# Preface

Computer networks have become an integral part of our daily life. As we rely on networks more, we need to make a better understanding of the underlying technologies that provide us with these services.

The concept of a layered model makes it much easier to study networks and understand their operation. The distinction and clear separation of functions for each layer also makes the process of designing protocols much easier. The logical separation of layers makes people's lives much easier when troubleshooting. It makes it sensible to be able to isolate the problem and troubleshoot it much faster.

ISO's OSI model has been around since the early 1980s. Although it did not succeed in becoming the de facto model of networking, it is considered an important concept that helps a great deal when it comes to understanding how networks operate. The concepts presented in the OSI model help anyone interested in starting a journey into the world of networking. Back in the 1980s, OSI was gaining momentum and seeing it as a worldwide standard seemed very imminent. However, as Andrew L. Russell puts it, "by the early 1990s, the (OSI Model) project had all but stalled in the face of a cheap and agile, if less comprehensive, alternative: the Internet's Transmission Control Protocol and Internet Protocol."

TCP/IP model came in as a simpler, less-restrictive, and cheaper alternative. After looking like the savior of the world of telecommunications, the OSI model started to seem too comprehensive and too restricting. The fast-paced developments in the world of electronics and communications demanded a parallel standard for network systems that are easier to work with and are less demanding. Most entities involved in the networking world starting from computer scientists and ending with industrial partners have shifted belief to the TCP/IP model.

This brief starts with a simple introduction to computer networks and general definitions of commonly used terms in networking in Chap. 1. The last part of the chapter discusses the reasons behind adopting a layered model.

Chapter 2 discusses in detail the OSI model starting from a brief history of the standard. The concept of connection-oriented and connectionless communications is also introduced in this chapter. Subsections of the chapter elaborate on the specific layer functions and what is expected of protocols operating at each layer. In the last part of the chapter a detailed step-by-step description of how a single packet travels from the source to the destination passing through a router is explained.

Chapter 3 is devoted to the TCP/IP model. A better understanding of the model lies in better understanding of the protocols constituting it. Thus, the chapter starts with a discussion of IP protocols and its supporting protocols: ARP, RARP, and InARP. This discussion explains the details of the IP packet and the operation of the IP protocol. The next section explains the two protocols operating at the transport layer: TCP and UDP. The details of each protocol segment are introduced and functions of each field in the headers are explained. The next section discusses the detailed inner working of application layer protocols like HTTP, DNS, FTP, TFTP, SMTP, POP3, and Telnet. Details on how each of these protocols operates are also introduced. The messages and server response types for each application layer protocol are discussed.

*Intended Audience of the Brief*

- Students starting study in the networking area.
- Professionals seeking knowledge about networking essentials.
- Field engineers working in troubleshooting on an application level.
- Researchers looking for core concepts of networking.
- Anyone interested in understanding how Internet protocols are used in everyday life work.

*How to Use This Brief*

If you are new to networking and need to build a solid theoretical knowledge of networking, you should start from Chap. 1 and follow on to the following two chapters. If you are looking for gaining knowledge about application protocols like HTTP, FTP, etc., jump directly to Chap. 3.

The brief contains small gray boxes that are meant to emphasize the important definitions or facts that are thought essential to the reader before going further in reading.

Finally, I would like to thank my editors Wayne Wheeler and Simon Rees. Without you guys this publication would not be possible. Thank you for believing in me.

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