

Mobile Commerce : Standards & Design Technologies

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Abstract—This paper presents the various standards and technologies with respect to various applications in the field of mobile commerce. It also compares J2ME with other technologies and standards are also compared so that more understanding of the various issues can be had while designing the mobile commerce applications. This paper analyzes the various technologies used for mobile commerce along with their advantages and disadvantages.

Index Terms—M-commerce, J2ME, i-mode, sixth term

I. INTRODUCTION

M-Commerce, stands for Mobile Commerce and refers to commercial transactions being conducted over cellular and mobile devices. M-Commerce originated around 90s. Mobile Commerce is defined as the use of information technologies and communication technologies for the purpose of mobile integration of different value chains and business processes, and for the purpose of management of business relationships. The various generations that represent technology are:

1G: 1979-1992 wireless technology

2G: current wireless technology; mainly accommodates text

2.5G: interim technology accommodates graphics

3G: 3rd generation technology supports rich media (video clips)

4G: will provide faster multimedia display

A. M-COMMERCE VERSUS E-COMMERCE

In comparison to e-commerce, m-commerce offers both advantages and disadvantages. The following list summarizes the *advantages* of m-commerce:

• Ubiquity: The use of wireless device enables the user to receive information and conduct transactions anywhere, at anytime.

• Accessibility: Mobile device enables the user to be contacted at virtually anytime and place. The user also has the choice to limit their accessibility to particular persons or times.

• Convenience: The portability of the wireless device and its functions from storing data to access to information or persons.

• Localization: The emergence of location-specific based applications will enable the user to receive relevant information on which to act.

• Instant Connectivity (2.5G): Instant connectivity or "always on" is becoming more prevalent will the emergence of 2.5 G networks, GPRS or EDGE.

• Personalization: The combination of localization and personalization will create a new channel/business opportunity for reaching and attracting customers.

• Time Sensitivity – Access to real-time information such as a stock quote that can be acted upon immediately or a sale at a local boutique.

• Security – depending on the specific end user device, the device offers a certain level of inherent security.

B. MOBILE COMMERCE STANDARDS

The categorization of mobile commerce standards is as follows:

- Transaction Based standards refer to requirements for a payment transaction to be accepted for processing
- Device Based standards refer to requirements for a terminal to capture a payment transaction
- Network Based standards refer to underlying network protocols that create result in demands and constraints
- Security Based standards refer to security & authentication measures around the core processes

& types of standards are:

GPS: Satellite-based Global Positioning System

PDA: Personal Digital Assistant—handheld wireless computer

SMS: Short Message Service

EMS: Enhanced Messaging Service

MMS: Multimedia Messaging Service

WAP: Wireless Application Protocol

II. MOBILE COMPUTING INFRASTRUCTURE

Mobile Computing Infrastructure involves:

A. APPLICATION LAYER TECHNOLOGIES

- Micro-browser based:

- WAP/WML, HDML: Openwave
iMode (HTML): NTT DoCoMo
Web Clipping: Palm.net
XHTML: W3C
- Voice-browser based: VoiceXML: W3C
- Client-side: J2ME: Java 2 Micro Edition (Sun)
WMLScript: Openwave
- Messaging: SMS: Part of GSM Spec.

B. WIRELESS SECURITY APPROACHES involves:

- Link Layer Security
 - GSM: A3/A5/A8 (auth, key agree, encrypt)
 - CDMA: spread spectrum + code seq
 - CDPD: RSA + symmetric encryption
- Application Layer Security
 - WAP: WTLS, WML, WMLScript, & SSL
 - iMode: N/A
 - SMS: N/A

C. MOBILE COMPUTING SERVICES

SMS & MMS: short & multimedia message service

Location-Based services: use a localization mechanisms (e.g. GPS) to support localization of products and services

Voice-Support Services: exploit voice recognition and synthesization in m-commerce applications, enabling the user to interact with a computerized system

WAP (Wireless Application Protocol): enable to access multimedia content customized for mobile devices

Internet Connectivity: allows to exchange data with servers (get information, download applications or multimedia, control a system)

III. DRIVERS OF M-COMMERCE

Widespread availability of devices: the number of cellular connections has reached 3.25 billions

The handset culture: widespread usage of mobile phones among the 15-25 year-old age group

Vendors' push: they advertise many applications of m-commerce

The mobile workforce: more and more workers operates out of the office – it is a social trend

Increased mobility: a more productive use of time for people that commute or travel frequently

Improved price/performance: the price of wireless devices and the price per minute is decreasing

Improvement of bandwidth: 3G communication provides data rate up to 2Mbps

IV. DEVELOPING M-COMMERCE APPLICATIONS WITH J2ME & XML

J2ME is Java technology specially customised for small consumer and embedded devices with limited processor, memory, display, and input capabilities. Java Virtual Machine (JVM) runs on top of the device's operating system and is customized for a specific operating system.

The size and complexity of JVM depends on the particular J2ME configuration it supports.

The fusion of Java and XML technologies creates the powerful combination of portable code and portable data. Using the kXML package to write an application for the MIDP profile that can parse an XML document. An *XML processing model* describes the steps an application should take to process XML; an application that implements such a model is called an *XML parser*. An XML parser can be integrated into Java applications with the Java API for XML Processing (JAXP). JAXP allows applications to parse and transform XML documents using an API that is independent of any particular XML processor implementation.

SAX (the Simple API for XML) and DOM are the most common processing models.

A. PERFORMANCE ISSUES IN DEPLOYING XML PARSERS

There are several performance issues that are to be kept in mind while deploying XML parsing in a MIDP application:

* *Increase in size*: An XML parser is code-intensive and increases the overall size of an application. This is a particularly important consideration for resource-constrained MIDP devices.

* *Heavy string parsing*: XML parsers use intensive string parsing to perform their jobs; this will add to the overhead in MIDP applications with low runtime memory. as possible.

* *Slow response time*: As the MIDP application parses a relatively large amount of XML data, the response time will increase. The XML files to be parsed should be small, and the parsing should be done in a thread of execution that is separate from the main application

B. DEVELOPING BLUETOOTH WIRELESS APPLICATIONS IN J2ME

A growing number of cellular phones support Java applications, but many devices can also run Java 2 Micro Edition (J2ME)-compliant applications. The Java APIs for Bluetooth wireless technology (JABWT) standard, supports rapid development of Bluetooth applications that are portable, secure, and highly usable.

Java Bluetooth API

The Java Bluetooth API relies on the Java Generic Connection Framework. The Java APIs for Bluetooth define two packages: javax.bluetooth for the core Java Bluetooth API and javax.obex for the Object Exchange (OBEX) protocol. An Bluetooth application has these components: stack initialization, device management, device discovery, service discovery, and communication.

V. ADVANTAGES & DISADVANTAGES OF J2ME

Advantages:

1. Strong use of transplanted J2ME technology development process.
2. The fast development of the Java language of their own characteristics, the development of fast procedures for a relatively short development cycle.
3. The popularity of J2ME technology is increasing rapidly because of the increased use of mobile devices.

J2ME technology Minuses:

- In order to achieve limited function of the transplanted J2ME technology, J2ME technology can not achieve the function of the system, such as reading a telephone directory, messaging systems content.
- The relatively slow speed running on the JVM J2ME technology on the basis of, coupled with the restrictions on cell phone hardware, operating speed is relatively slow.
- Procedures in the limited size of cell phones, J2ME technology development program procedures size under great restrictions.

includes TCP/UDP socket communications, HTTP support, SMS messaging, advanced telephony services, and support for file system access. BREW provides C/C++ software development, and the BREW C/C++ SDK easily integrates with Microsoft's Visual C++ development environment. All in all, BREW doesn't sound much different from Java. To a user, it presents a similar kind of application experience and to a developer, a more or less similar development model. However, some distinctions need to be made between the two:

* J2ME targets general consumer and embedded devices. BREW, on the other hand, targets wireless devices exclusively (specifically CDMA phones). As a result, it's more versatile when it comes to wireless phones and by the same token, lacks portability.

* J2ME doesn't consist of a specific distribution system corresponding to the BREW BDS. This may be an advantage as well as a shortcoming. BREW currently lacks the extent of development tools that Java developers have access to.

B. J2ME vs. WAP

J2ME apps have much more to offer than those built under the Wireless Application Protocol (WAP), in terms of both features and security. Whereas WAP is a thin-client development protocol, J2ME is a development platform specifically for smart applications. J2ME applications offer the following security advantages over WAP applications:

- Without a WAP gateway in the middle, smart applications can provide scalable end-to-end security from the back end to wireless devices. This will become especially important as the back end evolves into a message-driven Web-services framework.
- Smart applications utilize device processing power efficiently. Instead of encrypting everything with the same key strength regardless of needs, rich clients can establish a comprehensive differentiating security policy based on the content.

B. J2ME vs. native platforms

As compared with the native platforms, the main strength of the Java platform is that it allows us to write portable applications. The Java platform's portability stems from its execution model. Specifically, it stems from the use of the JVM to process Java bytecode into machine code at runtime, providing a compatibility layer on top of the hardware. The Java platform's execution model also introduces some important security benefits that are lacking in device-native applications. These benefits are as follows:

- The JVM verifies all classes in class loaders and ensures that applications do not perform any dangerous operations. Because runtime class verification is computationally expensive for MIDP VMs, MIDP has a special two-step bytecode verification scheme.

VI. WIRELESS JAVA AND J2ME

Wireless Java = J2ME + other Java Technologies (e.g., Java Cards)

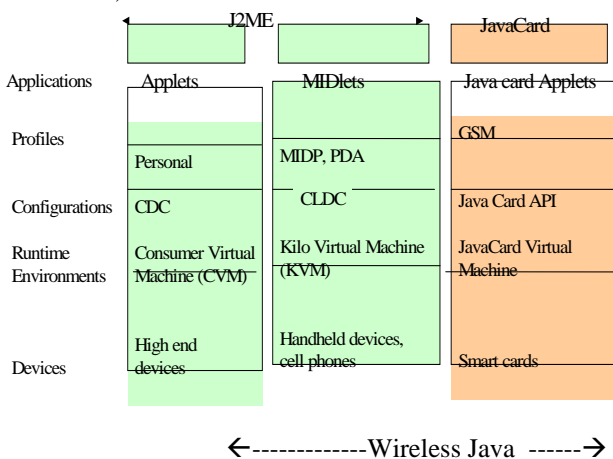


Figure 2 above shows Wireless Java environment.

VII. THE OTHER ALTERNATIVES

A. BREW

BREW is an application execution platform that runs at the firmware level (CDMA chipset) and specially targets wireless applications that can be downloaded and executed on mobile devices. The platform boasts enhanced capabilities that include GPS, VOIP, Bluetooth 1.1, MP3, and MIDI. The BREW suite of services

- The JVM has a monitoring mechanism to safeguard runtime application errors. A good example is the garbage collector. The JVM can clean up application memory heaps automatically at runtime. This helps to avoid memory leaks, which are the major cause of crashes among native applications.
- The JVM can provide a security manager or sandbox for applications. Viruses and other hostile code accidentally downloaded from the Web can pose serious security risks. On the Java platform, entire applications (i.e., JAR files) can be digitally signed. The JVM security manager grants the signed application privileges to access specific APIs (domains) based on the trust level of the signer.

VII. CONCLUSION

Industry is faced with challenges of providing the necessary capacity for both backbone transmission infrastructure and the access network. Support is needed for Mobile Apps which depends on how extensively the applications use the underlying network. Both J2ME and BREW present developers with exciting opportunities for taking advantage of the convergence of wireless and the Internet. While Java developers may find that J2ME is the right choice for a range of small consumer devices, BREW has its own advantages when targeting wireless phones. In many cases, of course, the choice of one technology over the other will be dictated by the platform that the network operator decides to support. At the Last, it is still for the application developers to think according to their needs and the applications.

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