Chapter 5
Quality of Service Provisioning in Wireless Mobile Ad Hoc Networks: Current State of the Art

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ABSTRACT

Wireless networks such as Bluetooth, WLAN and WiMax have transformed the way we access information and communicate seamlessly whether we are at home, in the office, or on the move on a train, bus or even aircraft. As mobile and embedded computing devices become more omnipresent, it will become increasingly difficult to interconnect them via wires and single-hop wireless links limited by radio transmission range. This has given rise to mobile ad hoc networks (MANET) where far away nodes communicate by requesting intermediate nodes to relay their information in order to reach the destination. MANETs self-organize, self-configure and self-heal themselves. MANETs are being used in many applications ranging from emergency response situations to wireless vehicular ad hoc networks. Many applications of MANETs such as Emergency Response and First Responders have strict Quality of Service (QoS) requirements for their communications systems, making MANET QoS provisioning mechanisms very crucial for supporting multimedia communications such as real-time audio and video. However, QoS provisioning in MANETs is quite tough in comparison to QoS provisioning in wireline IP networks. This is due to numerous reasons such as the dynamic network topology, unpredictable communication medium and limited battery power of mobile devices forming the network. This chapter describes the challenges and the current state of the art of QoS protocols and mechanisms in MANETs.

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INTRODUCTION

Only “best effort” communication services existed in the Internet in its early design, treating every kind of data traffic as equal and not having any provision for Quality of Service (QoS) support. In recent years, many real-time multimedia communication applications such as Voice over Internet Protocol (VoIP) and Video on Demand (VoD) have gained popularity. Such applications require stringent QoS requirements in terms of delay, jitter and throughput. Many QoS models have been developed to support the required communication QoS over the Internet. In order to satisfy the QoS requirements, the communication network has to meet certain QoS bounds such as delay, jitter, throughput and packet loss for a data flow (Crawley, 1998).

Wireless Networks have grown to be ever more popular in the recent years, creating the requirement for supporting real-time multimedia communication applications on highly mobile network environments. Within the wireless networks domain, Mobile Ad hoc networks (MANET) have received a lot of interest and numerous deployments. MANETs (Perkins, 2001) are formed by a collection of mobile nodes, such as PDAs and laptops; using wireless connections amongst the nodes in the network, without using any pre-existing wired or wireless network infrastructure, such as WLAN access points. Computing devices in MANET communicate with each other using wireless medium and route of data in a multi-hop fashion, if the wireless nodes are not within direct wireless transmission range of each other as shown in Figure 1.

There are many applications of mobile ad hoc networking technology such as Satellite multi-hop networks (Vladimirova, 2008; Shen, 2004) as shown in Figure 2, public safety applications (Miller, 2005), planetary surface exploration (Alena, 2005), inter-planetary networks (Sekhar, 2004), intelligent transportation systems (Toh, 2007), metropolitan ad hoc networks (Conti, 2003), building automation (Reinisch, 2007).
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