

# 1

## Smartphones and Symbian OS

Symbian OS is a full-featured mobile operating system that resides in most of today's smartphones. The demand for smartphone software is growing as these devices become more powerful and more widely used.

While Symbian OS-based smartphones are shipped with a variety of useful applications built in, an exciting aspect of these phones is that they are 'open'. This means that users can download, install and uninstall applications written by third-party developers (or by the users themselves). No special carrier service or device manufacturer's agreement is needed to distribute new smartphone applications – they can be downloaded by the user from a PC to the smartphone through a link such as USB or using Bluetooth technology (limited by the smartphone's storage space, of course).

Symbian OS provides a great opportunity for software developers since smartphone users are always looking for good applications for their devices. There is a growing list of Symbian OS software titles available as freeware or as paid downloads on numerous Internet sites ([www.handango.com](http://www.handango.com) and [www.epocware.com](http://www.epocware.com) are good examples). Available smartphone applications range from productivity, entertainment, multimedia and communications software to programs that can count fast food calories, improve your golf swing, keep diaries and calculate foreign currency exchange. And – business opportunities aside – sometimes it's just plain fun writing your own code to run on your own smartphone.

The purpose of this book is to help software developers create good software for Symbian OS-based smartphones. But, before launching into programming for Symbian OS, this chapter introduces the smartphone itself and gives an overview of its features and associated technologies. Understanding the smartphone's range of features helps the programmer to exploit them to their full potential.

I'll also discuss the company Symbian Ltd, give an introduction to Symbian OS and discuss how Symbian OS and other operating systems fit into the marketplace.

## 1.1 Smartphone Concept

A mobile phone that fits in your pocket and lets you communicate from and to anywhere in the world is an amazing invention. Like most inventions, mobile phones are built on a chain of prior technological advancements. Without advancements such as integrated circuits, micro-processors, semiconductor miniaturization, battery technology and, of course, the invention of telephone and radio, the modern mobile phone would not be possible.

Smartphones combine the mobile phone with another stream of technology: the computer, which adds the 'smart' in smartphone. Computers have progressed from centralized mainframes to personal computers with user-downloadable applications and graphical user interfaces. With the introduction of the Internet and email, the PC is a part of everyday life as a productivity, entertainment, and communication device. Laptops were introduced to allow PCs to be portable. Then came the mobile computing device known as the PDA – a true handheld computer.

Since the PDA and the mobile phone are both mobile devices, it's only natural that we would want to combine them into one device. After all, you only have so much pocket or purse space! This is the basic idea of a smartphone – but a smartphone is more than just the sum of two devices.

## 1.2 Smartphone Features

Like PDAs, smartphones can run applications such as organizers, games, and communications programs (e.g. email, browser). They can, of course, also make telephone calls. The smartphone's goal, however, is not just to limit the number of devices you carry, but also to combine mobile phone and computing technologies in a synergistic way. A simple example is the ability to pull up a person's contact information or even their picture, hit a button and automatically dial the person's phone number. Other examples include taking a picture, adding some text, and sending it instantly to a PC or another smartphone user. There are many more examples of this – and certainly many that have not even been thought of yet.

### 1.2.1 How Smartphones Communicate

Smartphones, like traditional mobile phones, use radio to communicate with base towers, which in turn act as gateways into landline-based communication infrastructures. While traditional mobile phone systems are based mainly on relaying voice communication between the wireless handset and the wired telephone infrastructure, smartphones provide more features that rely on network data transfer. After all, the basic concept

of the smartphone is to combine a mobile phone with a networked PDA. Improved data transfer is the current challenge for next generation mobile communications; unlike voice transfer which, requires a fixed bandwidth, the rule for data transfer is *the faster the better*.

## 1.2.2 Generations of Mobile Communication

With faster data speeds come better services. For example, when the bandwidth reaches a certain threshold, applications and services that transfer real-time audio and video become possible. The industry goals in wireless data communications have been categorized into generations – each generation includes a target data bandwidth as well as a set of data services available for it:

- First Generation (1G): Original analog mobile phone technology
- Second Generation (2G): Voice-centric digital systems with increased coverage and capacity and messaging
- Third Generation Transitional (2.5G): Stepping stone to 3G with always-on network connections and bandwidths up to 170 Kbps allowing better Internet browsing, email, and some audio and video; GPRS has been the dominant technology
- Third Generation (3G)/Fourth Generation (4G): Bandwidths up to 2 Mbps and 200 Mbps respectively for high-end services such as video teleconferencing.

The topic of wireless communication protocols is vast and could easily take up another book. But let's briefly cover some of the key communication technologies that apply to smartphones.

## 1.2.3 GSM

GSM, short for Global System for Mobile Communication, is a digital cell-based communication service that started in Europe, and has quickly spread throughout most of the world. A notable exception is the US, where CDMA is the dominant standard; however, GSM is gaining popularity there. GSM is the most supported protocol in smartphones.

GSM was designed for circuit-switched voice communication. Circuit-switched means that fixed bandwidth is reserved for each direction of a phone call for the entire duration of the voice call, whether you are talking or not.

Although originally designed for voice, GSM now has a variety of higher bandwidth data services (e.g. GPRS and EDGE) available, running on top of the base GSM protocol. This allows for faster data transfer, as we will see shortly.

The following types of GSM exist, each using its own band in the frequency spectrum: GSM 850, GSM 900, GSM 1800 and GSM 1900. The number indicates the frequency band, in MHz, that the protocol uses. Mobile phones supporting GSM 900 and GSM 1800 will ensure coverage in Europe and many other areas outside of the US, while GSM 850 and GSM 1900 are used in the US (mostly GSM 1900).

Fortunately, smartphones support multiple bands to ensure as wide a coverage as possible. It's common to have tri-band phones that support GSM 900, GSM 1800 and GSM 1900 to ensure maximum international coverage – although some still offer separate US models to reduce costs.

A GSM phone uses a Subscriber Identification Module (SIM) to gain access to the GSM network. A SIM contains all the pertinent information regarding a user's account including the services allowed. It is used to identify the user to the GSM network for billing purposes. The user can switch their SIM from one GSM phone to another, provided that the phone is not locked either to a specific carrier or to the carrier that the SIM is associated with.

## 1.2.4 CDMA

CDMA, which stands for Code Division Multiple Access, is a mobile phone standard that competes with GSM. CDMA currently dominates in the US and Korea, while GSM dominates virtually everywhere else. CDMA supports a high speed data mode called CDMA2000 1xRTT, which tends to hover around 50–70 Kbps, bursting up to 144 Kbps. The forthcoming CDMA2000 1xEV-DO supports rates up to 2.4 Mbps, but initial reports on the Verizon Wireless network in two test markets (San Diego and Washington, DC) made in 2003 show probable speeds of 500–800 Kbps, with peak data rates of 1.2 Mbps.

There are some smartphones based on CDMA, such as the Palm Treo 600 (both GSM and CDMA models are available). At the time of writing, however, there are no CDMA Symbian OS-based smartphones, although several do support W-CDMA (see Section 1.2.9).

## 1.2.5 CSD

CSD, short for Circuit Switched Data, is the most basic mode of transferring data over a circuit-switched connection like GSM. The connection is established by dialing the number of an ISP, in the same manner that a dial-up connection is started on a land-based telephone line using a PC modem. With CSD you do not need an extra data plan to send data, as you do for GPRS, which costs more (see Section 1.2.6). You can use your existing voice minutes.

There are two major disadvantages to using CSD, however. First, it takes a long time to connect since it involves dialing a number and

waiting for the server to answer the call. Second, it's slow – data transfer speed is only about 9.6 Kbps.

In GSM-based smartphones, this mode is referred to as 'Dial' or simply as GSM data. Earlier smartphones such as the Nokia 9290 rely entirely on this mode of data communication.

### 1.2.6 GPRS

GPRS, short for General Packet Radio Service, is a wireless technology that allows the smartphone user to quickly connect to the network and obtain good data rates. Connection time is fast since GPRS does not require any dialing (unlike CSD), and the smartphone feels as if it is always connected.

GPRS runs on top of the GSM protocol. While GSM alone is circuit-switched, GPRS is based on packet-switching technology. This means that the radio bandwidth is used only when data is actually transferred, even though you are constantly connected (circuit-switching keeps the full bandwidth reserved throughout a connection).

GPRS, in theory, supports bandwidths up to 170 Kbps. In practice, however, you'll get between 20 and 60 Kbps depending on network conditions – but this is still significantly faster than the GSM dialup data rate! The best way to think of the speed of GPRS is that it matches approximately with a PC connected to the network via a wired telephone modem. However, GPRS can feel better than dialup since it connects almost instantly to the network without the lengthy delay involved in dialing a number and establishing a call.

GPRS is a highly usable communication feature and a good preview of future wireless data communication technologies. Since it is a stepping stone to 3G technology, it is categorized as 2.5G technology. GPRS is available on most newer smartphones.

### 1.2.7 HSCSD

HSCSD is the high speed version of CSD. HSCSD is another 2.5G standard that supplies a comparable speed to that of GPRS (although on the lower side in many cases), but with a significant difference – the bandwidth is reserved to the smartphone throughout the connection. This is because HSCSD, like CSD and GSM, is a circuit-switched technology. This makes HSCSD better suited for applications that require a constant bit rate, although the practical bandwidth is rather low for good real-time multimedia transfers – which benefit the most from constant bit rates.

HSCSD is not widely used due to the high costs of implementation. The Nokia 6600 and the Motorola A920 are examples of smartphones that support HSCSD.

### 1.2.8 EDGE

EDGE, short for Enhanced Data Rates for GSM Evolution, is a GSM-based protocol that provides theoretical speeds up to 384 Kbps. It is a 2.5G technology that is sometimes referred to as 3G because of its higher speed. It is not yet as widely used as GPRS, but is gaining support. For example, AT&T has deployed EDGE on its GSM networks in the USA, reaching speeds of around 90 Kbps in practice. Smartphones such as the Nokia 9300 and Nokia 6620 support EDGE.

### 1.2.9 UMTS

UMTS, short for Universal Mobile Telecommunication Services, is a high speed data transfer protocol which supports bandwidths up to 2 Mbps. This protocol is the basis of third generation mobile communications that make many media-rich services a possibility. This is where smartphones will really shine! UMTS is not based on GSM technology – it uses a technology called W-CDMA. However, the UMTS platform is designed to work with GSM systems to ease its deployment.

Although it seems slow in coming, once this communication platform becomes widely implemented, it will revolutionize the way people use smartphone devices.

## 1.3 Smartphone Messaging

Text messaging, such as email and instant messaging, is widely used on PCs connected to the Internet. It makes sense to use similar modes of communication in mobile devices. Below are the messaging features supported by smartphones.

### 1.3.1 SMS

SMS stands for Short Messaging Service. SMS allows mobile phone users to send and receive short text messages up to 160 characters. These messages are sent between phones with only a small delay and can occur even while a voice call is in progress. SMS is well suited to many types of communication exchange and is less intrusive than making a voice call. SMS is part of the GSM communication platform and is used by mobile phones all over the world. SMS is not yet widely used in the United States, but is slowly growing in popularity. SMS is a standard feature on today's smartphones.

### 1.3.2 MMS

MMS, short for Multimedia Messaging Service, is an extension of SMS that provides the ability to send media data such as pictures, audio and

video along with your text message. MMS is a natural complement to smartphones due to their audio and video capabilities. For example, a smartphone user could snap a picture of a landmark, record a quick voice comment on it and send it instantly to another mobile phone user.

MMS messages can even be sent to people who have only SMS capability by sending a text link to a browser URL containing the MMS message. You can also send and receive MMS messages between a smartphone and an email account used from a PC.

### 1.3.3 Email

Having the ability to keep up with your email while on the road is a standard feature found in smartphones. With high resolution scrollable displays and alphanumeric entry methods, it does not feel much different from email on a PC. Smartphones allow the user to set up multiple POP3 and IMAP email accounts.

### 1.3.4 Fax

Many smartphones include the ability to send and receive faxes, or can be customized to do so with fax software.

## 1.4 Web Browsing

Internet browsing is a standard feature for smartphones. There are many different browsers available, and they fall into two main types: WAP and HTML.

### 1.4.1 WAP

WAP, which stands for Wireless Application Protocol, was specifically designed for Internet browsing on resource-constrained devices. It includes lightweight markup languages designed to minimize the processing power and memory needed by the mobile device to render the web page. WAP also ensures that the page is usable on a small screen. Markup languages include WML and XHTML (mobile profile).

In many cases, proxy servers are used, which will automatically translate traditional HTML web sites to the WAP markup language before transferring to the mobile device. This is known as *transcoding*.

### 1.4.2 HTML

Although WAP was very important for earlier mobile devices, smartphones today have better memory, processing power and displays.

Because of this, it is feasible to include traditional HTML browsers that directly load web sites in their native format similar to a browser on a PC. Many smartphones have HTML browsers and these usually include WAP capability – sometimes combined in one browser.

## **1.5 Local Device Communication Features**

Smartphones have a variety of communication features in addition to basic access to the cellular network. These features allow a smartphone to directly link with other devices, including PCs, PDAs, wireless headsets and other smartphones, to undertake a wide variety of data transfer functions. Below are the popular device-to-device communication means, along with some of their uses.

### **1.5.1 USB/Serial Cable Connection**

Smartphones can be connected to a PC via either a USB or a serial cable (varies from phone to phone). This high speed link is normally used for downloading new applications to the smartphone as well as synchronizing user data, such as calendar and contact entries. A user can also access the PC's high speed network connection directly from the smartphone for much faster network access than can be achieved through the cellular network. Many products provide a cradle into which the smartphone can be plugged, both for PC connectivity and for charging the phone's battery.

### **1.5.2 Infrared (IR)**

The smartphone provides the capability to communicate through an infrared port to a PC or other device such as a PDA. You can do all the things that can be done with the USB/Serial cable, but without plugging in any wires. IR requires a line-of-sight connection between the devices in the same way that a TV remote control does.

### **1.5.3 Bluetooth**

Bluetooth is a short-range radio technology that enables devices to find and connect to each other. While technologies like GSM replace long lengths of wire, Bluetooth replaces the rat's nest of short wires connecting various pieces of equipment. Unlike infrared, Bluetooth does not require line of sight and will even communicate through walls.

With Bluetooth technology you can connect more conveniently to PCs and PDAs to download applications and synchronize user data than you can with cable or IR. In addition to providing basic PC to



smartphone linkage, Bluetooth technology makes more device-to-device communication scenarios possible. For instance, you can snap a picture on your smartphone and send it to a nearby printer for printing. Another use in a smartphone is in a wireless headset for hands-free operation.

Some smartphones allow themselves to be used as a modem with access to the cellular network. In this case, a device such as a PC connects to the smartphone via Bluetooth technology to provide the PC with Internet connectivity.

As more devices become available, expect many new possibilities for Bluetooth-enabled smartphones.

## 1.6 The Mobile OS

In the past, portable devices such as mobile phones did not require sophisticated operating systems. These earlier devices used simple, and usually proprietary, system software. In many cases they used no operating system at all and all software remained fixed in the device's Read Only Memory (ROM). Now that mobile devices such as PDAs and smartphones have greater hardware power and implement sophisticated, media-rich (downloadable) applications, it's apparent that a sophisticated operating system is needed.

### 1.6.1 What Makes a Good Smartphone OS?

Smartphone devices have certain characteristics that are different from traditional desktop computers and that must be addressed by a smartphone operating system:

- **Resource-limited hardware** Smartphones should be small, have a long battery life and cost as little as possible. To meet these requirements, smartphones, like other mobile devices, have limited memory and processing power as compared to desktop PCs and laptops. The operating system must be frugal in using hardware resources – especially memory. Not only must the OS itself use memory carefully, but the architecture should also provide support to help OS applications limit their use of memory, as well as allowing them to handle low-memory situations gracefully.
- **Robustness** A user expects a mobile phone to be stable and will not tolerate the device locking up. This is a challenge for any full-featured operating system due to the complexity of the system software itself; however, it is especially challenging for resource-limited devices such as smartphones that also allow third-party applications – which may be of questionable quality – to be downloaded.

Not only must the OS itself be designed to avoid crashing, it must also provide support functions and policies for applications to follow, allowing the device to handle application errors and (as alluded to before) out-of-memory situations, without locking up the phone.

- **User interface for limited user hardware** The OS should implement a user interface environment that is efficient and intuitive to use, despite the smaller screen and limited user input capabilities of a smartphone. Also, screen sizes and input capabilities vary between different models of smartphones, so the UI architecture should be flexible, so that it can be customized for the varying form factors.
- **Library support** Smartphone operating systems should contain middleware libraries and frameworks with APIs that implement and abstract the functionality of the features of the smartphone. The purpose is to provide functional consistency and to ease software development. Examples of smartphone middleware include libraries and frameworks for email, SMS, MMS, Bluetooth, cryptography, multimedia, UI features, and GSM/GPRS – the more support for smartphone features the better.
- **Application development support** Smartphone buyers want to know that there are many good applications available for their device, and that they can expect more and better software for it in the future. In order for this to be a reality, the OS must have good software development tools, support, training and documentation. The more productive the developers, the more powerful, easy to use and bug-free applications will appear for the smartphone.

## 1.7 Symbian – A Little History

The creation of Symbian OS can be traced back to a talented team of software developers at a company called Psion, an early pioneer in the handheld computer market. After successive generations of software for Psion's handheld devices, the team created an object-oriented operating system called EPOC, which was designed specifically for the unique requirements of mobile computing devices.

Psion realized that there was a need for a mobile OS that could be licensed to other manufacturers for use in their mobile products, and that their EPOC operating system was well suited for this. At the time, the mobile phone industry was looking for a general operating system suitable for mobile phones and was interested in using EPOC. In June 1998, the software team stepped out on their own with the EPOC operating system and Symbian was born. Symbian was formed as a joint venture owned by other major mobile phone manufacturers as well as Psion, with the primary goal of licensing the EPOC operating system and improving it.

Fast forward to today, and we find that Symbian's operating system – now known as Symbian OS – is a major player in the smartphone marketplace, residing in the majority of today's smartphone devices. Symbian is jointly owned by Nokia, Panasonic, Psion, Samsung, Siemens and Sony Ericsson which, together, represent a major portion of the mobile phone industry.

### 1.7.1 Symbian OS Overview

Symbian OS was designed from the ground up for mobile communications devices. While some competing operating systems (such as Microsoft's Smartphone OS) evolved from operating systems written for larger, more resource-laden systems, Symbian OS approached it from the other direction. Symbian's earlier versions (known as EPOC) would run on devices with as little as 2 MB of memory.

Symbian OS is a multitasking operating system with features that include a file system, a graphical user interface framework, multimedia support, a TCP/IP stack and libraries for all the communication features found on smartphones.

Symbian OS has software development kits available for third-party application development. Also, the hardware layers of the operating system are abstracted, so that phone manufacturers can port the OS to the specific requirements of their phone.

### 1.7.2 One OS, Various Flavors

It is challenging to create an operating system that provides common core capabilities and a consistent programming environment across all smartphones – yet at the same time allow for manufacturers to differentiate their products. Smartphones come in many different shapes and sizes with varying screen sizes and user input capabilities; the user interface software needs to vary to fit these differences.

Symbian OS has a flexible architecture that allows for different user interfaces to exist on top of the core operating system functionality. Of course, it is not wise to be too flexible for two reasons: having too many different user interfaces inhibits code reuse among different devices and too much work is required by the OEM to create a GUI from scratch for their smartphone.

So, to give the phone makers a starting point, Symbian created a few reference platforms, each packaging the Symbian OS core functionality along with a user interface that matched one of the basic smartphone form factors (screen size and input capability). This was important in the beginning; the idea was for smartphone manufacturers to choose the reference platform that most closely matched their phone's hardware characteristics, and use that as a starting point for their own customized

UI layer. This indeed is what happened, and these reference platforms were the origin of the main flavors of Symbian OS you see today – Series 60, UIQ and Series 80.

Symbian OS no longer supports the original user interface reference platforms and the smartphone programmer has no contact with them at all. Instead, the developer uses the software development kit (SDK) for the platform supported by the phone. Also, there is no generic Symbian OS SDK for the developer – all core functionality is included in the particular platform SDK. A typical platform contains about 80% common Symbian code and 20% platform-specific code.

Here are the major platforms for Symbian OS:

- **Nokia Series 60** This user interface is designed for smartphones that have small displays (176×208 pixel) and where user input is performed with the basic phone keys. Nokia based Series 60 on the Symbian reference design known as Pearl, although Nokia did make significant modifications to it. Series 60 is a popular Symbian user interface for lower cost smartphones and resides in the majority of Symbian OS phones shipped. Phones that use the Series 60 user interface include the Nokia 6600, 7650, 3650. Nokia also licenses the Series 60 user interface to other manufacturers – the Sendo X is an example of a non-Nokia phone that uses Series 60.
- **Nokia Series 80** Nokia based the Series 80 on a Symbian reference design known as Crystal. Series 80 is designed for phones with a half-VGA screen, a keyboard and hard buttons along the right side of the screen that have dynamic functions as defined by the application. The Nokia 9210/9290 and 9300/9500 communicator devices use the Series 80 user interface.
- **UIQ** This operating system originated from a Symbian reference design known as Quartz. UIQ is owned, developed, maintained and licensed by UIQ Technology AB – a wholly-owned subsidiary of Symbian Ltd. UIQ is designed for pen-based (i.e. touch screen) smartphones with quarter-VGA display and no keyboard. A virtual screen keyboard and handwriting recognition is provided for user input. The Sony Ericsson P800/P900 and Motorola A920 smartphones are examples of phones that use UIQ.

Symbian OS no longer supports or maintains the original Pearl, Crystal and Quartz reference platforms; however, they do maintain an internal platform known as *Techview*. This UI is used and maintained internally by Symbian to validate development, and is the basis of Symbian's Training SDKs. Unlike the other UIs, the Training SDK does not support building for any target phone hardware.

### 1.7.3 Applications

One of the exciting things about smartphones is that you can download and install your own software applications – just like you can on a PC and PDA. The number and type of Symbian OS applications are growing rapidly. Current smartphone applications range from productivity and organizer software, to foreign language translators, multimedia players and editors, games, instant messaging clients, third-party web browsers and many specialized applications that are useful for mobile users.

## 1.8 Symbian OS Smartphones

This section introduces three Symbian OS-based smartphones: the Sony Ericsson P900, Nokia 6600, and Nokia 9500 Communicator. These phones each correspond to a different UI series, as described in the last section, and provide a good sample of the type of smartphones found in the marketplace. All three phones allow you to download Java and C++ software applications and come with basic organizer and game software.

### 1.8.1 Sony Ericsson P900

The Sony Ericsson P900 (shown in Figure 1.1) is a pen-based smartphone that uses the UIQ user interface. It has a 65K color, 280×320 pixel display with touch screen, virtual keyboard and handwriting recognition, along



Figure 1.1. The Sony Ericsson P900

with many prepackaged organizer and game applications. The device plugs into a cradle that is connected to a PC via USB for downloading applications and synchronizing user data. IR and Bluetooth are also supported. The P900 has an integrated camera that can both take still pictures and record video using MPEG-4. It contains a combination WAP/HTML browser, audio and video playback, email (with attachments), SMS and MMS. The device contains 16 MB of memory for user storage and supports an external memory card to expand this.

For communication the P900 supports GSM 800, 1800 and 1900, GPRS and GSM dialup communication.

### 1.8.2 Nokia 6600

The Nokia 6600 (shown in Figure 1.2) is a Series 60-based phone with a 176×208 pixel, 65K color screen. Following on from the Series 60 model, this device has no touch screen and all input is via the numeric keys as well as two labeled soft-keys.

Like the P900, the device has a camera capable of taking both still pictures and video. The device has Nokia VPN software as well as digital rights management functions, so you can buy and play music that uses this protection. The device has 6 MB of user memory and it is expandable by a MMC card. In addition, the built-in software includes a WAP browser and a media player, and it supports email, SMS and MMS. Connectivity to other devices is supported via Bluetooth technology and IR, as well as PC connection via USB.

For communication the 6600 supports GSM 800, 1800 and 1900, GPRS and HSCSD.



Figure 1.2 Nokia 6600



**Figure 1.3** Nokia 9500

### 1.8.3 Nokia 9500 Communicator

The Nokia 9500 is the latest smartphone in Nokia's high-end series of phones, known as communicators. Communicators look like traditional mobile phones (although they are a bit heavier), except that the case opens up into an easy to read landscape display and a QWERTY keyboard. Communicators use the Series 80 Symbian OS user interface. They have a 640×200 pixel screen with 4K colors (not a touch screen). The devices include a WAP and HTML browser as well as email and SMS support. User input is via the keyboard (this is the easiest smartphone for entering text) and soft labeled keys along the right side of the display.

The original communicators were Nokia's 9200 series devices. The Nokia 9290 supports GSM 1900 for the USA, the Nokia 9210 supports GSM 900 and 1800.

The 9200 series communicators, while being the easiest to use of the smartphones due to the large keyboard and screen, have two main drawbacks: their size (they are referred to affectionately as 'bricks') and their lack of high-speed data transfer (they only support CSD-style dialup). This however has changed with the recently introduced Nokia 9500 and 9300 communicators.

The Nokia 9500 communicator is smaller and lighter than the 9200 series, and has support for the faster EDGE and GPRS data transfer mechanisms. Also, impressively, it supports WiFi capability as well as Bluetooth technology for local communication. The Nokia 9500 is based on a later version of Symbian OS than the 9200 series phones (v7.0s rather than v6.0), and includes support for multi-homing – the ability to be connected to two connections at the same time (e.g. WiFi and EDGE) – so you may be browsing using EDGE but downloading email at the same time on WiFi, for example. The Nokia 9500 has 80 MB of internal memory as well as supporting a MultiMediaCard (MMC). A camera is also included with this phone.

Even smaller than the Nokia 9500 communicator is the Nokia 9300. This phone is the same as a Nokia 9500, except it has no camera and no WiFi communication. However, this communicator is significantly smaller and is aimed at users who are attracted to the usability of a communicator yet turned off by the size and weight of the previous devices.

## 1.9 Other Smartphone Operating Systems

The smartphone market is competitive and so, not surprisingly, there are other choices of smartphone operating system besides Symbian OS. At the time of writing, Symbian OS enjoys a wide lead in this market, but competition is expected to become fierce as smartphones become more popular and manufacturers release more phones not based on Symbian OS. There are many factors that will determine who will ultimately win this market (and sadly not all based on who make the best smartphones), but that's not the subject of this book.

This section gives a brief overview of three operating systems that compete with Symbian OS for the smartphone market: Palm OS, Microsoft Smartphone OS and Linux.

### 1.9.1 Palm OS

Palm OS is a major player in the PDA market and has probably done more for creating the mobile handset market than any other company. The Palm PDA products, which started with the Palm Pilot, are known for being simple to use. Palm OS, like Symbian OS, was designed specifically for lower-resource portable devices.

Since Palm is such a major force in the PDA market, and with wireless communication introduced as early as the Palm VII devices, it's only natural that Palm OS would be a good fit for the smartphone market. One of the biggest advantages is the large number of Palm PDA applications that exist that also can run on their smartphones. There is also a significant base of Palm OS application developers and documentation.

The Handspring Treo 600 is an example of a smartphone based on Palm OS. It supports both GSM and CDMA (via different models). The Treo 600 has all the standard smartphone features, such as SMS, MMS, web browsing and email, as well as the ability to connect to a PC via USB. It has a 160×160 pixel color display, a built-in thumb keyboard and integrated digital camera.

### 1.9.2 Microsoft Smartphone OS

There is little doubt that Windows is the dominant operating system for the PC, but Microsoft is also gaining a presence in mobile computing devices – including smartphones. This started with the creation



of Windows CE for low-resource handheld devices (or other 'embedded' devices).

Windows CE uses many of the same APIs and architecture as desktop-based Windows and includes a subset of the Windows user interface suitable for handheld devices. They released the Pocket PC as a PDA, which ran the Windows CE-based OS called Pocket PC OS. Although not as widely used as Palm devices, Pocket PCs are quite significant in the PDA market. As of 2003, the Windows CE and Pocket PC operating systems merged into the Windows Mobile family.

Microsoft also aims to be a dominant player in the smartphone market, and has released another variation of Windows Mobile called Windows Mobile Software for Smartphone. As with Palm OS, an advantage of Windows Mobile is the availability of Pocket PC applications that can be run on Microsoft-based smartphones. In addition to this, it supports miniature versions of many of the applications that are dominant in the desktop PC market – Microsoft Word and Excel, for example.

Other advantages are the large Windows developer base, the abundant programming documentation/knowledge base, and the availability of powerful development tools that have been tailored from desktop Windows to work with mobile operating systems.

An example of a smartphone that uses Windows Mobile is the Motorola MPx200, which has some of the functionality of a Pocket PC, along with a mobile phone's voice and messaging capability. This smartphone has a 176×220 pixel 65K color screen and supports GSM and GPRS. Another example is the Orange SPV.

### 1.9.3 Linux

Smartphones based on the open-source Linux operating system have been appearing on the market. There are many advantages to using an open-source operating system like Linux. No cost and the opportunity to tap into the Linux open source community is appealing. This has made Linux grow, not only for the server and PC market space, but also in the embedded device area including handheld computers. Sharp, for example, has released Linux-based PDAs. Linux is not likely to dominate the smartphone market any time soon, but there are smartphones being released for it and it is likely to be popular in some geographical areas, such as Asia. Motorola is a notable supporter of Linux and has released the A760 smartphone based on this OS.

