

# Chapter 18

## Mobile–Fixed Integration for Next–Generation Mobile Network: Classification and Evaluation

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### ABSTRACT

*In recent years, the growth the in number of heterogeneous interconnected systems, as well as the emergence of new requirements in applications and services are progressively changing the original simplicity and transparency of the Internet architecture. When this architecture was designed, the main goal was to interconnect stationary host. Therefore, the appearance of mobile communications has made necessary to adapt traditional protocols in order to accommodate mobile users. This implies a new interaction between the mobile network and the fixed access network. This chapter describes the main IP mobility protocols and presents a novel classification, which relates the integration of the mobility protocol with the access network. The chapter also presents analytical models to evaluate the registration updates cost and the packet loss rate of the classified protocols.*

### INTRODUCTION

The Internet was originally designed at mid-seventies to link together a small group of researchers. Nowadays, is used by millions of people around the world. Evolutionary approaches aim at improv-

ing currently used technologies. The appearance of mobile communications has made necessary to adapt traditional protocols in order to accommodate mobile users. The next step is the design of new architectures that guide to the integration of mobility in the future Internet.

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Fourth-Generation (4G) wireless networks aim to integrate heterogeneous networks seamlessly (Frantasi, Fathi, Fitzek, Prasad, Katz, 2006), in order to satisfy the increasing demand of users in terms of QoS and bandwidth requirements (Beck, Chrisment, Droms, & Festor, 2010). This integration does not involve only wireless network but also fixed networks seamlessly.

The integration is obtained deploying all-IP architectures to meet new requirements in 4G networks such as QoS, timing synchronization, lower packet loss and high availability (Tipmongkolsilp, Zaghloul, & JukanFrattasi, 2011).

As mentioned above, one of the main issues in future fixed-mobile converged networks is the provision of end-to-end QoS to fulfill the requirements of emerging services and applications. The future converged network will have to deal with users that are going to be using diverse applications, from the simplest ones like e-mailing and web browsing to real time applications like IP telephony or Video on Demand.

However, enabling QoS over Internet is a great challenge, because it introduces complexity starting from applications, different networking layers and network architectures, but also in network management and business models.

QoS is a term that covers network performance characteristics and has two parts:

- Finding a path throughout a network that can provide the service that is going to be offered.
- Enforcing that service.

QoS is most often used to describe a set of techniques to manage packet loss, throughput, latency, and jitter. Quality of Service is usually described as managed unfairness. For instance, if the network has contention for system resources, which kind of service is the network unfair to,

why prioritize a packet flow with respect to the others, or how does the network decide which packets get what service.

The answers to these questions become tougher when QoS is introduced in an environment of mobile hosts, wireless and wired networks, and different access technologies, due to the wireless networks dynamic changes, topologies and resources. The need for QoS mechanisms in these environments are even greater due to scarce resources, such as unpredictable available bandwidth, variable error rates and disruption times.

When the Internet was designed, mobility support was not taken in account. Later, the IETF noticed this lack and the Mobile IP working group were founded to develop mobility support for IP. The rapid growth of mobile devices users as well as the continuous development of wireless technologies has changed the way in which the Internet is used. Furthermore, this evolution has introduced its own set of challenges related with mobility management and QoS issues.

Traditional and rigorously QoS architectures that were proposed for the Internet are not directly applicable to mobile networks. Flexible QoS schemes that could adapt to the agile nature of wireless networks need to be developed. Many challenges still remain to be solved for achieving a Future Fixed-Mobile Converged networks, but this task has proven to be nontrivial as well as costly.

The following section gives a brief overview of traditional mobility management protocols and QoS paradigms. Then, the future trends related to QoS in fixed-mobile environments and a framework to provide QoS on the fixed-mobile converged networks are presented. Next, an analytical evaluation and a performance comparison of different proposal for fixed and mobile integration are also made. Finally, the chapter presents the conclusions of the work.

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