» **The host ID (or host address):** Identifies a specific device on the network indicated by the network ID

Most of the complexity of working with IP addresses has to do with figuring out which part of the complete 32-bit IP address is the network ID and which part is the host ID. The original IP specification uses the *address classes* system to determine which part of the IP address is the network ID and which part is the host ID. A newer system — classless IP addresses — is rapidly taking over the address classes system. You come to grips with both systems later in this chapter.

The dotted-decimal dance

IP addresses are usually represented in a format known as *dotted-decimal notation.* In dotted-decimal notation, each group of eight bits — an *octet* — is represented by its decimal equivalent. For example, consider the following binary IP address:

```
11000000101010001000100000011100
```

The dotted-decimal equivalent to this address is

```
192.168.136.28
```

Here, 192 represents the first eight bits (`11000000`); 168, the second set of eight bits (`10101000`); 136, the third set of eight bits (`10001000`); and 28, the last set of eight bits (`00011100`). This is the format in which you usually see IP addresses represented.

Classifying IP Addresses

When the original designers of the IP protocol created the IP addressing scheme, they could have assigned an arbitrary number of IP address bits for the network ID. The remaining bits would then be used for the host ID. For example, the designers may have decided that half of the address (16 bits) would be used for the network and the remaining 16 bits would be used for the host ID. The result of that scheme would be that the Internet could have a total of 65,536 networks, and each of those networks could have 65,536 hosts.

In the early days of the Internet, this scheme probably seemed like several orders of magnitude more than would ever be needed. However, the IP designers realized from the start that few networks would actually have tens of thousands of hosts. Suppose that a network of 1,000 computers joins the Internet and is assigned