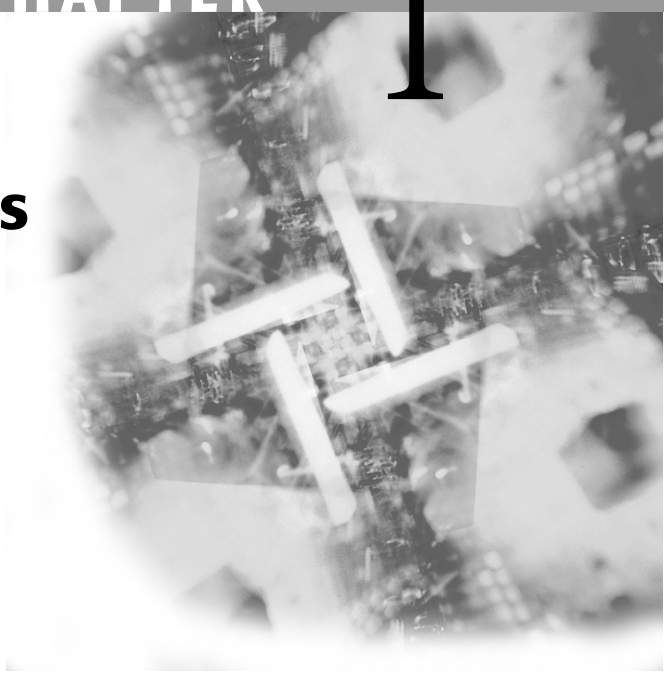
CHAPTER 1

Introduction to PDAs



This chapter provides a brief history of the evolution of mobile wireless databases and introduces the Personal Digital Assistant, or PDA, and typical PDA environment. The purpose is to detail all the pieces of this technology at a high level. For those with no knowledge of PDAs, this chapter is an absolute necessity.

The Basics

The PDA environment and units can be very simple or quite advanced, depending on your level of technical expertise and usage. The term *PDA* is highly used, but it should really be *handheld computer* or *handheld PC*. PDA was initially used because the units mainly contained a daily calendar, personal address book, calculator, to-do list, perhaps a currency exchange program, and usually an international time zone map. In this respect, these units were indeed personal digital assistants, as people would forgo their usually big personal calendar and to-do agendas for these little electronic machines. I remember back in the early 1990s when I received my first PDA, a Texas Instruments digital assistant. I entered all the telephone numbers for all the people I knew, along with their addresses and whatever comments I could find such as birthdays, anniversaries, and upcoming special events. It was fantastic—the calendar would sound an alarm on the days I marked for notification. In meetings, I could take brief (very brief) notes and was a whiz with my fancy calculator

that really couldn't do much more than just the basic functions. We're obviously still using the term *PDA*, as per its embedded use in the name of this book, but we really mean a handheld personal computer whenever we refer to it here.

A funny thing about the term *PDA* is that no vendor really uses it. When people are asked what a PDA is, they usually reply "Palm Pilot" (if they remember these), and recognize Pocket PC devices in the same category, but no vendor actually calls their devices "PDAs." "PDAs" was coined back in 1992 when introduced by Apple's Newton MessagePad, which really didn't take off. Microsoft also had their hands in these PDAs with WinPad, but had the same problem. Microsoft poured on the research and development and came up with quite a number of new product releases, including PC Companions, Windows CE, Handheld PCs, Palm-size PCs, Auto PCs, and Pocket PCs. Whenever we refer to PDAs in this book, we are referring to Palm devices such as the m500, and Pocket PC devices such as the Compaq iPaq.

As previously mentioned, the PDA's basic functions were quite simplistic. Palm's devices have expanded upon the PDA base with handwriting recognition, and enhanced memory—it used to be 64K at best, and now we're into megabytes and gigabytes. Along with these, PC synchronization, expansion slots for additional memory, and email have been added. Today's users can even buy added-value packages of memory with embedded programs for many uses. By far, the most popular added functionality is games. One of the latest Palm devices is the m500 model, which we'll be using throughout this book, compliments of Sybase, one of our main sponsors.

Palm opened their operating system, allowing thousands of developers the opportunity to create sophisticated and diverse programs specific to Palm. This really allowed the broadening of Palm's operating system, and hence device usage, that sent the PDA market skyrocketing. New units have color screens, modems, and the capability to wirelessly synchronize data and applications almost anytime and anywhere via modems and the wireless Internet—more on these possibilities later in the book. We'll show you how we built a simple application with its own database, and how we keep its data on the PDA unit and on the PC synchronized.

Pocket PCs are devices with the Windows CE operating system. Windows CE (originally code-named Pegasus in 1994) was initially based on Windows 3.1. Over the years, it has been completely rewritten as a 32-bit operating system built to run on embedded devices. WinCE basically manages the communication between the hardware and the applications that run on it. This operating system is very modular and therefore can run a multitude of different hardware platforms and applications. WinCE is used in cars, gasoline pumps, and video games, to name a few.

Pocket PCs are specific devices running Windows CE version 3.0, such as the Compaq iPaq 3800 series, which is what we'll be using throughout this book in our example applications (sponsored by Sybase). These devices also run Pocket Outlook, Pocket Office (Pocket Word, Pocket Excel), and much more. These devices truly are mini computers.

Portable Wireless Evolution

The wireless evolution began around 1996, but this depends on exactly what we're talking about. If we're discussing small computing devices such as Palm units or Pocket PC devices, these began in 1996 and 1999–2000, respectively. If we're talking about wireless connectivity to the Internet and hence connectability to corporate data via wireless devices, then we're talking 1997 with WAP.

What Is WAP?

The later scenario, called the *wireless Internet evolution*, used something called the *Wireless Application Protocol* (WAP). This technology came about only several years ago back in 1997. WAP is a method of global open wireless Internet standards for real-time communication of wireless mobile devices such as Web cellular phones, PDAs, and the Internet. WAP is not only a language, but also a platform for development and interconnectivity.

WAP components include:

- Multiple programming languages such as Handheld Device Markup Language (HDML) and Wireless Markup Language (WML).
- Physical units or wireless devices also known as *Web phones*, Web-enabled devices, or WAP devices built specifically with the capability to access the Internet. This additional built-in feature is called a *microbrowser*. Note that the primary purpose of the individual device, at this stage, is still to function as a telephone or PDA.
- Gateways that handle the transition of data from the wireless network through to the Internet network, and vice versa.
- Software Developer toolKits (SDKs) for the development and testing phase of the WAP applications.

WAP Evolution

For the first two years, no one really heard too much about WAP. In late 1999, however, something clicked and the world suddenly became very interested in wireless Internet technology. It could have been because a similar technology

called *iMode* was making it big (really big) in Japan. Or, perhaps it was because the big cellular companies were getting their infrastructures set up and investing more funds in huge marketing campaigns. Either way, the technology allowing cellular phones to connect seemingly directly to the Internet was becoming very popular almost everywhere except North America.

As with any new technology, as WAP became more understood, acceptable, and feasible, people began thinking of potential revenue-generating opportunities, which led to research and development funding. With more financing available, more discoveries were made, more advancements were accomplished, and the wireless Internet evolution was under way. Some call it the Internet's second phase; others coin it as the merger of the Internet and telecommunications. Whatever you call it, it's definitely here and it's a major step in wireless mobile Internet communications.

WAP View

Mobility first came about from the telecommunications industry. It allowed individuals to communicate via wireless cellular phones, which gave us the ability to walk and talk, hence, the term *mobility*.

The Internet infrastructure has also been around for some time. This infrastructure allows anyone with a computer and a modem to connect to any other computer with a modem, and gives us the freedom to transfer or browse data from anywhere with connections to the Internet. However, unless you have a wireless modem, the communication must be wire based and, therefore, only *portable*.

Mobility and portability are now easily possible through the use of WAP, which is the merging of these two industries and technologies. Using wireless telecommunications and the Internet via wireless Internet devices, anyone can now access information anytime, anywhere.

With the world rushing toward a standardized telecommunication infrastructure, network, and protocol, along with the ever-increasing wireless device capacity, memory, and functionality, more people will be accessing the Internet via Web phones and PDAs than from any other method. While personal computers will always be our personal base stations at work or in our homes, wireless Internet technology will evolve into our everyday portable and mobile interconnectivity medium. The future potential is unlimited as it only has today's boundaries to overcome.

Growth Predictions

As seen in Figure 1.1, the forecasted number of cellular phone subscribers will increase enormously in the first half of the current decade due to several fac-

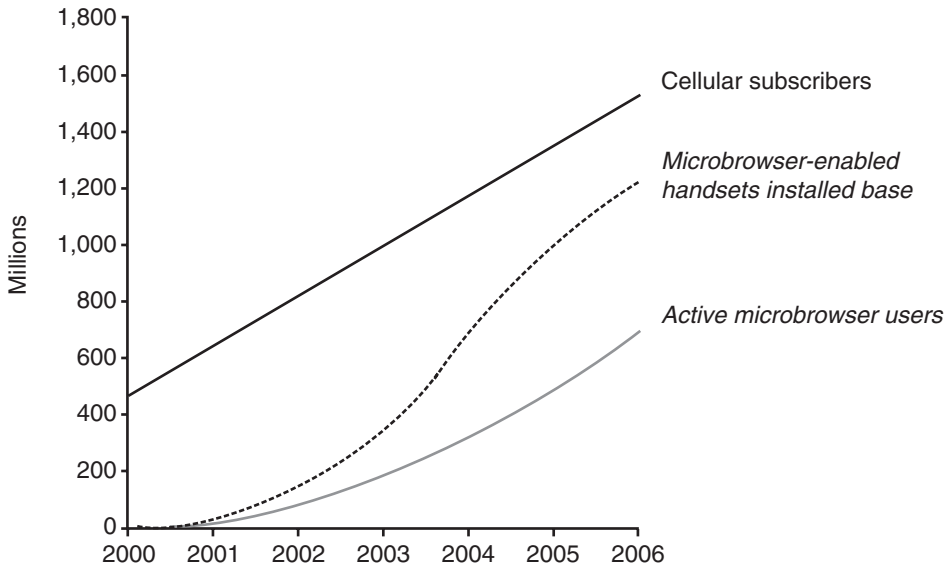


Figure 1.1 Wireless subscribers.
Source: Ovum (WAP/A)

tors. First, the ongoing trend of individuals wanting to be connected or available whenever they want, anytime, anywhere, is increasing. Second, many countries currently have poor telecommunication infrastructures, and cellular telecommunications is simpler and less expensive to set up.

Many people in third-world countries still do not have telephones, let alone cellular phones. Interestingly enough, telecommunications companies in these types of regions find it more cost efficient to simply erect cellular towers with relay base stations supplying wireless communications, rather than laying the groundwork to install cables throughout their cities. The cost difference between erecting several cellular towers and base stations compared to telephone poles and wires throughout thousands of miles of undeveloped rural regions is considerable. Based on these facts and the population growth of many world regions, the number of cellular subscribers will dramatically increase in the coming years.

With the knowledge and foresight of this new wireless Internet technology growth, wireless device manufacturers are beginning to distribute cell phones with microbrowsers in hopes that many individuals will subscribe to the service. Of course, there is a partnership between the microbrowser vendors, cell phone manufacturers, and the major cellular providers, since they will all profit from this new technology. The number of people who will subscribe to the wireless Internet service via their cellular phones will far surpass the number of individuals currently accessing the Internet via personal computers.

The applications available today are few, but we are in the infancy of the wireless Internet potential. In 10 years, many won't comprehend how we ever lived without wireless access to the Internet.

In the near future, we'll have the capability to contact others and have any information we desire at our fingertips. We'll carry our wireless mobile devices with us all day everywhere we go, and have unlimited access to any Internet item. The only foreseeable problem will be with wireless network and physical device capacities.

With so many individuals accessing the Internet, will the cellular carriers be able to cope with peak access periods as Internet service providers (ISPs) do now? Will the physical unit processors be able to cope with the mass influx of information at our fingertips? Look at the personal desktop computer; every year and a half, a bigger and better CPU chip is released. Instead of megabytes, PCs now come with gigabytes. As it stands, the Internet has only really taken off in the last half decade, and look at what's happened to the typical home and work personal computer within that time. Back in the early 1990s, it was sometimes difficult to justify the allocation of a 10MB database, and now a gigabyte single database is the norm. The processing power of some office computers today can easily replace the entire computer center of a typical company just 15 years ago. We've come a long way, and the same thing will happen with wireless devices, but at a much quicker pace. In 5 to 10 years, we'll have all the capabilities of our desktop computer on our cell phone or *wireless device*, as they'll be known.

NOTE

A while back, a news report on the radio mentioned a very interesting statistic: One out of five U.S. residents who wanted to learn more about the 2000 federal election between Gore and Bush obtained poll results and other information from the Internet, as compared to only 4 percent during the last election. That's an increase of Internet usage of over 600 percent in four years, which goes to show the amazing growth of this Information Age.

PDA Evolution

The PDA is the other half of the wireless evolution, in our context. WAP-enabled cellular phones are wonderful, but have only simple browsers to specific Internet sites. Rather than using Microsoft Explorer or Netscape Navigator from PCs, you would use a microbrowser from, say, Openwave or Nokia already pre-installed in your Web-enabled cellular phone. PDAs, on the other hand, are essentially tiny processing units with the capability to compute and synchronize features with a desktop personal computer.

PDAs evolved from personal organizers. Remember those expensive three- by eight-inch units, which opened into a screen and keyboard, or other units such as the one from Texas Instruments? These original devices are still active and still on the market. Their intention was to combine a calculator, calendar, personal telephone directory, a note pad, and maybe a currency exchange program. What a pleasure it was for people when they got their first TI personal organizer. They felt like they had a tiny super computer in their hands, with everything at the touch of a button wherever they were. That was technology!

The late 1980s and early 1990s gave us much technology, but the late 1990s were when the real revolution began. An initial player in the PDA business was Palm, who created and introduced the Pilot organizer back in 1996. Soon after came the famous PalmPilot, followed by the even better known Palm III series and Palm V series.

Along with these devices came Palm's HotSync software. We will be discussing this more in depth later, but at this point, it suffices to say that HotSync is the software used by Palm to connect the Palm device to the PC.

Palm currently holds approximately 60 percent of the world's PDA device market, and for quite a while they were alone in the industry. Then came Microsoft with their Pocket PC using Windows CE. With the PDA market anticipated to be very large and, very possibly, the future of computing, Microsoft couldn't resist and decided to bring on their own unique version of a PDA. WinCE is a small version of Windows used in many types of small devices, with the most common being the Pocket PC. It has also been used in many types of applications such as TV set-top boxes, factory-floor devices, cell phones, bar code readers, automatic teller machines, digital cameras, and so on. We, the authors, personally expect Pocket PC devices to continue to grow in number, models, and popularity. As with the Internet browser wars, the PDA battle has begun.

To parallel Palm's HotSync software, Pocket PC uses ActiveSync to connect devices to PCs. We'll look at this in the next section.

One of the most popular Pocket PC devices today is the Compaq iPaq, which is what we used to build the many Pocket PC applications in this book. Of course, this is just one model, but it's the one that currently dominates the market.

PDA Environment

This section highlights the basic hardware and connectivity software. Let's take it one step at a time and look at the components. The basic components are the physical units, the connectivity devices, and additions based on your requirements.

Devices

There are many types of devices; some are specific to the Palm, and others are specific to the Pocket PC world. Both devices connect to Windows on the PC, but Palm has no Windows components itself.

While the Palm m500 is an exceptional device, the iPaq has some very interesting features. It contains built-in Bluetooth software capable of wirelessly connecting to other Bluetooth devices. It also comes with a default voice recorder, which is very handy if you'd like to quickly record a memo or two.

Both types of devices have three components: the screen, the buttons, and the stylus—no mouse, no disk, no keyboard, and no cables (unless you count the cradles).

Screen

The screens work on the same concept of tap once to activate the program. The Palm unit has two parts, the display area and the Graffiti area, which also has the soft buttons. The display area shows the application, whatever that might be. The Graffiti area is used to write text, which in turn is stored in the application if applicable. The soft buttons in this part of the screen are predefined; that is, the little house is for home (main screen), the drop-down button is under that on the left side, the top right is to invoke the calculator, followed by the find button beneath it—nice and fast action buttons.

The Pocket PC is a bit different. Microsoft has arranged their screen similar to Windows 95 or 98. Top left is the Start button similar to a regular Windows PC. The main screen is called the Today window and contains many application summaries as configured by the user—the default is date/time, owner information, appointments/tasks, and email summary. The top bar has a little speaker icon for volume followed by the time. The bottom bar has the word *New*—click on it to add a variety of items. The bottom right icon is used for Bluetooth.

Buttons

Both devices have four basic buttons, which have quite different functionality on each device. The default buttons on the Palm, from left to right, are assigned to the calendar (or date book), address/phone book, to-do list, and memo pad function. The default iPaq buttons are, again from left to right: calendar, contacts, email inbox, and itask. Buttons on both devices can be reprogrammed to any application on the device. This allows for independent applications to be assigned to specific buttons. Both devices also have the middle-scrolling button (two buttons on the Palm unit). The iPaq has one more button on the left side

of the unit. This button defaults to voice recording, as the unit is capable of recording sound.

Backlight

Both units have backlight screens. On the Pocket PC, the light comes on automatically when in use. After several minutes (depending on configuration), the unit's light will go off but the unit will remain on. For the Palm m500, simply hold the On button (upper right) for two seconds (also customizable) and the light will automatically appear. An obviously great feature to read the unit's screen in the dark, but it reduces battery life considerably.

Persistent State

Both units have a feature called *persistent state*. This means that when the unit is turned off and back on again, the last application running will return with all values as it was—if you were running something. This is similar to sleep mode on your PC. When your screen saver comes on, you simply move the mouse and your screen returns. The same applies to the PDAs—turn on the unit and the last thing you were working on returns. This feature is a must since it conserves battery power. By the way, a nice thing about these devices is that the battery lasts for 12 hours or more (depending on usage). A laptop battery normally has a short life of two hours, which can be frustrating when working away from an electrical outlet. The Palm m500 seems to last considerably longer than the iPaq does, battery wise, which might have to do with the backlight draining the life from its battery.

Reset

Both units have a Reset button; Palm's is on the backside top middle and easy to spot, since it says, "reset." iPaq's Reset button is located on the bottom near the cradle port. There is a soft and hard reset. Hard reset will completely reset the device, replacing all values back to the factory settings and removing any nonfactory applications. Beware: This will cause loss of data. Soft reset will simply stop and restart the unit.

On the Palm, press a bent paper clip or the special stylus device into the unit for a soft reset. For a hard reset, hold down the Power button and press the stylus reset device into the button opening. Check out the stylus; the top unscrews, revealing a smaller stylus specifically designed to reset the unit.

The Pocket PC unit follows the same rules, but the original stylus fits into the reset opening area. One push and the unit is stopped and restarted. To hard

reset the Compaq iPaq, press and hold the two outside application buttons, insert the stylus into the reset switch area, and press the switch for five seconds. Then, to reactivate your unit, insert the stylus into the reset switch again and press it for one second—or simply connect the unit to the cradle. If ever you forget your device password, you'll have to perform a hard reset.

Connectivity

The great thing about both Palm and Pocket PC is they both have connectibility to a Windows PC. We have not done any test or usage other than with Windows-based platforms. Palm does its connectivity with their HotSync software, and Pocket PC has its own programs called ActiveSync. Each of these is used to connect the individual devices usually, and mostly using their respective cradles to the personal computer.

Connecting the devices to a desktop computer essentially allows them to share information and to synchronize the data between them. Setting up each is fairly simple, and once done, ongoing synchronization is quite easy. The underlying connection and the program, which passes the information between the PC and the device, is called a *conduit*. We'll discuss more on conduits later in the book.

HotSync and ActiveSync

Each of these programs is usually used via the cradles, but can be used via a communication cable. The Palm HotSync cradle is connected directly to the USB port (or serial port depending on the cable you have) on the desktop or laptop. Activating Palm's HotSync is as easy as pressing the special HotSync button on the cradle.

Simply set up the Palm desktop program, connect the cradle to the desktop computer, and press the HotSync button. Figure 1.2 shows the Palm desktop custom menu. It has all the different conduits, programs to connect specific applications, and each is customizable depending on how the user wants to synchronize. If you don't want to do anything for a specific application such as mail, choose that action and the next HotSync you perform will not copy mail from PC to Palm, or vice versa. This goes for each application on the device.

Palm also provides a special Desktop application. Most people using the Windows platform have Microsoft Outlook and prefer to connect to it. However, for those who'd prefer to use another application, Palm supplies its Palm Desktop. Date scheduling, addresses, to-do lists, memos, and more are all available through this desktop application (see Figure 1.3). You can choose to use it and synchronize to it as you see fit.

Figure 1.2 HotSync custom menu.

Microsoft has an application of the same concept, but with an automated synchronization process. For Pocket PCs, simply install Microsoft ActiveSync on the desktop computer, connect the cradle to the USB port on the machine, configure the software, and place the iPaq in the cradle. ActiveSync will automatically recognize and detect the device, and then automatically synchronize the unit with the desktop. It can also be programmed to do this on an ongoing periodic basis. Very handy!

Figure 1.4 shows Microsoft's ActiveSync application. It is the same concept as with the Palm conduit program, but represented slightly differently. This application shows the programs that ActiveSync is prepared to consider for synchronization. Again, each program has the specific option of how to synchronize, when to synchronize, and what to synchronize. There's a lot more to the program, but we'll cover the details later in the book. One nice feature to

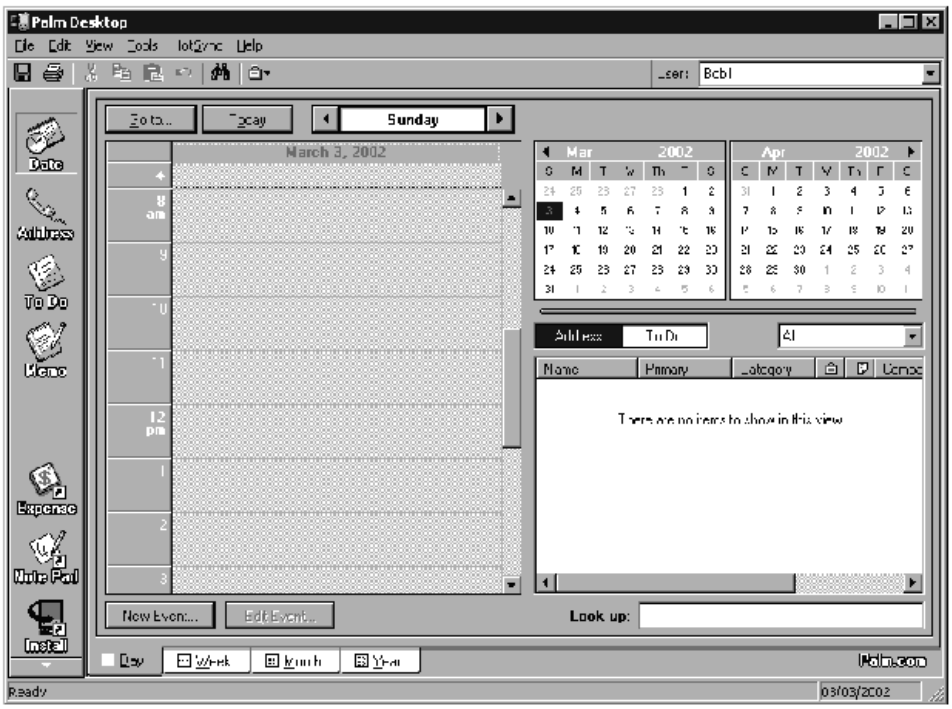


Figure 1.3 Palm Desktop menu.

note on ActiveSync is that while the device is connected to the PC and the PC is connected to the Internet, pass-through mode allows the device to access the Internet directly, making downloading very simple.

There's much more to say about these units, but let's cover that as we move forward in the book. As we explain the examples, we discuss unit features and functionality.

Modems

Part of the beauty of having a portable mobile wireless PDA is the capability to connect to the Internet at anytime. To do this, you must have some type of modem. These devices allow the individual to connect to the back-end enterprise data warehouse or operational system.

From a planning point of view, if the user connects now and then, the itemized information on the backend application must somehow synchronize with the units. This can be done by queuing the messages using some type of middleware system—obviously, some level of advanced systems architecture is required at this point. This is a much more advanced topic, but the point is that

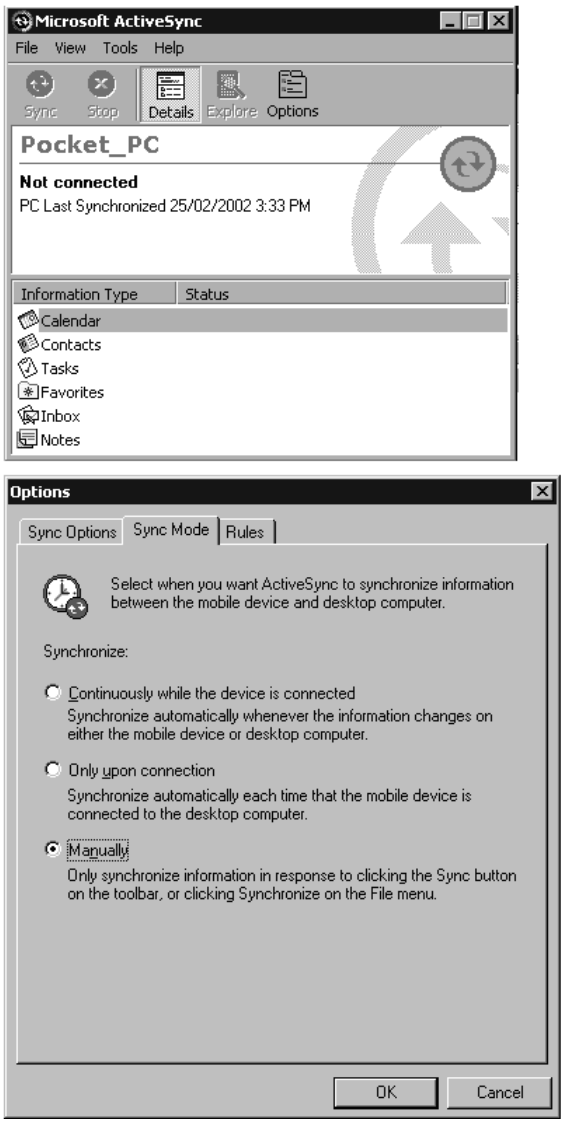


Figure 1.4 ActiveSync menu.

wireless computing with these PDA mini computers can easily connect to an enterprise system for complete data synchronization to back-end information while on the road anytime, anywhere.

Modems come in different styles. One example is the CompactFlash Fax modem. It runs at 56K and works just like a PCMCIA card but is about one-third the size, which makes it ideal for palm-size and handheld PCs. It adds

little weight to the unit (one-third ounce, or eight grams), and has no impact on the size of the unit because it slides into the existing expansion slot.

Final Thoughts

While wireless Internet has come a long way, it's still in its infancy. WAP was the initial kick-start into the wireless world for computers and, in our opinion, the next step is with these PDA devices. To dive into this PDA world, the first step is learning how to build applications on these devices and how to synchronize them with databases on servers. The following chapters will walk you through the components required to build PDA applications with portable and synchronizable databases.