Preface

This book was written to explain how the most important Internet protocols work. The text assumes that you, the reader, are an information technology professional, either still in college or already employed. The method of teaching is a series of hands-on projects in which you will program the central algorithms of the protocols. Each chapter describes an important protocol by presenting its technology context and explaining its principal algorithm(s). In this process you will learn something about a number of technologies associated with the Internet, but that is not why this book was written. In fact, there are several other books that cover a range of networking technologies in more depth and breadth. So, you might ask, what is different about this book?

The thing that is unique about this book is that each chapter contains a project in which the reader must program the central algorithm of a protocol. You won't be simply reading about the protocols, you will be *doing* something. In the process of doing, you will gain deeper understanding of the algorithm that makes the protocol work. To work through the projects, you must know the basics of probability and statistics and have the ability to program in C. To confirm that the protocol has been programmed correctly, you will execute it in a simulation system called the Network Workbench (NW). This custom software provides a complete, Internet-like protocol stack with working versions of protocols, and it gives you the ability to observe the network's operation in detail. The CD-ROM in the back of the book contains the NW software in forms compatible with several major computing platforms and compilers.

You can use this book by itself to gain a basic understanding of the Internet protocols, or you can use it the way my students do: in conjunction with a textbook intended to provide in-depth coverage of data communications and networking principles and protocols. For those interested in the second approach, Appendix D provides suggested pairings of the chapters and projects in this book with several major textbooks.

A very significant part of learning about networking is the vocabulary (or, to be more honest, the jargon). Every chapter in this book introduces many new terms, which are printed in italics. Each of these terms is defined again in the Glossary at the end of the book.

The projects in this book have been used for several years by my introductory computer networking classes at George Mason University. My students have confirmed what many information technology professionals know: A good way to really understand a process is to program it yourself. My intention in writing this book wasto enable readers to gain this higher level of understanding. Experience has shown that this understanding can make a big difference if you are involved in making the Internet work or in programming or maintaining Internet applications.

The book is organized to make learning easy. The first chapter provides an introduction to the protocol stack concept and an overview of NW. Chapter 2 expands on this overview by presenting the "big picture" of network topology. After that, the chapters (and the hands-on projects they contain) start at the bottom of the Internet protocol stack and work to the top in small steps. In this way, the chapters progress through all of the protocols most important to the Internet, as follows:

Chapters	Topics
3, 4, 5	Data link characteristics and data link control software
6, 7	Local area networks
8, 9	Wide area networking and Internet routing
10	Transport protocols
11	Multicasting and multimedia networking
12	Application layer servers and clients

At this point, you will know the basic aspects of the whole stack well enough that the last two chapters can go back to big-picture issues:

Chapter	Topic
13	Network security and firewalls
14	Making your whole stack work together on the Internet

Following Chapter 14 are several appendices that are intended to help you get more out of the book and out of NW:

Appendix	Purpose
A	Tells you how NW simplifies the real protocol
B	Provides directions for loading the software
C	Copy of the NW header file for reference
D	Suggestions for using this book with networking textbooks
E	References and other information resources
Glossary	Networking vocabulary

Creating a book or a sizable piece of software is a labor of love. That is certainly true of this book and the Network Workbench. My hope and wish for you is that you gain from them a level of understanding that will enable you to function well as an information technology professional working with the Internet.

Mark Pullen