an IP address automatically without requiring a server to be configured. The concept is sometimes termed *plug-and-play networking*. The point can be summarized:

> *DHCP allows a computer to move to a new network and obtain configuration information, without requiring an administrator to make manual changes to a server database.*

Like BOOTP, DHCP arranges for a computer to broadcast a request to which a DHCP server sends a response†. An administrator can configure a DHCP server to supply two types of addresses: permanently assigned addresses (the same as BOOTP) or a pool of dynamic addresses to be allocated on demand. Most servers are configured to use a pool of dynamic addresses that are assigned to arbitrary hosts. To prevent a host from obtaining an address and keeping it forever, each address assignment is limited to a fixed time, and allocation is known as a *lease*‡.

The use of leases allows a DHCP server to reclaim addresses, if necessary. When the lease expires, one of two actions occur. The host that was using the address can choose to relinquish the address, or can renegotiate with DHCP to extend the lease. Negotiation occurs concurrent with other activity, so users remain unaware that their computer renewed a lease. In fact, most DHCP servers are configured to approve each lease extension, which means a computer can continue to operate over a long period of time without any interruption to running application programs or ongoing network communications. However, a server may be configured to deny lease extension for administrative or technical reasons. For example, consider a network in a university classroom. In such cases, a server can be configured so that all leases expire at the end of the class period (to permit the set of addresses to be reassigned to the next class). DHCP grants absolute control of leasing to a server — if a server denies an extension request, the host must stop using the address.

23.14 DHCP Protocol Operation And Optimizations

Although the protocol is straightforward, DHCP includes several important details that optimize performance. The three most significant are:

- Recovery from loss or duplication
- Caching of a server address
- Avoidance of synchronized flooding

The first item means DHCP is designed to ensure that missing or duplicate packets do not result in misconfiguration — if no response is received, a host retransmits its request, and if a duplicate response arrives, a host ignores the extra copy. The second item means that once a host uses a *DHCP Discover* message to find a DHCP server, the host caches the server's address. Thus, lease renewal is efficient.

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†DHCP uses the term *offer* to denote the message a server sends.
‡An administrator specifies the lease time for each address when establishing a pool of addresses.