Mobile Computing for M-Commerce

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INTRODUCTION

The ubiquitous nature of modern mobile computing has made "any information, any device, any network, anytime, anywhere" a well-known reality. Traditionally, mobile devices are smaller, and data transfer rates are much lower. However, mobile and wireless networks are becoming faster in terms of transfer rates, while mobile devices are becoming smaller, more compact, less power consuming, and, most importantly, user-friendly. As more new applications and services become available every day, the number of mobile device owners and users is increasing exponentially. Furthermore, content is targeted to user needs and preferences by making use of personal and location data. The user profile and location information is becoming increasingly a necessity.

The aim of this article is to present an overview of key mobile computing concepts, in particular, those of relevance to m-commerce. The following sections discuss the challenges of mobile computing and present issues on m-commerce. Finally, this article concludes with a discussion of future trends.

CHALLENGES OF MOBILE COMPUTING

Current mobile devices exhibit several constraints:

- Limited screen space: screens cannot be made physically bigger, as the devices must fit into hand or pocket to enable portability (Brewster & Cryer, 1999)
- Unfriendly user interfaces
- Limited resources (memory, processing power, energy power, tracking)
- Variable connectivity performance and reliability
- Constantly changing environment
- Security

These constraints call for immediate development of mobile devices that can accommodate high quality, user-friendly ubiquitous access to information, based on the needs and preferences of mobile users. It also is important that these systems must be flexible enough to support execution of new mobile services and applications based on a local and personal profile of the mobile user.

In order to evaluate the challenges that arise in mobile computing, we need to consider the relationships between mobility, portability, human ergonomics, and cost. While the mobility refers to the ability to move or be moved easily, portability relates to the ability to move user data along with the users. A portable device is small and lightweight, a fact that precludes the use of traditional hard-drive and keyboard designs. The small size and its inherent portability, as well as easy access to information are the greatest assets of mobile devices (Newcomb et al., 2003). Although mobile devices were initially used for calendar and contact management, wireless connectivity has led to new uses, such as user location tracking on-the-move. The ability to change locations while connected to the Internet increases the volatility of some information. As volatility increases, the cost-benefit trade of points shift, calling for appropriate modifications in the design.

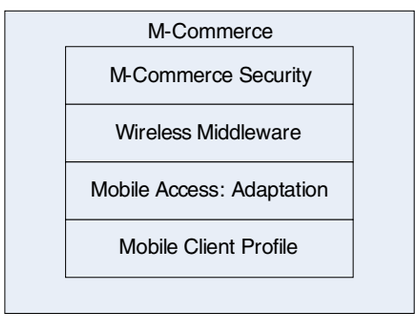
Wireless communications and mobile connectivity are overridden by bandwidth fluctuations, higher loss rates, more frequent and extended disconnections, and network failures that make Quality of Service (QoS) a continuous challenge. As a result, applications must adapt to a continuously changing QoS. Although mobile devices are designed to run light applications in a stand-alone mode, they still make use of wireless communication technologies such as Bluetooth, GPRS, and WiFi, which makes them useful in the new mobile world sphere, but they succumb to QoS limitations as a result of portability.

Mobility also is characterized by location transparency and dependency. A challenge for mobile computing is to factor out all the information intelligently and provide mechanisms to obtain configuration data appropriate to the current user location. In fact, in order to resolve a user's location, it is necessary to filter information through several layers: discovering the global position, translating the location, superimposing a map, identifying points of interest for the user and their relative range to that of the user. This suggests a multi-layer infrastructure. A number of location tracking services were developed in order to provide location information transparently to application developers who need to deploy location-aware applications.

M-COMMERCE

Mobile commerce is fast becoming the new trend for buying goods and services. As with e-commerce, it requires security for mobile transactions, middleware for content retrieval, and adaptation using client and device information.

Figure 1. M-commerce



The enormous effect of mobile commerce in our lives can be noticed by studying the effect of m-commerce on industries in a way that will exceed wireline e-commerce as the method of preference for digital commerce transactions (e.g., financial services, mobile banking), telecommunications, retail and service, and information services (e.g., delivery of financial news and traffic updates). The global m-commerce market is likely to be worth a surprising US $200 billion in 2004 (More Magic Software, 2000). Report statistics confirm that in 2003, over a billion mobile phone users regarded it as a valuable communication tool. Global mobile commerce revenue projections show revenues up to the 88 billions for 2009 (Juniper Research, 2004).

Mobile security (M-Security) and mobile payment (M-Payment) are essential to mobile commerce and mobile world. Consumers and merchants have benefited from the virtual payments that information technology has conducted. Due to the extensive use of mobile devices nowadays, a number of payment methods have been deployed that allow the payment of services/goods from any mobile device. The success of mobile payments is contingent on the same factors that have fueled the growth of traditional non-cash payments: security, interoperability, privacy, global acceptance, and ease-of-use (Mobile Payment Forum, 2002).

The challenges associated with mobile payments are perhaps better understood using the example of credit card transaction. A card transaction involves at least four parties. As illustrated in Figure 2, the user as a buyer is billed by the card issuer for the goods and services he or she receives from the seller, and the funds are transferred from the issuer to the acquirer, and finally to the merchant. First, the consumer initializes the mobile purchase, registers with the payment provider, and authorizes the payment. A content provider or merchant sells product to the customer. The provider or merchant forwards the purchase requests to a payment service provider, relays authorization requests back to the customer, and is responsible for the delivery of the content. Another party in the payment procedure is the payment service provider, who is responsible for controlling the flow of transaction between mobile consumers, content providers, and trusted third parties (TTP), as well as for enabling and routing the payment message initiated from the mobile device to be cleared