Chapter VII

Modeling Static Aspects of Mobile Electronic Commerce Environments

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ABSTRACT

Mobile phones and other small and powerful portable devices have revolutionized personal communication and affected the lifestyles of the people in the industrialized world. Following credible estimates, in a few years there will be one billion of such portable devices. An emerging trend is the electronic commerce performed using mobile terminals, often called mobile commerce. Mobile commerce environments are characterized by high complexity, including myriads of technical and organizational aspects. This property makes it difficult to distinguish the more fundamental issues, structures, and concepts in mobile commerce from the hype. To capture the fundamental aspects of mobile commerce environments, we have developed a model. It covers fundamental static aspects of the m-commerce environment and their relationships. We distinguish four spheres of concern: Regulatory Frameworks, Business Models, Enabling Technologies, and the Global Infrastructure. Rather than providing technical details of m-commerce environments, our aim is to model invariant properties that will evidently persist for years to come. Making use of the abstraction capabilities provided by the object-oriented approach, the model is represented by OO structure diagrams.

INTRODUCTION

Mobile phones and other small and powerful portable gadgets have revolutionized personal communication and affected, considerably, the lifestyles of the people in the industrialized world. In a recent development, voice capabilities of mobile phones are augmented with data capabilities of increasing speed, and stand-alone Personal Digital Assistants (PDA) are equipped with additional communication capabilities. The Mobile Electronic Transaction Forum (2001) indicates that small-size mobile terminals are currently converging and evolving into Personal Trusted Devices (PTD) that allow users to access mobile Internet services and run applications at any time and at any place. The telecom industry estimates that there will be 500 million Internet-enabled mobile phones in 2003. The number of these mobile Internet-enabled PTDs is expected to exceed the number of fixed-line Internet users around 2003. Mobile commerce (m-commerce) is an important emerging application class in the wireless Internet environment.

M-commerce involves numerous domains, including network technology, business, government regulation, and standards. The main contribution of this chapter is organizing these aspects of mobile commerce environments and describing them using an object-oriented approach. This chapter focuses on the static aspects of mobile commerce environments; dynamic aspects are discussed briefly, mainly in settings where they have implications on the static structures. However a complete modeling of the dynamic aspects of mobile commerce environments—such as functioning of a particular protocol—is outside the scope of this contribution.

The overall setting we have in mind is shown in Figure 1. At the center is the global network infrastructure (called Wireless Backbone) that carries all kinds of high-volume data traffic. Currently, it is mostly the Internet. At the edges there are different wireline and wireless access technologies, such as wireline telecom networks, wireline local area networks (IEEE 802.3), wireless local area networks (IEEE 802.11), standardized by the LAN/MAN Standards Committee 802 of the Institute for Electrical and Electronics Engineers or wireless telecom networks (GSM, 3G) specified by the European Telecommunications Standards Institute (ETSI) (2000), and Bluetooth, specified by Bluetooth Consortium (Bluetooth, 2002). In computer network technology (as e.g., Tanenbaum, 1996 points out), these access networks represent OSI-layers 1-3. The electronic commerce (e-commerce) services are offered by the servers and are accessed by the terminals or other servers through the wireless or wireline access networks. Most electronic commerce services require end-to-end connections between the terminal and server at OSI-layers 4-7. This is necessary especially due to authentication and authorization.

Differences in the technologies at layers 1-3 are mostly uninteresting for the e-commerce services, including m-commerce services. This is true for data transfer and general connectivity, but the access network types have some important differences that suggest that the division in Figure 1 into the wireless and wired worlds will persist. First, wireless terminals are inherently mobile. This makes

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