شبكات

Classless Addressing

Classless Addressing

To overcome address depletion and give more organizations access to the Internet, classless addressing was designed and implemented. In this scheme.

Address Blocks

In classless addressing, when an entity, needs to be connected to the Internet, it is granted a block (range) of addresses. The size of the block (the number of addresses) varies based on the nature and size of the entity.

An ISP, as the Internet service provider, may be given thousands or hundreds of thousands based on the number of customers it may serve.

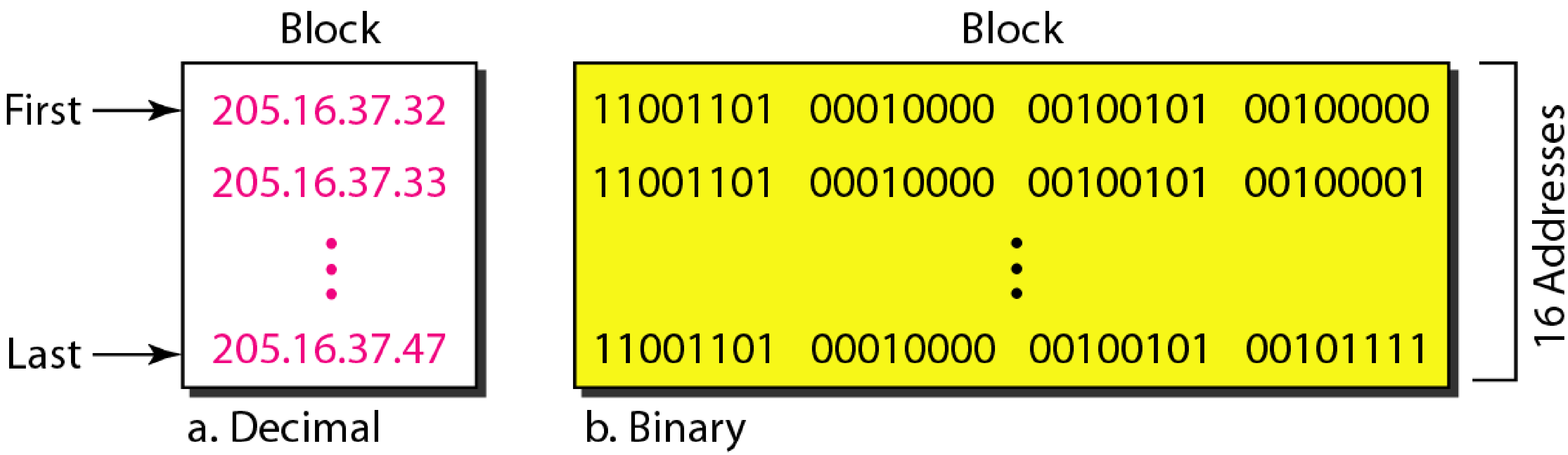
Restriction

To simplify the handling of addresses, the Internet authorities impose **three restrictions** on classless address blocks:

1. The addresses in a block must be contiguous, one after another.
2. The number of addresses in a block must be a power of 2 (1, 2,4,8,.etc)
3. The first address must be evenly divisible by the number of addresses.

Example

Figure shows a block of addresses, in both binary and dotted-decimal notation, granted to a small business that needs 16 addresses.



We can see that the restrictions are applied to this block: The addresses are contiguous. The number of addresses is a power of 2 ($16 = 2^4$), and the first address is divisible by 16.

The address and the */n* notation completely define the whole block (the first address, the last address, and the number of addresses).

First Address ***The first address in the block can be found by setting the 32 - n rightmost bits in the binary notation of the address to 0s.***

Example

A block of addresses is granted to a small organization. We know that one of the addresses is 205.16.37.39/28. What is the first address in the block?

Solution

The binary representation of the given address is

11001101 00010000 00100101 00100 111

If we set 32−28 rightmost bits to 0, we get

11001101 00010000 00100101 00100000

or

205.16.37.32

Last Address

The last address in the block can be found by setting the 32 - *n* rightmost bits in the binary notation of the address to 1s.

The last address in the block can be found by setting the rightmost : 32 − n bits to 1s.

Example

Find the last address for the block.

205.16.37.39/28

Solution

The binary representation of the given address is

11001101 00010000 00100101 00100111

If we set 32 − 28 rightmost bits to 1, we get

11001101 00010000 00100101 00101111

or

205.16.37.47

The number of addresses in the block can be found by using the formula : 2^{32-n}

Example

Find the number of addresses in Example 6.6.

205.16.37.39/28

Solution

The value of n is 28, which means that number of addresses is 2^{32-28} or 16.

205.16.37.32 → 205.16.37.47

Example

Another way to find the first address, the last address, and the number of addresses is to represent the mask as a 32bit binary (or 8-digit hexadecimal) number. This is particularly useful when we are writing a program to find these pieces of information. Ex: The 205.16.37.39/28 , /28 can be represented as (Mask Definition)

11111111 11111111 11111111 11110000

(twenty-eight 1s and four 0s).

Find

a. The first address

b. The last address

c. The number of addresses.

Solution

a. **The first address can be found by ANDing the given addresses with the mask. ANDing here is done bit by bit. The result of ANDing 2 bits is 1 if both bits are 1s; the result is 0 otherwise.**

Address:	11001101	00010000	00100101	00100111
Mask:	**11111111**	**11111111**	**11111111**	**11110000**
First address:	11001101	00010000	00100101	00100000

205.16.37.32

b. **The last address can be found by ORing the given addresses with the complement of the mask. ORing here is done bit by bit. The result of ORing 2 bits is 0 if both bits are 0s; the result is 1 otherwise. The complement of a number is found by changing each 1 to 0 and each 0 to 1.**

Address:	11001101	00010000	00100101	00100111
Mask complement:	00000000	00000000	00000000	00001111
Last address:	11001101	00010000	00100101	00101111

205.16.37.47

c. **The number of addresses can be found by complementing the mask, interpreting it as a decimal number, and adding 1 to it.**

Mask complement:	000000000 00000000 00000000 00001111
Number of addresses:	15 + 1 = 16

Example:

A block of addresses is granted to a small organization. We know that one of the addresses is 190.100.0.136/26. using Classless and Mask Definition methods

What is the:-

first address in the block: 190.100.0.128

Last address in the block: 190.100.0.191

Number of Addresses in the block: 64