

# Mobile Handheld Devices for Mobile Commerce

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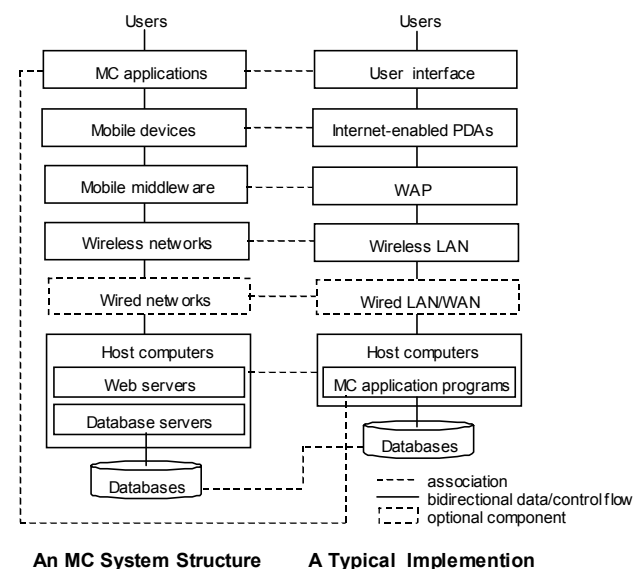
## INTRODUCTION

With the introduction of the World Wide Web, electronic commerce has revolutionized traditional commerce and boosted sales and exchanges of merchandise and information. Recently, the emergence of wireless and mobile networks has made possible the extension of electronic commerce to a new application and research area: mobile commerce (MC), which is defined as the exchange or buying and selling of commodities, services, or information on the Internet through the use of mobile handheld devices. In just a few years, mobile commerce has emerged from nowhere to become the hottest new trend in business transactions. Despite a weak economy, the future of mobile commerce is bright according to the latest predictions (Juniper Research Ltd., 2004). Internet-enabled mobile handheld devices are one of the core components of a mobile commerce system, making it possible for mobile users to directly interact with mobile commerce applications. Much of a mobile user's first impression of the application will be formed by his or her interaction with the device, therefore the success of mobile commerce applications is greatly dependent on how easy they are to use. This article first explains the role of handheld devices in mobile commerce systems and then discusses the devices in detail. A mobile handheld device includes six major components: (a) a mobile operating system (OS), (b) a mobile central processor unit (CPU), (c) a microbrowser, (d) input and output (I/O) devices, (e) memory, and (f) batteries. Each component is described, and technologies for the components are given.

## BACKGROUND

Internet-enabled mobile handheld devices play a crucial role in mobile commerce as they are the devices with which

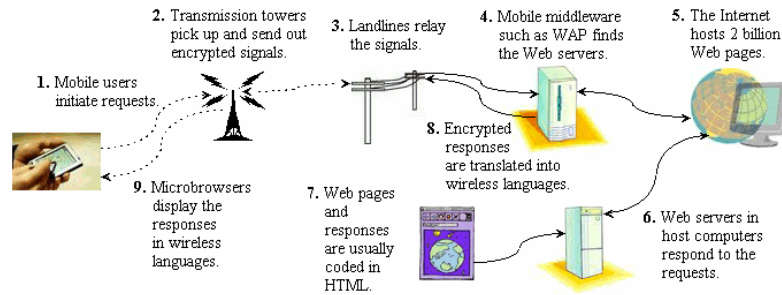
Figure 1. A mobile commerce system structure



mobile users interact directly with mobile commerce applications. This section first introduces a mobile commerce system and then illustrates how it is used to carry out a mobile transaction. A mobile commerce system is inherently interdisciplinary and could be implemented in various ways. Figure 1 shows the structure of a mobile commerce system and a typical example of such a system (Hu, Lee, & Yeh, 2004). The system structure includes six components: (a) mobile commerce applications, (b) mobile handheld devices, (c) mobile middleware, (d) wireless networks, (e) wired networks, and (f) host computers.

To explain how the mobile commerce components work together, Figure 2 shows a flowchart of how a user request is processed by the components in a mobile commerce system.

Figure 2. A flowchart of a user request processed in a mobile commerce system



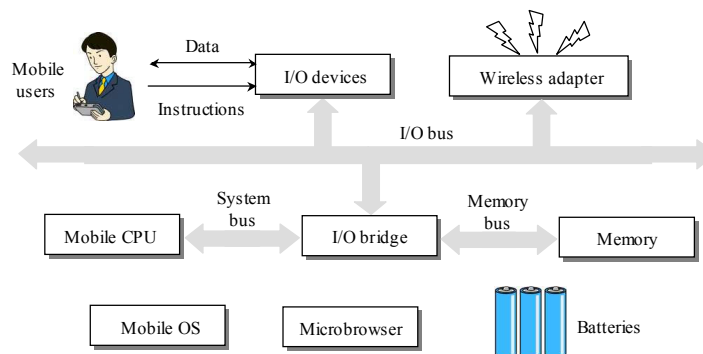
## MOBILE HANDHELD DEVICES

Mobile users interact with mobile commerce applications by using small wireless Internet-enabled devices, which come with several aliases such as handhelds, palms, PDAs (personal digital assistants), pocket PCs (personal computers), and smart phones. To avoid any ambiguity, a general term, mobile handheld devices, is used in this article. Mobile handheld devices are small general-purpose, programmable, battery-powered computers, but they are different from desktop PCs or notebooks due to the following special features.

- Mobility
- Low communication bandwidth
- Limited computing power and resources such as memory and batteries

Figure 3 shows a typical system structure for handheld devices, which includes the following six major components: (a) a mobile operating system, (b) a mobile central processing unit, (c) a microbrowser, (d) input and output devices, (e) memory, and (f) batteries. Brief descriptions of all the components are given in the coming sections.

Figure 3. System structure of mobile handheld devices



## Mobile Operating Systems

Simply adapting desktop operating systems for mobile handheld devices has proved to be a futile endeavor; an example of this effort is Microsoft Windows CE. A mobile operating system needs a new architecture and different features in order to provide adequate services for handheld devices. Several mobile operating systems are already available and each employs a different architecture and implementation. Figure 4 shows a generalized mobile operating system structure, which can be visualized as a six-layer stack.

Although a wide range of mobile handheld devices are available in the market, the operating systems, the hubs of the devices, are dominated by just three major organizations. The following two lists show the operating systems used in the top three brands of smart cellular phones and PDAs in descending order of market share.

- **Smart Cellular Phones:** Microsoft Smartphone 2002, Palm OS 5, and Symbian OS 7 (Vaughan-Nichols, 2003)
- **PDAs:** Palm OS 5, Microsoft Pocket PC 2002, and Symbian OS 7 ("Mobile Computing," 2003)

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