

## Foreword

Mobility has become the next big challenge in our inter-connected world. Indeed, after the Internet widespread dissemination, users are eager for information anytime anywhere. Although ubiquity brought the power of computing anywhere, it is the access to global information that enriches the usefulness of mobile computing.

From an historical perspective, the Internet widespread dissemination enabled the access to huge amounts of free information. This information is accessible from any pc, provided it is connected to a network.

Naturally, the users that were previously restricted to a desktop pc now aspire to have the same access to information from everywhere. Accessing information anytime, everywhere requires a mobile computing environment. To the development of a mobile computing environment contributed the miniaturization of devices and the improvement on wireless technologies.

From the miniaturization of devices spurred Smartphones, devices that merge the mobile phone with the pocket pc concepts, and Netbooks, small laptops that favor (wireless) communications to raw computing power. On the other hand, the development of carrier technologies with increased network bandwidth popularized broadband access either at home (through cable) or on mobile devices (through wireless).

We now live in a highly inter-connected world, made of several networks, available from a multitude of wireless technologies that enable a mobile behavior (consider for example WiFi, WiMAX, UMTS, HSDPA).

### **CHALLENGES AND OPPORTUNITIES AVAILABLE**

However, (hardware) technology by itself does not suffice to harness the challenges present on a mobile computing environment. It is necessary to consider how technology should be used by applications.

The applications for the mobile environment share the same communication model but also the same limitations found in Internet applications.

There is an overwhelming range of distributed applications available for distributed systems in general, and for the Internet in particular, that can be brought to the mobile environment. However, the mobile environment presents some specific challenges that are not common for a generic distributed system like the Internet.

Device and service availability is an important property of a mobile system since some devices may come and go from the system, rather than being permanently available like the typical server device. A consequence of the absence of permanent availability is the absence of data persistency. Where should

data be stored? After storing data, possibly in more than a single place, synchronization is another important property. Is the data being accessed the most up-to-date?

When looking at the Web evolution, it is possible to clearly identify two phases: the first is about accessing information; and the second is about accessing (web) services. Like the Web, the mobile environment is perfectly capable of offering remote services. Joining services with mobility opens up new market opportunities. For example, geographic based advertising is an example of merging information access (through web services) and mobile positioning. Several web-based map providers are starting to offer recommendations based on the location of the user. This can only be possible having a mobile device that can communicate through a wireless network.

Nowadays, there are a variety of (mobile) devices and applications that are capable of running mobile services (consider for example a Smartphone with email/internet access and GPS positioning). Yet, little is known of the success of this new technology, and most importantly, how are people adopting it. The success of a mobile platform is not determined exclusively by technology, but also by how people use it to enrich their lives.

## **CONTRIBUTIONS OF THE BOOK**

This handbook of research contributes with state-of-the-art research on all three aspects considered previously: technology, applications and social impact on the adoption of these systems.

Several technologies are covered in the book, ranging from performance improvements and routing optimizations on (generic) wireless networks; considerations for WiMAX; new designs for sensor networks; and new uses for RFID and Near Field Communication systems.

In the application arena, several areas of interest have been covered, namely: health, e-government, advertisement, e-learning, university campus services, vehicular networks, Virtual and Small-Medium Enterprises and mobile grid computing.

A particular attention was given to e-learning, with several contributions in providing lessons through mobile devices, supporting and monitoring tools on mobile devices and identifying success factors for mobile learning model, including specific case studies in large organizations.

Device localization received several contributions for being an important operational feature for positioning mobile devices. Two wide range of localization schemes were considered: GPS based and local wireless (WiFi) based. Device localization is necessary to enhance a whole range of services, from advertisement to social ones.

Vehicular networks are yet another mobile computing platform that has specific characteristics as a wireless ad-hoc network. This type of network raises unique challenges and security issues that were identified and are not present on typical (computer) networks.

In the social impact of a mobile computing platform, several domains have been presented, from a specific collaborative learning environment, to the use of mobile devices in higher education institutions to enterprise institutions.

Indeed, the adoption of mobile devices is a disruption of the typical stationary computing platform. Youngsters tend to adopt more easily new technologies, in this case mobile devices, than elders. The typical population of education institutions is younger than enterprise institutions, hence the interest of these case studies in different environments. However, the mobile platform is not confined to the educational environment, and hence the interest of considering how mobile applications can be applied to

new domains like tourism and entertainment. Regardless of the specific domain in use, it is shown the viability of business models for mobile e-commerce.

In summary, a handbook of research that demonstrates what can be achieved within this domain would have been welcome in itself. A handbook that besides this purpose gives real insight, and that drives and inspires those that read it to contribute to the ongoing technological improvements and development of successful applications, represents a major contribution to the body of knowledge in mobility and computing.

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