

Chapter 11

Quality of Service Issues in Micro Mobility Enabled Wireless Access Networks

A. Dev Pragad
King's College London, UK

Vasilis Friderikos
King's College London, UK

A. Hamid Aghvami
King's College London, UK

ABSTRACT

Provision of Quality of Service (QoS) and Micro Mobility management is imperative to delivering content seamlessly and efficiently to the next generation of IP based mobile networks. Micro mobility management ensures that during handover the disruption caused to the live sessions are kept to a minimum. On the other hand, QoS mechanisms ensure that during a session the required level of service is maintained. Though many micro mobility and QoS mechanisms have been proposed to solve their respective aspects of network operation, they often have interaction with each other and can lead towards network performance degradation. This chapter focuses specifically on the issues of interaction between micro mobility and QoS mechanisms. Special focus is given to the relatively unexplored area of the impact Mobility Agents can have on the wireless access network. Mobility Agents play a central role in providing micro mobility support. However, their presence (location and number) can affect the routing as well as the handover delay. Through an example network this issue is highlighted. Following which an optimization framework is proposed to deploy Mobility Agents optimally within a micro mobility enabled wireless access network to minimise both the routing overhead as well as the handover delay. Results show considerable improvements in comparison to deploying the Mobility Agents arbitrarily.

DOI: 10.4018/978-1-61520-680-3.ch011

1. INTRODUCTION

Quality of Service (QoS) and micro mobility have become significant pillars for the successful deployment of the next generation of wireless IP based mobile communication networks. The next generation of IP based mobile networks such as WIMAX and LTE (advanced) are expected to support a wide array of services and mobile devices requiring strict QoS and micro mobility support. Providing seamless delivery of content to the numerous mobile devices on the move with appropriate QoS has become a prominent challenge to be met. In order to tackle this various IP level QoS mechanisms were proposed to ensure that sessions are provided appropriate QoS guarantees. To tackle the issue of moving Mobile Nodes (MN) Mobile IPv4 (Perkins, 2002) and then Mobile IPv6 (Johnson, Perkins, & Arkko, 2004) were proposed. However, Mobile IP can not be considered as an appropriate solution for optimal handover management i.e. to minimise handover latency. Mobile IP is associated with large handover delays as at each handover a location update needs to be sent to the HA through the Internet leading to large signalling overheads (A. T. Campbell & Gomez-Castellanos, 2000). These delays are predominantly due to the necessary registration signalling to the Home Agent and the establishment of the new tunnel. To counter the large handover latency of Mobile IP, various local mobility or micro mobility solutions were proposed to ensure a seamless handover performance by minimising the packet loss and delay during handovers, especially for time critical applications such as Voice over IP (VoIP). Moreover, micro-mobility can be thought as being inherently a QoS solution to address the degradation caused during Mobile IP handovers.

IP based networks such as the Internet in its original form does not provide any QoS nor Mobility support. As it stands the existing Internet cannot be used to deploy IP based mobile networks. The flexibility as well as other benefits of

deploying IP based mobile networks has lead to numerous research activities in developing QoS and mobility mechanisms for the Internet. On the other hand there are strong incentives of mobile wireless networks to move towards IP technology. The most prevailing of them is to capitalize on the success of Internet applications but also to provide a common forwarding and management plane where convergence of the different wireless networks can be built (Wisely, 2009). In that integrated environment, provisioning the mobile Internet with QoS and mobility support will lead to the realization of ubiquitous communications (communication anytime and anywhere). Such a paradigm can bring forth numerous benefits both to end users by allowing them to use transparently the best available network and the network operators by reducing the cost of managing their infrastructure.

This chapter provides an overview of the recent QoS and micro mobility works as well as their interactions between them. In particular, the interaction between micro mobility and routing (QoS and normal routing) are considered. The impact of Mobility Agent (MA) based micro mobility is shown through examples followed by a proposed optimization framework that allows deploying Mobility Agents so that adverse effects of Mobility Agents on routing are minimized. Finally, avenues of future research work are also given towards the end of the chapter.

BACKGROUND

Future mobile access networks are expected to support a variety of mobile devices over IP. Hence, having efficient support of Mobility and QoS are of paramount importance for the successful deployment of IP based access networks. This section explores the major aspects of the QoS and mobility mechanisms and provides a background towards the main contribution of this chapter.

17 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:
www.igi-global.com/chapter/quality-service-issues-micro-mobility/40758

Related Content

Data Gathering in Correlated Wireless Sensor Networks with Cooperative Transmission Data Gathering in Correlated Wireless Sensor Networks with Cooperative Transmission

Laxminarayana S. Pillutla and Vikram Krishnamurthy (2012). *Wireless Technologies: Concepts, Methodologies, Tools and Applications* (pp. 944-966).

www.irma-international.org/chapter/data-gathering-correlated-wireless-sensor/58825

A QoS Guaranteed Call Admission Control (QOG-CAC) Algorithm for Broadband Networks

Aminu Mohammed, Yese Orduen Solomon and Ibrahim Saidu (2019). *International Journal of Wireless Networks and Broadband Technologies* (pp. 46-63).

www.irma-international.org/article/a-qos-guaranteed-call-admission-control-qog-cac-algorithm-for-broadband-networks/237191

Open Source for Mobile Devices and Mobile Learning

Hal Steger (2012). *Wireless Technologies: Concepts, Methodologies, Tools and Applications* (pp. 1900-1908).

www.irma-international.org/chapter/open-source-mobile-devices-mobile/58875

Recent Advances on Artificial Intelligence in Cognitive Radio Networks

Badr Benmammar (2020). *International Journal of Wireless Networks and Broadband Technologies* (pp. 27-42).

www.irma-international.org/article/recent-advances-on-artificial-intelligence-in-cognitive-radio-networks/249152

Analyzing Small-Cells and Distributed Antenna Systems from Techno-Economic Perspective

Christos Bouras, Vasileios Kokkinos, Anastasia Kollia and Andreas Papazois (2017). *International Journal of Wireless Networks and Broadband Technologies* (pp. 45-64).

www.irma-international.org/article/analyzing-small-cells-and-distributed-antenna-systems-from-techno-economic-perspective/198516