Chapter 3
Protocol Functions

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ABSTRACT
Communications networks connect people of the world in spite of large geographical distance, they play a big role in our entertainment during leisure time, and they help to arrange our everyday activities. Communications networks’ ubiquitous nature is a big challenge for network protocol developers. They have to offer different services in heterogeneous hardware and software environment.

There are basic protocol functions, which have to do usually appearing tasks in communication networks. Among these tasks, we highlight PDU creation, error handling, medium access, handling of load-related problems (flow control and congestion control) and PDU delivery’s sub-tasks like finding the destination point by addressing and routing.

After the introduction of basic protocol functions, this chapter deals with the advanced functions of communications protocols that are especially highlighted in network management and multimedia transmission. This chapter deals with the most important aspects of the network management: security management, performance management, accounting management, fault management, configuration management, and mobility management. During multimedia transmission over a well-managed network, another important question arises: How to ensure desired quality of service? This chapter presents methods for quality management, too. Finally, this chapter collects future trends of protocol functions based on the present directions of network technology development.

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INTRODUCTION

Computer and telecommunications networks started like supporting systems in the academic area, but in short time they became indispensable part of our life. We can send mails and arrange audio or video call with their help. They connect us in spite of the big geographical distance between us. We can listen to music, read news, watch movies, or television programs using the networks. They have big role in our entertainment during leisure time activity. We can do the shopping in e-shops, learn using e-learning materials, and do the banking functions from our living room. Networks help to arrange our everyday activities from the distance.

As both the kinds of offered services and the number of users of the network increases exponentially, the system has to deal also with the increasing heterogeneity. It requires sophisticated management methods. An important topic of this chapter is the advanced functions of network management. Solutions are collected based on the mostly used network management protocols (SNMP, CMIP), covering Fault, Configuration, Accounting, Performance, and Security issues.

Security issue is especially important topic of network protocols, because more and more people use communications networks, for example, to arrange their money transfer (e-shopping, e-banking, etc.). At this point, we have to mention the security gaps in some network protocols, which also influence the security of the communication (e.g. TCP-flood, DNS-spoofing, etc.).

Other proceeds of the popular use of networks are that people who change their location also want to access the information and services of the networks in increasing number. It requires that users should be connected continuously while they change their locations and the system should know their locations as well. Introduction of special methods of mobility management also takes part in our chapter of advanced protocol functions. Different types of handover and location update are the most important functions of mobility management. Especially Mobile IP and its complementary protocol, the Cellular IP care these functions in IP networks.

When we mention multimedia delivery over network, the quality of service (QoS) is an important measure of transmission success. Several methods have been introduced ensuring the desired quality of transmission. In real time, applications mainly jitter and congestion may debase the quality of service. Solutions for these problems are mostly implemented in network and transport layers. These functions are also covered in this chapter next to the basic protocol functions like addressing, PDU (Protocol Data Unit) creation, error handling, flow control, congestion control, medium access, and routing.

As we can see, different management methods play important role in protocol functions. After the presentation of basic protocol functions, this chapter intends to introduce the problems and advanced solutions of network, mobility, security, and service quality management of communications networks.

In other books, which deal with communication protocols, protocol functions are usually scattered between different network architecture (like OSI or TCP/IP) layers. Some functions re-appear in different layers. E.g., both data-link and transport layers deal with flow control, all the layers create their own PDU (usually with different names, like frame, packet, segment, block, etc.) and error handling is also a common protocol function of several layers. In this chapter, we do not follow this method. Our discussion is centered on tasks, which different protocol functions have to deal with. It is an unusual presentation type of protocol functions; however, our motivation for it is the presentation of the evolution of different solution methods for specific tasks of communication networks.
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