Networking Beyond
Connecting to the Internet

Earlier in this book (Chapter 8) we discussed the basics of connecting to a network with the goal of connecting to the Internet. For many people, that was all the networking knowledge one would need; however, Mac OS X being Mac OS X, it has lots of networking power for those who want or need it. In this chapter we are going to

- Provide a basic overview of networking and network terminology
- Look at some advanced networking options offered on the Network System Preference pane
- Explore additional networking tools offered by Mac OS X, including Network Utility and AirPort Utility

Networking Defined

When you send an e-mail message from your computer to a friend’s computer, across town or halfway around the world, a whole bunch of stuff happens behind the scene to make sure it gets there. First, your message is broken up into packets or datagrams (small organized collections of data and metadata that can be reassembled as your complete message when it reaches each destination). The way these packets are created and reassembled is defined by a protocol, in this case TCP (Transmission Control Protocol). These packets are then sent from your computer using another protocol, usually SMTP (Simple Mail Transfer Protocol), to your outgoing mail server, which will forward your message using yet another protocol, IP (Internet Protocol), on a journey around the Internet until it reaches your friend’s mail server. There, your friend’s computer will use another protocol, such as IMAP (Internet Mail Access Protocol), to query its mail server and download the message. Sounds like a lot of work to send a simple message. In fact, this little example glosses over a number of other stops and protocols that likely were used along the way.
NOTE: As in the preceding example, I’m going to try to keep this discussion somewhat oversimplified. My goal is to provide an understanding of how things work if you’re interested, at which point you can go seek it out. For everyone else, you could probably skim over this section (or this whole chapter) and be perfectly content.

To add to the complexity, there are different ways of describing networking: there is the OSI (Open Systems Interconnection) model, which defines seven different networking protocol layers, and there is the Internet Protocol Suite (know more often as TCP/IP), which defines four. For our purposes we are going to focus on the Internet Protocol Suite, not only because it’s simpler, but also because this is all most people in most situations today will need to know.

The Internet Protocol Suite (TCP/IP)

The Internet Protocol Suite, as mentioned, defines four layers of protocols that work together to send all manner of information from one point to another over a network. These layers are:

- **The Link Layer**: This is the lowest layer in the Internet Protocol Suite; it covers protocols that cover the connections between physical devices or hosts. For example, a Wi-Fi connection between your computer and a wireless router would fall into the link layer. Common protocols in the link layer include PPP, MAC (Media Access Control), DSL, ISDN, and IEEE 802.11 (Wi-Fi) (many of these were mentioned in Chapter 8).

- **The Internet Layer**: This layer defines protocols that define how datagrams and packets are sent from one location to the next through the use of gateways. In other words, this defines how data on one system is accurately routed to the system or systems where it is intended. The most common protocol for this layer is IP (IPv4 and IPv6).

- **The Transport Layer**: The transport layer protocols work with the application layer to assure that data is reliably transported from end to end in a network. That is, while the Internet layer assures that the data moves from system to system, the transport layer assures that the data is accurately moved from the application on one system to the appropriate application process on the other. The most common transport protocols are TCP and UDP (User Datagram Protocol).

- **The Application Layer**: Using the transport layer, the application layer contains protocols that allow one application to talk to another application over a network. This layer contains a long list of common protocols, including DNS, SMTP, IMAP, POP, Telnet, and HTTP.