Chapter LVII
Mobile Computing:
Technology Challenges, Constraints, and Standards

Anastasis A. Sofokleous
Brunel University, UK

Marios C. Angelides
Brunel University, UK

Christos N. Schizas
University of Cyprus, Cyprus

ABSTRACT

Mobile communications and computing has changed forever the way people communicate and interact and it has made "any information, any device, any network, anytime, anywhere" an everyday reality which we all take for granted. This chapter discusses the main research and development in the mobile technology and standards that made ubiquity a reality: from wireless middleware to wireless client profiling to m-commerce services.

INTRODUCTION

What motivates the ordinary household to embark on mobile computing is the availability of low-cost, lightweight, portable "Internet" computers. What fuels this further are protocols and standards developed specially, or modified, to enable mobile devices to work pervasively: "any information, any device, any network, anytime, anywhere" and hence to support mobile applications especially m-commerce. Mobile devices are usually being utilized based on the location and mobile users' profile, and therefore content has to be provided and most of the times to be adapted in a suitable format. Although mobile devices' constrains vary (e.g., data transfer speed, performance, memory capabilities, display resolution, etc), researchers and practitioners taking advantage of new technologies and standards, are trying to overcome every limitation and constraint.

This chapter presents an overview of mobile computing and discusses its current limitations. In addition, it presents research and development work currently carried out in the area of technology and standards, and emphases the effect industry has on mobile computing. Furthermore, this chapter aims to provide a complete picture of mobile computing challenges in terms of payment, commerce, middleware and services in m-commerce. The proceeding chapter presents the most popular technologies and standards implemented for mobile devices whilst the chapters thereafter discuss wireless middleware, the importance of client profiling for wireless devices. The final chapter concludes with discussion of challenges and trends.

WIRELESS TECHNOLOGIES AND STANDARDS

Currently, the focus is on wireless technologies and standards, such as in the area of network connectivity, communication protocols, standards and device characteristics (e.g., computing performance, memory, and presentation). A lot of technologies are being proposed and investigated by researchers and practitioners, some of which have been incorporated in industrial wireless products whose aim is to dominate the next generation market (Figure 1).

Among the most known communication standards and wireless deployments are the GSM, TDMA, FDMA, TDMA, CDMA, GPRS, SMS, MMS, HSCSD, Bluetooth, IEEE 802.11, etc. **GSM** (global system for mobile communications) is a 2G digital wireless standard, which is the most widely used digital mobile phone system. GSM uses the three classical multiple access processes, space division multiple access (**SDMA**), frequency division multiple access (**FDMA**), and time division multiple access (**TDMA**) in parallel and simultaneously (Heine & Sagkob, 2003). **CDMA** (code division multiple access), which is

also a second generation (2G) wireless standard, works by some means different than the previous wireless. It can be distinguished in the way information is transmitted over the air, since it uses unique coding for each call or data session, which allows a mobile device to distinguish other transmissions on the same frequency. Therefore this technology allows every wireless device in the same area to utilize the same channel of spectrum, and at the same time to sort out the calls by encoding each one uniquely. **GPRS** (General Packet Radio Service) is a packet-switched service that allows data communications (with data rates significantly faster than a GSM — 53.6kbps for downloading data) to be sent and received over the existing global system for mobile (GSM) communications network. The introduction of **EDGE (**enhanced data rates for GSM evolution) enhances the connection bandwidth over the GSM network. It is a 3G technology that enables the provision of advanced mobile services (e.g., the downloading of video and music files, the high-speed color Internet access and e-mail) anywhere and anytime.

The **SMS** (short message service) is a technology that allows sending and receiving text messages to and from mobile telephones. Although the very first text message was sent in December 1992, commercially, SMS was launched in 1995. The rapid evolution of SMS is evident, since by 2002, over a billion text messages were being exchanged globally per day and by 2003, that figure had jumped to almost 17 billion. One reason mobile phone carriers continue to push text messaging is that they derive up to 20% of their annual revenues from SMS service (Johnson, 2005). **MMS** (multimedia messaging service) is the descendant service of SMS, a store and forward messaging service that allows mobile subscribers to exchange multimedia messages with other mobile subscribers. **HSCSD** (high speed circuit switched data) is an enhancement of data services (circuit switched data — CSD) of all current GSM networks enabling higher rates

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