Chapter XVIII
Transport Protocols and QoS for Wireless Multimedia

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ABSTRACT

This chapter introduces the QoS issues and support in transport protocols for wireless multimedia transmission. After an overview of the transport layer functionalities in a transmission and the multimedia characteristics, conventional transport layer protocols: transmission control protocol (TCP), and user datagram protocol (UDP) are described. In this chapter, some of the proposed modifications to these protocols in order to improve multimedia transmission quality in wireless networks are also summarized. Particulary, UDP Lite, TCP friendly rate control protocol (TFRC), and real-time transport protocol (RTP)--real-time transport control protocol (RTCP) are mentioned. Finally, the chapter is concluded with some discussions on the current trends in transport protocols for wireless multimedia transmission and on some of the ongoing research issues.

INTRODUCTION

Recently, there has been an unprecedented increase in the demand for wireless multimedia applications. However, the type of network access technologies has varied a lot. These network access technologies of the present and future are envisioned to range from body area networks to satellite wide area networks (WANs) as can be seen in Figure 1. These networks are being developed to transport high-speed multimedia content for streaming, interactive, peer-to-peer and content

distribution services to network segments as well as to individual users. With the recent explosion of YouTube™ and similar multimedia-based services, it has become more crucial to deliver multimedia services with an acceptable quality. These quality of service (QoS) demands for multimedia traffic are compounded in the case of a wireless network, where new problems arise due to the implied mobility of the users as well as due to the nature of the current IP protocols that support IP-based mobility, combined with a lossy and interrupt/outage-prone nature of the communications channel**.** Therefore, the traditional protocol stacks have to be re-engineered, by designing more flexible and generic communication protocols (Argyriou, 2005).

TCP (transmission control protocol) is the most commonly used protocol at the transport layer of the network stack in the all-IP networks, originally developed in wired networks with low bit error rate (BER) in the order of less than 10^{-8}. In this context, any wireless network with Internet service needs to be compatible with the protocol used in the wired network (i.e., mainly the TCP/IP protocol). However, future wireless all-IP networks, while offering the promise of these exciting broadband applications, are expected to consist of several, potentially incompatible, wireless access technologies that would be offered by a number of competing service providers. The diversity of access technologies, however, may drastically affect the QoS for multimedia services.

Additional issues arise when considering the widely differing types of services that the user may use: streaming media, real-time communications, interactive communications, VoIP, just to name a few. Each of these services imposes its distinct QoS requirements. Thus, it is a formidable challenge to provide multimedia services which have strict quality-of-service (QoS) requirements on bandwidth, delay and delay jitter over wireless networks. This challenge has been amplified with

Figure 1. Heterogeneous network access technologies