Chapter 12
Medical Quality of Service (m-QoS) and Quality of Experience (m-QoE) for 4G-Health Systems

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ABSTRACT

It is well known that the evolution of 4G-based mobile multimedia network systems will contribute significantly to future m-health applications that require high bandwidth, high data rates, and more critically better Quality of service and quality of experience. The key to the successful implementation of these emerging applications is the compatibility of emerging broadband wireless networks such as mobile WiMAX, HSUPA, and LTE networks with future m-health systems. Most recently, the concept of 4G-health is introduced. This is defined as the evolution of m-health towards targeted personalized medical systems with adaptable functionalities and compatibility with future 4G communications and network technologies. This new concept represents the evolution of m-health toward 4G mobility. It will have new challenges especially from the next generation of mobile communications and networks perspective and in particular from relevant quality of service and quality of experience issues. This chapter presents some of these challenges and illustrates the importance of the new concepts of medical Quality of Service (m-QoS) and medical Quality of Experience (m-QoE) for 4G-health systems. The chapter also presents a validation scenario of these concepts for medical video streaming application as a typical 4G-health scenario.

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INTRODUCTION

The m-health concept is originally defined and introduced as 'emerging mobile computing, medical sensor, and communications technologies for healthcare'. This emerging concept represented the evolution of e-health systems from traditional desktop "telemedicine" platforms to wireless and mobile configurations (Istepanian, et al., 2004).

Since then and with the introduction of HSxPA and broadband wireless networks, numerous successful deployments of several m-health scenarios have been gained that support mobile real-time m-health applications. For example, with current wireless technologies, patient records, X-ray images, and CT scans can be accessed by healthcare professionals from any given location by connection to the specific medical center's information system using the 3G/3.5G/WiFi enabled iPhone or iPad terminals.

The increasing demand for high bandwidth applications with specific quality of service (QoS) and quality of experience (QoE) has been increasing sharply. More recently, the focus of different network service providers is switching from network quality of service to user quality of experience that describes the overall performance of network from the user's perspective.

This mechanism constitutes major challenges on future m-health systems in assuring both end-to-end QoE and QoS for next generation networks and to achieve high network QoS especially on the application layer.

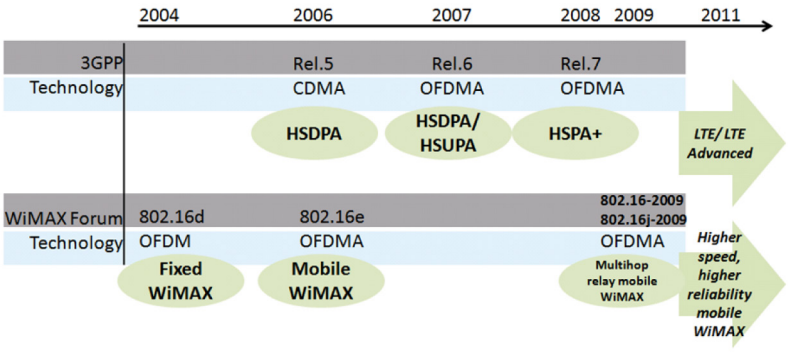
In this chapter, we present the new concepts of medical quality of experience (m-QoE) and medical quality of service (m-QoS) and describe their perspective mapping issues for different m-health applications. We also validate these mapping issues in a typical video streaming application model.

4G-Health Systems

The last decade has witnessed major research progress on m-health systems using different wireless access technologies(Istepanian, et al., 2002; Istepanian, et al., 2000; Istepanian, 2000; Istepanian, 1999; Richards, 1999; Istepanian, 1999; Tachikawa, 2003). However, major limitations existed on earlier m-health network technologies based on 2.5G/3G networks that restricted their wider deployment. Some of these issues were summarized as follows (Istepanian, et al., 2004):

1. The lack of existing flexible and integrated "m-Health-on-demand" connectivity with different mobile telecommunication systems and standards for different healthcare services. This lack of compatibility exists due to the difficulty of achieving operational

Figure 1. Evolution timeline of beyond 3G (4G) networks (Berndt, 2008)



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