

facing a street called Main Street and another facing a different street called Broadway. In this situation an IP address is usually associated with the network interface or the network connection rather than with the computer. Thus, in our analogy, an address is assigned to each door of a house rather than to the house itself. For a computer with a single network interface (typically called a host), we can safely think of the IP address as the identity of the host.

An IP address has a fixed length of 32 bits. The address structure was originally defined to have a two-level hierarchy: **network ID** and **host ID**. The network ID identifies the network the host is connected to. Consequently, all hosts connected to the same network have the same network ID. The host ID identifies the network connection to the host rather than the actual host. An implication of this powerful aggregation concept is that a router can forward packets based on the network ID only, thereby shortening the size of the routing table significantly. The network ID is assigned by the Internet Network Information Center (InterNIC). The host ID is assigned by the network administrator at the local site. When TCP/IP is used only within an intranet (an internal and private internet), the local network administrator may wish to assign the network ID on its own. However, the address will not be recognized by a host on the global Internet. The formats of the "classful" IP address are shown in Figure 8.5. The bit position shows the number of bits from the most significant bit.

The IP address structure is divided into five address classes: Class A, Class B, Class C, Class D, and Class E, identified by the most significant bits of the address as shown in the figure. Class A addresses have seven bits for network IDs and 24 bits for host IDs, allowing up to 126 networks and about 16 million hosts per network. Class B addresses have 14 bits for network IDs and 16 bits for host IDs, allowing about 16,000 networks and about 64,000 hosts for each network. Class C addresses have 21 bits for network IDs and 8 bits for host IDs, allowing about 2 million networks and 254 hosts per network. Class D addresses are used for multicast services that allow a host to send information to a group of hosts simultaneously. Class E addresses are reserved for experiments.

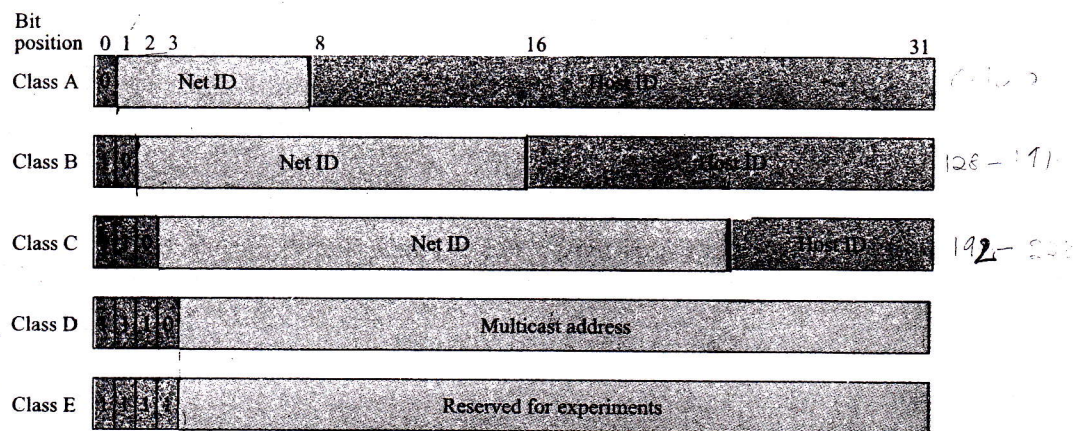


FIGURE 8.5 The five classes of IP addresses