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Note from the Authors: This article is an excerpt from Chapter 5, Section 5.4 of *Wireless Internet & Mobile Business How to Program* and introduces wireless payment standards. We look at the development of current standards and the challenges the wireless community faces in regards to interoperability and inconsistency of these standards. We look at m-payment standards organizations, the remote m-wallet standard and the Mobile Electronic Transactions (MeT) standard as well as discuss overall m-payment issues in the wireless industry.

5.4 Wireless Payment Standards

The variety of wireless devices, the lack of m-payment *interoperability* and the immaturity of the m-payment industry have created a fractured industry and inconsistent user experiences. Interoperability, the ability for transactions to be performed using any software or device, is a major hurdle for the m-payment industry. Unlike e-payments, which are made using PCs, m-payments can be made using mobile phones, PDAs or laptops; each device has different interfaces and uses different technologies. As a result, m-payments lack transaction standards enabling interoperability, thus limiting consumer adoption of m-payment technology. As organizations develop standards and support interoperability, m-payments will become more widely adopted.

Early e-mail software is an example of a technology with interoperability problems. For example, America Online's initial e-mail software did not communicate with other e-mail systems. Users could communicate only with other America Online (AOL) users. AOL redesigned its e-mail software to support open, or public, e-mail standards, such as *Post Office Protocol (POP)* and *Internet Message Access Protocol* (*IMAP*). To succeed, the m-payments industry must become interoperable. Currently, if users have m-wallet applications on their cell phones, they can purchase items only from merchants who support the same m-wallet software. Some m-payment companies have recognized this problem and are developing interoperable software.As with online payments, ensuring security is crucial to m-payments; consumers and merchants must be able to trust that their information remains secure during transmission. In this section, we examine wireless-payment organizations that develop transaction standards models to encourage interoperability m-payment transactions.

5.4.1 M-Payment Standards Organizations

Companies in the mobile industry (such as Ericsson and Nokia) financial institutions (such as Deutsche Bank) and payment-card companies (such as MasterCard), recognize the need for m-payment standards and have organized to support such efforts. Several organizations have produced transaction models that software companies can use as guidelines for developing wireless-payment software.

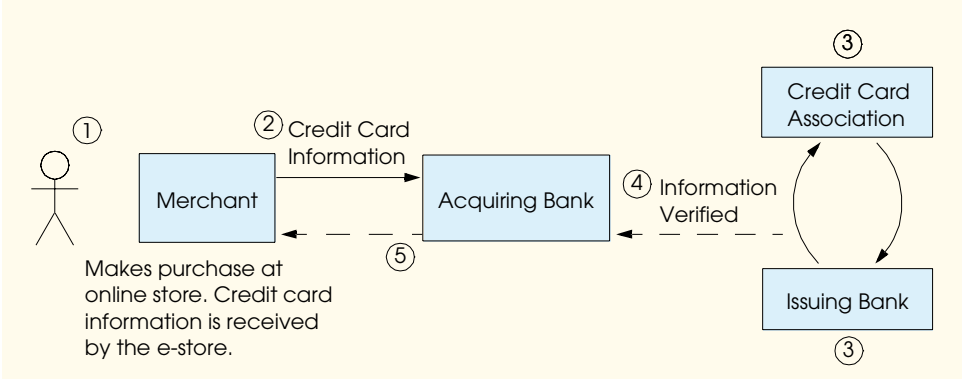

Fig. 5.1 Basic steps in an online credit-card transaction.

m-Fact 5.1

According to Forrester Research, Eurostat and ECB, the European m-payments market will be worth $23 billion (US dollars) by 2005.[4]

The *Global Mobile Commerce Interoperability Group (GMCIG)* (**www.gmcig.org**) is a nonprofit organization founded to develop secure, interoperable wireless-payment standards. Its efforts are presented to wireless-standards organizations, such as the *European Telecommunications Standards Institute (ETSI)* and the *WAP Forum*, to gain consensus in the industry. GMCIG's specifications documents include *Introduction to Digital Mobile Payments over Open Networks*, *Remote (Europay, MasterCard, Visa) Payments Using a Mobile Device*, *Remote Wallet Server Architecture* and *Remote EMV/SET Payments Using a Mobile Device*.[5]GMCIG members include credit-card companies, telecommunications-network operators, wireless-device manufacturers, mobile-technology developers, content providers and financial institutions.[6]

m-Fact 5.2

Celent forecasts that 60 million people worldwide will use mobile payments by 2004.[7]

Ericsson, Motorola, Nokia, Panasonic, Siemens and Sony sponsor the *Mobile Electronic Transactions (MeT) Group* (**www.mobiletransaction.org**). MeT develops open standards for wireless technology. MeT expects cell phones to evolve into devices that hold important personal and payment information. The organization has published specifications for security requirements, guidelines for consistent user interfaces and documents outlining account-based payments, event ticketing, retail shopping and WAP banking.[8] MeT also has joined the GMCIG to work toward interoperable standards. Section 5.4.3, Mobile Electronic Transactions (MeT) Standard, outlines the MeT m-payments model.

The Mobey Forum (**www.mobeyforum.org**), formed in May 2000, encourages the use of wireless payments, wireless banking and wireless brokerage access by financial institutions. Membership is open to financial institutions and mobile-phone manufacturers. Founding organizations include Ericsson, Motorola, Nokia, BNP Paribas, Barclays, Deutsche Bank, Nordea and Visa International.[9]

5.4.2 Remote M-Wallet Standard

Over a dozen companies offer m-payment capabilities supported by m-wallet software. GMCIG created a *wireless wallet (m-wallet) transaction model*. This model stresses secure transactions and consistent user experience over multiple devices.[10]

Central to the GMCIG's model is a computer that holds a database of user information, the *remote-wallet server.* To set up an m-wallet account, the user visits the wallet provider's Web site and enters billing and shipping information. The user must submit a password and, if applicable, the *Subscriber Identity Module (SIM)* of their cell phone. A SIM is a unique identifying number embedded in a cell phone. GMCIG's transaction model uses an embedded SIM or a phone that holds a *smart card*—a plastic card that looks like a credit card and stores and processes data. Many cell phones include identity modules. For instance, all cell phones designed to operate on the Global System for Mobile Communications (GSM) network, a system popular in Europe and other parts of the world, have SIMs embedded in them when manufactured. However, many cell phones manufactured for use in the U.S. do not necessarily hold a SIM, and another form of identification has to be used.[11]

For a cell-phone user to make a purchase, the user needs to complete a *payment application*. A payment application signals the user's intent to make a purchase (Step 1, Fig. 5.2) and is enabled through a SIM or through a remote-wallet server account. User information is encrypted in the cell phone and sent through the mobile operator's WAP gateway to the remote-wallet server that is connected to the Internet (Step 2, Fig. 5.2).[12] A *WAP gateway* serves as the link between the mobile device and the remote wallet server connected to the Internet. WAP gateways are designed to convert WAP to Hypertext Transfer Protocol (HTTP). HTTP is the common protocol used in the transfer and viewing of information in Web transactions. The server processes the mobile-device request by searching through existing databases and stores of account information. For security reasons, the remote wallet server is located at the bank that issues and acquires the transaction payments, rather than at the mobile carrier's site. The model uses a secure protocol for transactions between the remote wallet server and the bank servers (Step 3, Fig. 5.2). Purchase verification is then encrypted and the wallet server sends the requested information back to the WAP gateway using HTTP. The gateway translates the information back into WAP and sends it to the mobile device (Step 4, Fig. 5.2).[13]

Motorola and MasterCard are building a system that ensures interoperability between MasterCard's electronic-payment systems and Motorola's wireless-Internet devices and platforms. The two companies will develop next-generation m-commerce technologies that support GMCIG models. For example, if users are en route to an airport and their cell phones notify them of flight cancellations, they can find and book alternative flights and pay for the new tickets by using their cell phones.[14]

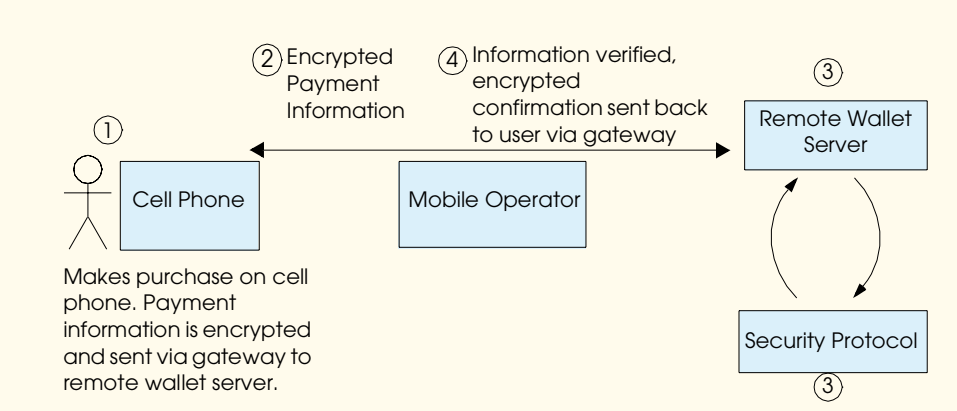

Fig. 5.2 M-wallet transaction model. (Courtesy of the Global Mobile Commerce Interoperability Group. © 2000-2001 MasterCard International Incorporated. All rights reserved.)

5.4.3 Mobile Electronic Transactions (MeT) Standard

Like the GMCIG, the *Mobile Electronic Transactions (MeT)* group (**www.mobile-transaction.org**) develops protocols for payments made using cell phones. Certain steps in MeT transactions are similar to the GMCIG model.[15]

The MeT model refers to SIMs as *security devices*. Each phone authenticates information and transactions through a security device embedded or added to a dual-slot phone (Step 1, Fig. 5.3). The security devices hold *key pairs* or certificates for authentication. Keys are strings of digits that act as passwords to authenticate the device to a merchant. Certificates are digital documents issued by *certification authorities,* and include relevant information about the company or individual being certified. Certification authorities are third-party companies that take responsibility for authentication and check information before issuing the certificates.

Authentication begins during the *Service Registration Interface* (Step 2, Fig. 5.3). In this step, the *Personal Trusted Device (PTD)* (or cell phone), downloads certificates from the issuer, which may be a bank or other financial institution.[16] The content server presents information to the PTD in the *Service Execution Interface* (Step 3, Fig. 5.3). The acquiring bank provides the contact between the issuer (the organization that supplies the account and the service certificate to the user) and the content provider. The acquiring bank performs a variety of tasks, including consolidating charges when there are multiple issuers. Users establish authentication requested by the content server by entering personal identification numbers (PIN) that correspond to service certificates and private keys stored in the PTDs.[17]

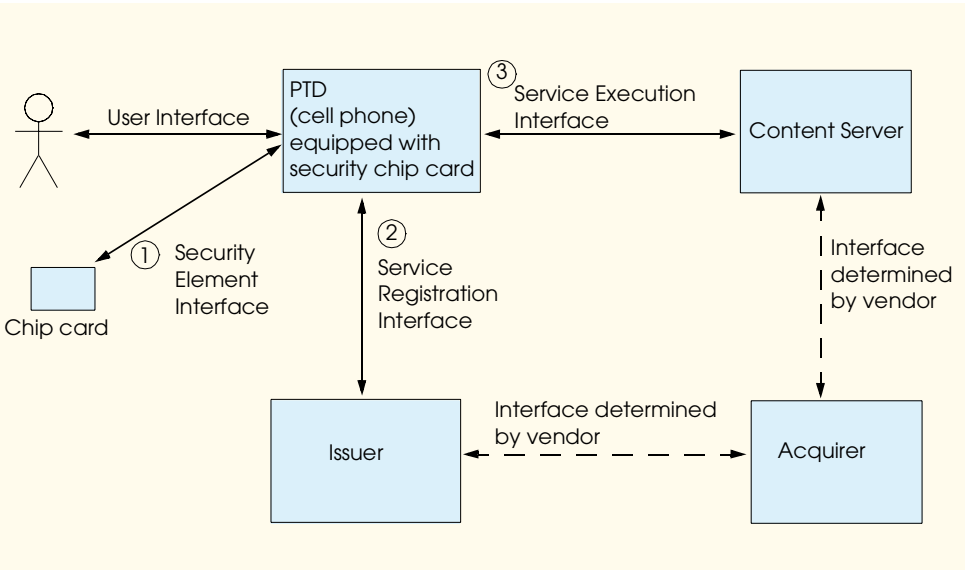

Fig. 5.3 MeT payment transaction model interfaces. (Courtesy of Mobile Electronic Transactions Initiative.)

MeT specifications do not address transaction steps that suit proprietary solutions (i.e., software or processes created by a company specifically for its business needs). Proprietary interfaces include communication between the content provider and the acquiring bank (or acquirer, the content provider's bank), the contact between the issuer (the bank that supplies the credit card) and the content provider, or between the issuer and the acquirer. In some cases, one entity performs all the functions of content provider, acquirer and issuer.[18]

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The notation **<www.domain-name.com>** indicates that the citation is for information found at the Web site.

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