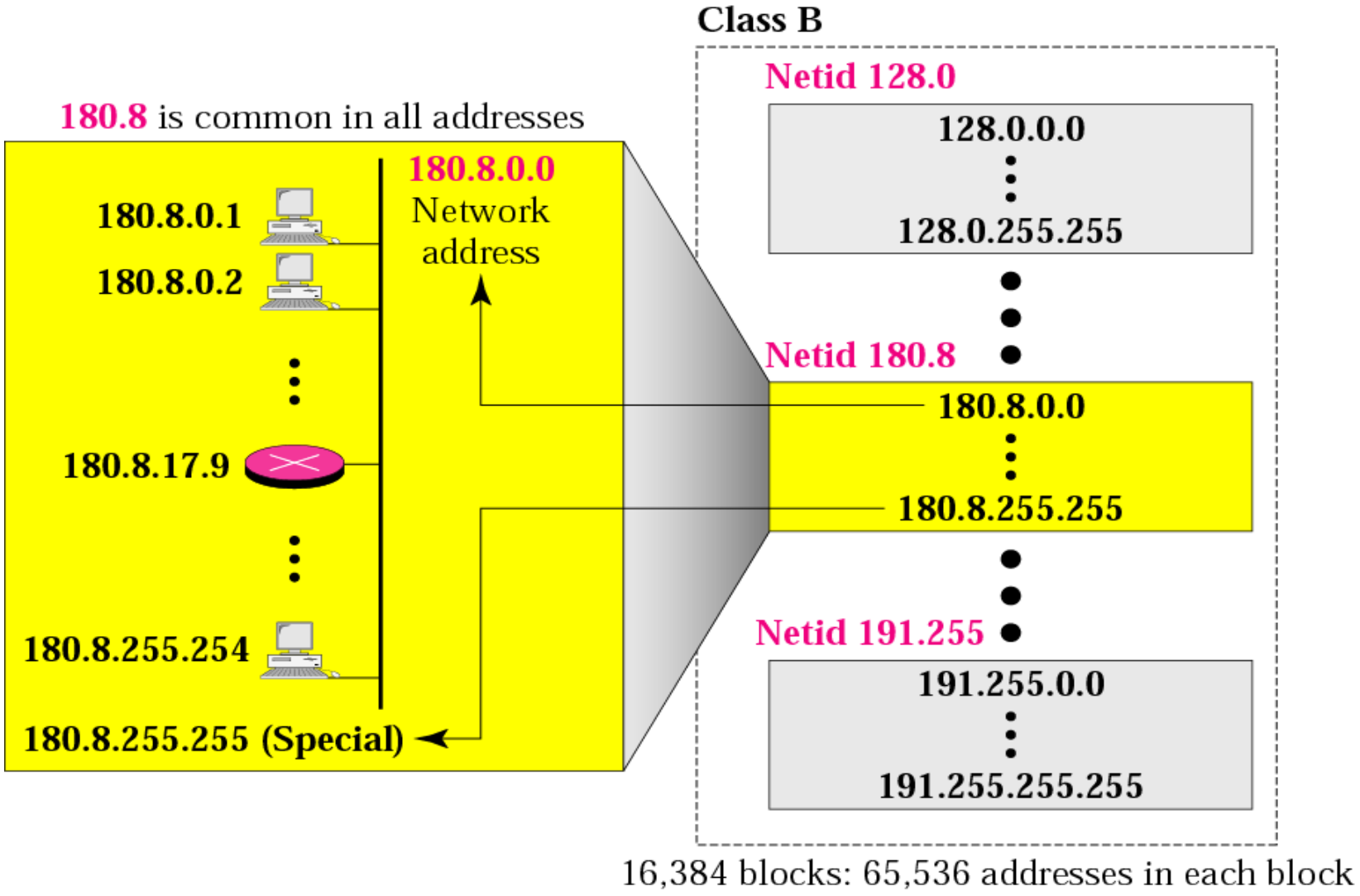


Note

Millions of class A addresses are wasted.

Figure 4-8

Blocks in class B

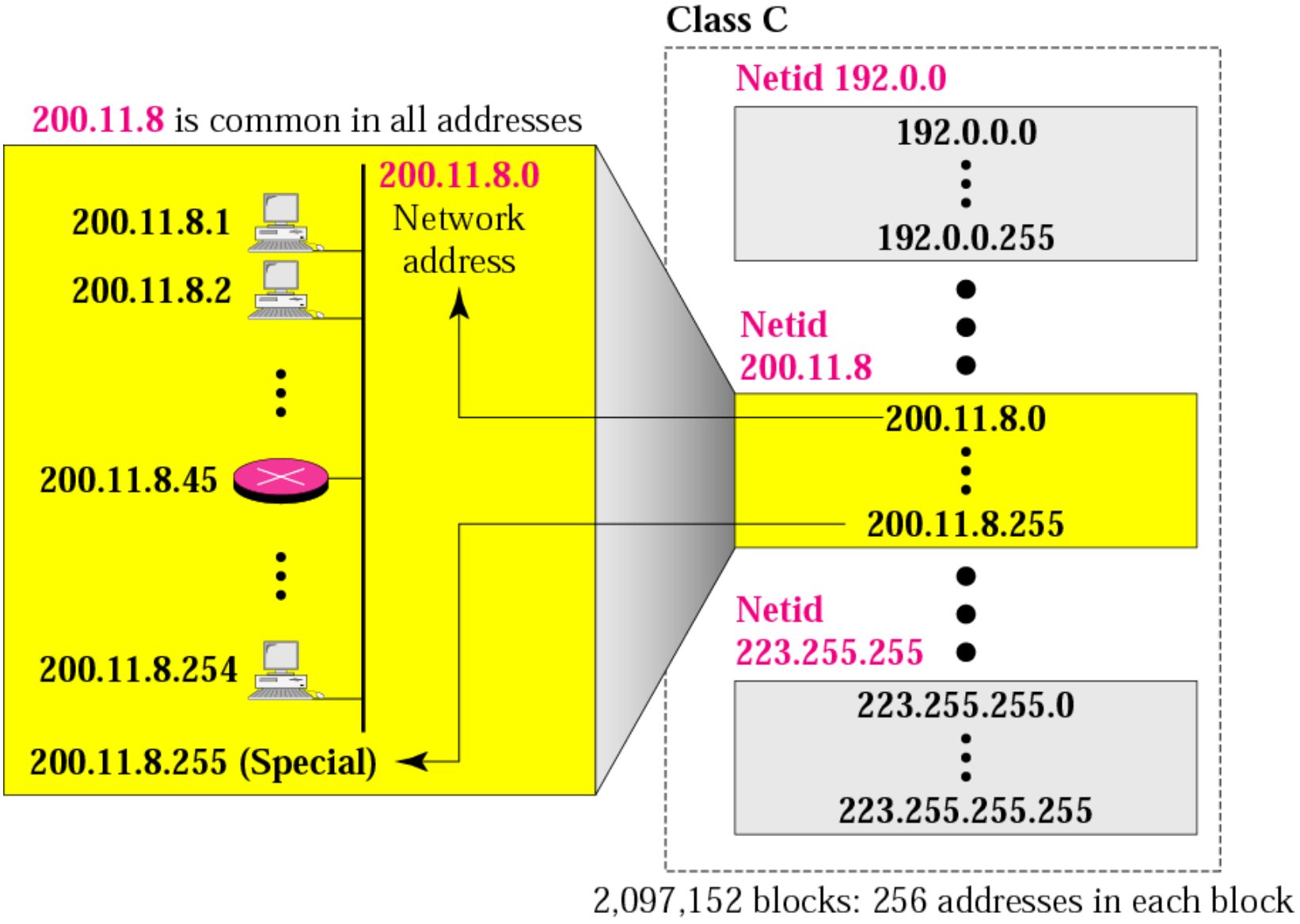


Note

Many class B addresses are wasted.

Figure 4-9

Blocks in class C



Note

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

Note

Class D addresses are used for multicasting; there is only one block in this class.

Note

Class E addresses are reserved for special purposes; most of the block is wasted.