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DNS: The Domain Name System

14.1 Introduction

The *Domain Name System*, or *DNS*, is a distributed database that is used by TCP/IP applications to map between hostnames and IP addresses, and to provide electronic mail routing information. We use the term *distributed* because no single site on the Internet knows all the information. Each site (university department, campus, company, or department within a company, for example) maintains its own database of information and runs a server program that other systems across the Internet (clients) can query. The DNS provides the protocol that allows clients and servers to communicate with each other.

From an application's point of view, access to the DNS is through a *resolver*. On Unix hosts the resolver is accessed primarily through two library functions, `gethostbyname`(3) and `gethostbyaddr`(3), which are linked with the application when the application is built. The first takes a hostname and returns an IP address, and the second takes an IP address and looks up a hostname. The resolver contacts one or more *name servers* to do the mapping.

In Figure 4.2 (p. 55) we showed that the resolver is normally part of the application. It is not part of the operating system kernel as are the TCP/IP protocols. Another fundamental point from this figure is that an application must convert a hostname to an IP address before it can ask TCP to open a connection or send a datagram using UDP. The TCP/IP protocols within the kernel know nothing about the DNS.

In this chapter we'll take a look at how resolvers communicate with name servers using the TCP/IP protocols (mainly UDP). We do not cover all the administrative details of running a name server or all the options available with resolvers and servers. These details can fill an entire book. (See [Albitz and Liu 1992] for all the details on the care and feeding of the standard Unix resolver and name server.)