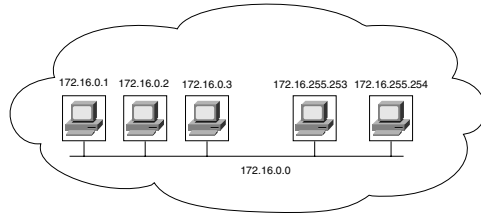


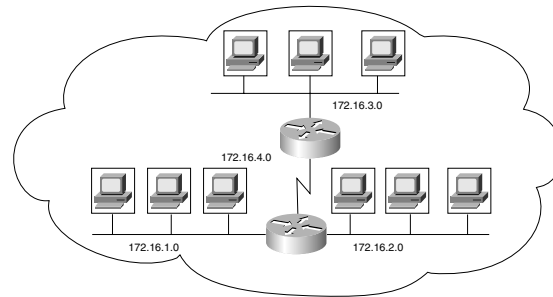
Implementing Subnet Planning



Without subnets, the organization operates as a single network. These flat topologies result in short routing tables but, as the network grows, the use of bandwidth becomes inefficient. (All systems on the network receive all the broadcasts on the network.) Network address-

ing can be made more efficient by breaking the addresses into smaller segments, or subnets. Subnetting provides additional structure to an addressing scheme without altering the addresses.

In the figure, the network address 172.16.0.0 is subdivided into four subnets: 172.16.1.0, 172.16.2.0, 172.16.3.0, and 172.16.4.0. If traffic were evenly distributed to each end station, the use of subnetting would reduce the overall traffic seen by each end station by 75 percent.



Subnet Mask

A *subnet mask* is a 32-bit value written as four octets. In the subnet mask, each bit determines how the corresponding bit in the IP address should be interpreted (network, subnet, or host). The subnet mask bits are coded as follows:

- Binary 1 for the network bits
- Binary 1 for the subnet bits
- Binary 0 for the host bits

Although dotted decimal is the most common format, the subnet can be represented in several ways:

- **Dotted decimal**—172.16.0.0 255.255.0.0
- **Bit count**—172.16.0.0/16
- **Hexadecimal**—172.16.0.0 0xFFFF0000

The **ip netmask-format** command can be used to specify the format of network masks for the current session. Dotted decimal is the default.

Default Subnet Masks

Bits:	1	8	9	16	17	24	25	32
Class A:	0NNNNNNN	Host		Host		Host		
Range (1-126)	1	8	9	16	17	24	25	32
Class B:	10NNNNNN	Network		Host		Host		
Range (128-191)	1	8	9	16	17	24	25	32
Class C:	110NNNNN	Network		Network		Host		
Range (192-223)	1	8	9	16	17	24	25	32
Class D:	1110MMMM	Multicast Group		Multicast Group		Multicast Group		
Range (224-239)	1	8	9	16	17	24	25	32

Each address class has a default subnet mask. The default subnet masks only the network portion of the address, the effect of which is no subnetting. With each bit of subnetting beyond the default, you can create $2^n - 2$ subnets. These examples show the effect of adding subnet bits.

