Opportunities and Challenges from Unlicensed Mobile Access (UMA) Technology

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INTRODUCTION

The tremendous growth in the mobile communications sector has had a profound technical, economic/business, and social impact in Europe and worldwide (Chochliouros & Spiliopoulou, 2005). In particular, various sectors' effects combined with the rapid expansion of (fixed) broadband wireless technologies have generated, *in several instances,* suitable prerequisites (and/or conditions) for further development and exploitation, to successfully realize a diversity of convergence-based opportunities (Chochliouros, Spiliopoulou, & Lalopoulos, 2004; Yoon, Yoon, & Lee, 2005).

Mobile devices are currently used in virtually every domain of human activity (i.e., private, business, and governmental). While the relevant penetration levels are likely to continue to enlarge (*in fact, mobile phone penetration has now reached well over two billion subscribers globally*), the most important future evolutionary progress will be the development of innovative broadband facilities-applications. Potential offerings of third-generation mobile (3G) infrastructure (and of its enhancements), together with other modern wireless technologies, especially Radio Local Area Networks (RLANs) and Wi-Fis (Kumar, 2004; Siau & Shen, 2003) affect the growth of the modern economy. The fast expansion of these technologies creates a paradigm shift that will make possible the appearance (and the adoption) of new data services, able to combine the advantages of broadband with mobility features (Commission of the European Communities, 2004a). To this important perspective, all related applications can exercise an essential impact in various fields (technical, commercial, financial, regulatory, social, etc.) and, *most significantly*, they can produce considerable economic effects by potentially modifying the way that business is done. However, as most of the innovative electronic communications offerings can be accessed and exploited by converged means and resources, the "combined" usage of fixed and mobile infrastructures/facilities can be the basis for further development and progress.

Moreover, if looking forward, the convergence of telecommunications-, broadcasting-, and Internet-based facilities will result in the proliferation of high-speed multimedia services, delivered over such networks/infrastructures. Recent market experiences have demonstrated that 2.5G/3G infrastructures (and RLANs) will coexist and provide complementary services (Commission of the European Communities, 2004b). Users can thus benefit themselves of high-speed wireless access when near a hot-spot, and receive 3G services over a broader area. Therefore, convergence of fixed and mobile services, through unified fixed/mobile offerings, is expected to bring additional opportunities for novelty.

UNLICENSED MOBILE ACCESS IN THE CONTEXT OF THE BROADER "CONVERGENCE" EFFORTS

As voice becomes even more of a commodity service and use of data services grows, network operators realize that they need to adopt converged (network-based) services and offer easier ways to roam across networks

(Sutherland, 2007). The world scenery for wireless and mobile communications is changing very quickly (subsequent to international trends and practices) and consequently, a number of market operators of the wider electronic communications industry have nowadays focused their business priorities on the applicability/effectiveness of an increasing set of fixed-mobile convergence (FMC) initiatives (Merry, 2007), linked with modern and fascinating technological solutions (Lainé, Drevon, & Cannet, 2005).

The majority of these initiatives are expected to be suitably developed through the exploitation of "*Unlicensed Mobile Access*" (*UMA*) *(or alternatively known as "Generic Access Network"-GAN)* technology, which represents the first global standardized effort (supported by the 3rd Generation Partnership Project - 3GPP) for subscriber access to mobile circuit-, packet-, and IMS-based (IP Multimedia System) services over any IP-based access network (e.g., Wi-Fi, DSL (Digital Subscriber Line), Cable, Fiber-to-the-Home (FTTH), etc.), including the Internet (More specifically, the related system was initially called "UMA" and then renamed to "GAN").

All further work related to unlicensed mobile access takes place in 3GPP and is coordinated with all future standardization and development of the actual GSM (Global System for Mobile Communications) and WCDMA (Wideband Code Division Multiple Access) networks.

Originally developed by 15 leading companies in the mobile industry (including, among others, Alcatel, British Telecom, Cingular, Kineto Wireless, Motorola, Nokia, Nortel Networks, Siemens, Sony Ericsson, and T-Mobile), the UMA (http://www.umatoday.com/) is now the 3GPP standard for enabling subscriber access to mobile services over Wi-Fi and broadband IP networks (3GPP, 2007a; 2007b).

Handset and network vendors have taken an energetic part in the relevant standardization procedures in order to: minimize the impact on the handset and leverage on already-existing implementations; enable rapid time-to-market; ensure interoperability between a wide range of handsets and networks; and, increase the possibility of commercial handset availability from multiple handset vendors. The endorsed specification is now able to define network elements and protocols that support user authentication and the transparent handoff of calls from cell towers to IP-based access points based on both Wi-Fi and Bluetooth. The UMA specification focuses on four key design objectives: security and authentication, full-service support, seamless session transparency, and minimal impact to the core network (Finger-Gibson, Bilderbeek, & Vestergaard, 2005).

The suggested UMA network facilities, *because of their cost and performance advantages*, are proving to be quite important complements to cellular radio access networks. In particular, when the fixed access is of wireless nature, then UMA can become an efficient and sophisticated solution allowing for seamless handover between cellular networks and wireless local area networks (WLANs), while simultaneously supporting a variety of enhanced interoperability/interconnection features (Chochliouros & Spiliopoulou, 2003).

This is a challenge of high priority for a huge majority of market players, either fixed or mobile: that is, the former can consider the suggested solution as a "proper defensive move" to protect their "customer base" in opposition to churn and traffic losses due to existing worldwide trends for "*fixed-to-mobile*" substitution; a fixed/broadband operator can thus expand its business into mobile operations via a Mobile Virtual Network Operator (MNVO) agreement and sell mobile services under its brand using the mobile operator's network. On the other hand, fixed operators can also take advantage of UMA, but the "key prerequisite" is partnership with a mobile operator, enabling them to offer mobile services directly (or to bundle them with existing services). In cases where ownership interest exists, the cooperation is easier to establish, and several operators are working on the synergy that a UMA service closely tied to a fixed network can generate (Ericsson, 2005; Nokia Corporation Networks, 2006).

In addition, mobile operators are considering UMA as a suitable means: (i) to penetrate the indoor voice market; (ii) to enhance the performance of mobile services indoors (by improving coverage in locations where it is not economical or technically feasible to provide GSM or WCDMA coverage); and, (iii) to capitalize new streams of revenue by differentiating their offerings and making pricing more affordable (Schweizer, 2006). This also provides the possibility to offer a bundled service together with a fixed/broadband market partner, in the environment of competitive markets. One supplementary key advantage of UMA is that the mobile core network remains unchanged, as the related solution can integrate directly with the mobile core network.