

# Preface

Internetworking and TCP/IP now dominate all of networking — even telephone companies that were once the exclusive bastions of circuit switched networks have adopted IP technology. Two more revolutionary changes are occurring that rely on internetworking: the cloud computing paradigm and the Internet of Things. In the cloud model, computation and storage are performed in cloud data centers. Users rely on the Internet to upload, download, and access their information and to share data with others. The phrase *Internet of Things* is used to characterize an Internet of intelligent, embedded devices that act autonomously rather than devices, such as smart phones and laptops, that a human operates. Using Internet technology allows embedded devices to communicate with remote servers as well as with one another; the resulting cyber infrastructure already includes devices in homes, offices, and stores, as well as sensors that measure the environment and civil structures such as bridges and dams.

Many readers have requested that the text be updated to reflect recent changes; many have suggested specific topics and emphasis. Twenty years after its invention, IPv6 is finally gaining acceptance. Voice and video have replaced file transfer as major uses of the Internet. The sixth edition responds to readers' suggestions by reorganizing and updating existing chapters and introducing new material. In particular, chapters on the early applications of Telnet and FTP have been eliminated to make space for newer material. A new chapter on the Internet of Things considers the use of TCP/IP in a wireless sensor network. A new chapter on Software Defined Networking examines the use of OpenFlow which, although it is not an IETF standard, has become an important part of network and Internet management.

To satisfy an oft-repeated request, the chapter on protocol layering has been moved earlier in the text. Instructors are warned, however, that layering is not a rigid architecture that explains all protocols. Students should see it as a basic but somewhat simplistic guideline that helps us understand protocols. In Chapter 30, for example, we learn that the protocols for a route-over mesh blur the boundaries between layers by adding shims and blending IP forwarding with Layer 2 reachability.

Each chapter has been updated to focus on ideas and technologies that are now being used in the Internet. The most significant change consists of integrating the IPv6 discussion with that of IPv4. Each chapter describes a principle, explains the general design, and then proceeds to explain how the principle applies to IPv4 and IPv6. Readers will see that the two versions of IP are closely interrelated and that it is impossible to understand the changes introduced by IPv6 without understanding IPv4.