

5.11 IPv4 Address Blocks And CIDR Slash Notation

Unlike the original classful scheme, CIDR addresses are not self-identifying. For example, if a router encounters address 128.211.168.1, which is one of the addresses in the example block, a router cannot know the position where the boundary lies unless external information is present. Thus, when configuring a CIDR block, a network manager must supply two pieces of information: the starting address and an address mask that tells which bits are in the prefix.

As noted above, using binary or dotted decimal for a mask is both inconvenient and error prone. Therefore, CIDR specifies that a manager should use slash notation to specify the mask. Syntactically, the format, which is sometimes called *CIDR notation*, consists of a starting address in dotted decimal followed by a mask size in slash notation. Thus, in CIDR notation, the block of addresses in Figure 5.8 is expressed:

128.211.168.0/21

where /21 denotes an address mask with 21 bits set to 1†.

5.12 A Classless IPv4 Addressing Example

The table in Figure 5.8 illustrates one of the chief advantages of classless addressing: complete flexibility in allocating blocks of various sizes. When using CIDR, the ISP can choose to assign each customer an address block of an appropriate size (i.e., the size the customer needs rounded up to the nearest power of 2). Observe that a CIDR mask of N bits defines an address block of $2^{(32-N)}$ host addresses. Therefore, a smaller address block has a longer mask. If the ISP owns a CIDR block of N bits, the ISP can choose to assign a customer any piece of its address space by using a mask longer than N bits. For example, if the ISP is assigned 128.211.0.0/16, the ISP may choose to give one of its customers the 2048 addresses in the /21 range that Figure 5.8 specifies. If the same ISP also has a small customer with only two computers, the ISP might choose to assign another block 128.211.176.212/30, which covers the address range that Figure 5.9 specifies.

	Dotted Decimal	32-bit Binary Equivalent
Lowest	128.211.176.212	10000000 11010011 10110000 11010100
Highest	128.211.176.215	10000000 11010011 10110000 11010111

Figure 5.9 An example IPv4 CIDR block, 128.211.176.212/30.

One way to think about classless addresses is as if each customer of an ISP obtains a (variable-length) subnet of the ISP's CIDR block. Thus, a given block of addresses can be subdivided on an arbitrary bit boundary, and a router at the ISP can be configured to forward correctly to each subdivision. As a result, the group of computers on a

†The table in Figure 5.7 on page 80 summarizes all possible values used in slash notation.