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Mohammed M. Alani

Guide to OSI and TCP/IP Models



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Foreword

Standards are needed to promote interoperability among vendor equipment and to encourage economies of scale. Because of the complexity of the communications task, no single standard will suffice. Rather, the functions should be broken down into more manageable parts and organized as communications architecture. The architecture would then form the framework for standardization. This line of reasoning led the International Organization for Standardization (ISO) in 1977 to establish a subcommittee to develop such an architecture. The result was the Open Systems Interconnection (OSI) reference model. Although the essential elements of the model were in place quickly, the final ISO standard, ISO 7498, was not published until 1984. A technically compatible version was issued by CCITT (now ITU-T) as X.200.

Meanwhile, a somewhat different architectural model emerged from the development of Internet-based protocols, and goes by the name TCP/IP model. Because rapid progress was made in the development of protocols within the TCP/IP model and in the deployment of such protocols by numerous vendors, TCP/IP became established as the “practical” model for communications protocols. OSI, on the other hand, can be viewed as a “descriptive” model that provides a universal terminology and context for discussing protocol operation. Thus, TCP/IP and OSI are complementary.

In this monograph, Prof. Mohammed M. Alani provides an excellent introduction to both OSI and TCP/IP. [Chapter 1](#) provides a context for the discussion, by introducing computer networking and the concept of a layered model. [Chapter 2](#) examines the OSI model. This chapter looks in detail at the functionality of each of the layers and provides a clear example of how data travel through the layers from a source system, through intermediate systems, and to the destination system, showing the actions at each layer along the way. Finally, [Chap. 3](#) looks in detail at the functionality of each of the layers of the TCP/IP model and describes a number of important protocols that have been implemented within this model.

All in all, Prof. Alani has provided a concise, well organized, and clear introduction to these important networking topics.

William Stallings

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.