PALM: Providing Fluid Connectivity in a Wireless World

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I. Introduction: Ubiquitous Wireless Connectivity—Are We There Yet?

In 2000, there were 39 million mobile and remote workers in the U.S. By 2004 that number is expected to grow to 54 million. (Interestingly, reliable worldwide figures were unobtainable but estimates range between 150 - 300 percent of U.S. numbers.) With numbers like these, it's easy to see why this question of wireless connectivity is so critical. *Are* we there yet? The answer is a qualified "yes." While the global infrastructure that will enable truly ubiquitous, seamless, wireless connectivity is still several years out, today a matrix of wireless technologies is delivering connectivity in many parts of the world. Will wireless connectivity get better? For sure, a lot, and soon.

In the wireless world (by decade's end) people will move through their day from home, to school, to work, to customer, surrounded by a cloud of connectivity that enables them to access information wherever it lives—on the Internet, the company intranet, the campus network, their desktop, their home network, their PC—instantly from wherever they are. In that world, when wireless connectivity is ubiquitous and transparent, we won't have think about how we access our information; we'll just do it.

Today, though, connectivity is far from seamless. For now, those who require continuous connectivity will likely access information in multiple ways depending on where they are and what they're trying to do. The reason for this is—for well into the foreseeable future, anyway—connectivity will not be enabled by any single wireless technology. Instead, it will actually be made up of three types of wireless networks: Wide Area Networks (WANs), wireless Local Area Networks (W-LANs), and Personal Area Networks (PANs). Each of these types of wireless networks has strengths and weaknesses; each lends itself to some environments over others; and within these categories multiple (and sometimes incompatible) regional and technological standards further complicate the scene.

Connecting You to Your Information, No Matter Where You Are

Wireless connectivity represents a quantum leap in terms of handheld utility. To get a sense of the importance of this transformation, you have to go back to the days before dial-up Internet connections: The difference between the first PalmPilot™ device and a wirelessly connected Palm™ handheld is not unlike the difference between an early stand-alone PC sitting on your desk and a PC with a modem.

Since information management on the go is the very essence of the handheld, Palm has been a pioneer in PDA wireless connectivity from the beginning and already has exhibited leadership in the wireless arena. Our very first wireless functionality was so popular that "beaming" quickly became a trademark of the young and hip. Not only was the Palm VII handheld the first successful, full-featured handheld with integrated wireless, but Palm's Mobile Connectivity Kit and third-party solutions further extend wireless functionality to include most Palm Powered™ handhelds in many parts of the world.

Increasingly, Palm is helping people stay connected to their information, whether they're across the hall or across the country. Today, Palm Powered handheld users can get connected to their information faster, and stay connected more of the time, in more wireless environments, than users of any other mobile operating system.

Fluid Connectivity for a Seamless Experience

Going forward, our strategy will be to focus on delivering mobile communication solutions that fit within existing IT infrastructures. But Palm is doing more than simply enabling people to negotiate the different wireless technologies as they move between PANs, W- LANs and WANs in the span of a single day. With our focus clearly sharpened on wireless and our efforts in that area redoubled, we are expanding our leadership in handhelds to the wireless space.

An important element of Palm's wireless value-add will be to facilitate a more fluid connectivity. The same qualities that have made the Palm brand synonymous with wearable, easy-to-use handheld devices will provide the best wireless experience; not only will we connect people to their information faster, we'll make staying connected easier, more intuitive, more seamless. No company does this better than Palm.

This paper examines the three types of wireless networks that exist today from the perspective of the handheld and discusses how Palm will exploit each.

II. Wireless Technologies: Cutting the Cords

For those new to the discussion, it may be helpful to think of wireless technologies as replacements for cables of one sort or another:

- Personal Area Networks link devices within close proximity of one another (about 30 feet); they replace USB cables; they're spontaneous, or "ad hoc"; and unlike the other types of wireless networks, PANs need no infrastructure.
- Wireless Local Area Networks replace the Ethernet cables that enable corporatewide networks. A W-LAN delivers connectivity throughout a localized site, such as a university or corporate campus, or a home network, by placing "access points," fixed base stations with a range of about 500 feet, along the existing infrastructure.
- The Wide Area Network is perhaps the most familiar of the three since it's the technology behind cell phones. WANs replace telephone wires. Today, WAN antennas can be spotted on rooftops around the globe. Not site-specific like W-LANs, but multiple, incompatible standards (TDMA, CDMA, GSM) prevent continuous coverage from one geographical region to another.

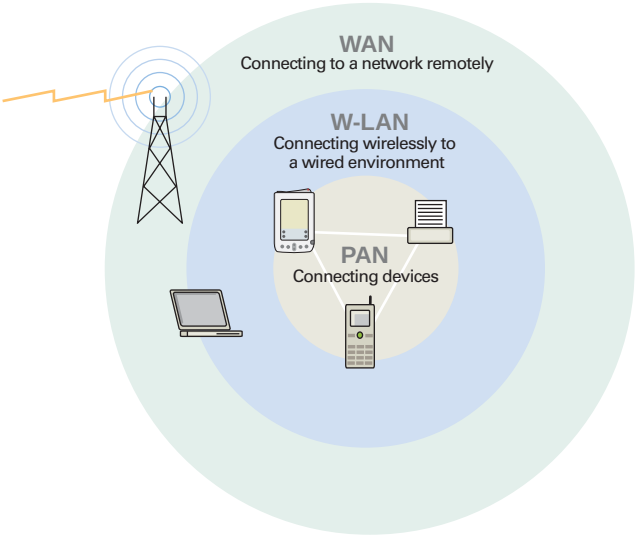

Figure 1. The matrix of wireless networks

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Personal Area Networks

Devices of all types, from phones and handhelds to printers, and even home electronics such as TVs and stereos, are perfectly suited to these short-range, ad hoc networks—giving an entirely new meaning to the term, "universal remote."

We at Palm believe Bluetooth is the optimal technology for PANs because of its small chipset and low power consumption, and we are deeply committed to helping Bluetooth become the industry standard for personal wireless devices. The Palm Bluetooth card, which wirelessly enables any Palm handheld equipped with an expansion slot, was one of the earliest Bluetooth products introduced. Targeted for shipment in the first quarter of calendar year 2002, the card enables Palm handhelds to connect to other Bluetooth-enabled devices, such as a cell phone, printer, network access point, or another Palm handheld.

PANs connect devices.

PANs offer myriad possibilities for connecting, communicating, and collaborating, such as the following:

Connect: A Bridge to the Internet—By far, the most important use of Bluetooth in the near term will be to connect a handheld to the Internet. Here, a PAN is created between the phone and the handheld, which then uses the phone as a modem to connect the handheld to the Internet or to an intranet via a WAN between the phone and its network. The phone/handheld connection also adds the convenience of automatic dialing, allowing the user to select a phone number stored in the handheld, which the phone then automatically dials. With the addition of a headset, a user can dial from the handheld with a single tap and talk hands-free—all while the phone remains in a briefcase nearby. This elegant two-piece solution will be supported by the Palm Bluetooth card.

Communicate: Devices that Talk to Each Other—Since PANs don't need an infrastructure, they don't require an IT manager. This enables the creation of ad hoc networks between devices—a handheld and, say, a printer, fax, camera or an LCD projector; even a television or a stereo—that may last for a single transaction: A user asks her handheld to finda printer; the handheld identifies any printers nearby, the user selects one and then goes to pick up her document. That's an example of a single-transaction network.

Collaborate: Peer-to-Peer Networking—We think the opportunities for collaboration among a small group of devices (up to eight) is one of the most exciting aspects of a Bluetooth PAN. Initially, a group using Palm handhelds equipped with a Palm Bluetooth card will be able to do things like share a to-do list, but the future offers opportunities for more complex tasks. For example, the devices will be able to share information about group members' calendars—and automatically determine a date and time when everyone is available to meet. Just as connecting PCs created a galaxy of unexpected new uses, products and services, we expect the new, wirelessly enabled information-sharing and collaboration capabilities enabled by these networks to do the same for handhelds.

Bluetooth and 802.11: Distinctly Different Markets, Different Uses

Much has been made in the media about whether Bluetooth and 802.11b, both short-range wireless protocols, are complementary or mutually exclusive. The reality is, the markets for 802.11b and Bluetooth are distinctly different. The two protocols serve radically different functions and will rarely, if ever, face off for the same type of use.

Thanks to its PC origins and high data speeds, 802.11b has become the indisputable standard for W-LANs today and is expected to move into most laptops, where cost and power consumption matter less than in other devices. On the other hand, the higher cost, bigger footprint and higher power consumption of 802.11b give Bluetooth the advantage in personal area networks.

Palm OS® supports both the Bluetooth and 802.11b protocols. In addition to Palm's Bluetooth card for expansion-slot Palm handhelds, TDK also manufactures a Bluetooth module for Palm handhelds. On the 802.11b side, Xircom recently introduced an 802.11b add-on hardware module for Palm devices, and Palm is focused on optimizing next-generation 802.11b solutions for handhelds.

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The question of whether Bluetooth or 802.11b is the optimal technology depends on the implementation. No doubt about it, 802.11b is the preferred choice for W-LANs, and workers will most likely opt to use an 802.11b integrated device while they're within the W-LAN "locality." But until open 802.11b networks become more prevalent, these same workers will have to rely on a WAN or PAN two-piece solution to stay connected to their information while they're on the road; in this situation Bluetooth offers more flexibility.

Not only can Bluetooth and 802.11b coexist peacefully, we believe there can be a definite benefit to deploying both. Where an infrastructure is already in place, in most cases 802.11b will be the obvious choice. But with so many devices from printers to phones to slide projectors Bluetooth-enabled, you will probably also want to have Bluetooth capability.

In the future, we will likely see some merging of the technologies. In fact, several industry leaders are already looking into this area. You are going to see 802.11b/WAN chip sets, and a Bluetooth/802.11b radio, or two radios on the same-size circuit that enable a device to use either technology. Going forward, Palm devices will increasingly incorporate support for PANs, and W-LANs, and WANs based on customer needs.

Facts About Bluetooth

- The Bluetooth chip set is small and inexpensive (relative to 802.11b).
- Bluetooth tends to be battery-friendly, which is critical to mobility.
- Bluetooth is not site-specific; it requires no infrastructure (also critical to mobility).
- Bluetooth provides robust security at the application and link layers.
- Bluetooth will be found in computer mice, phones, pens, laptops, handhelds and cameras.
- Independent market research indicates the low cost and lower power consumption will drive Bluetooth into phones and consumer gadgets with shipment volumes more than 100 times greater than laptops.

Facts About 802.11

- 802.11b has a significantly faster data transfer rate than Bluetooth.
- 802.11b is site-specific; that is, it requires an infrastructure, such as an Ethernet.
- 802.11b is widely deployed today and is the standard in use in today's W-LANs.
- Although 802.11b could be used to create a PAN, its relatively large chip size and high battery usage make it less attractive in the mobile environment.
- 802.11b lends itself to relatively few types of devices (mostly PC Card and Compact Flash modules).

Local Area Networks

Wireless LANs are the biggest and fastest wireless pipe to the Internet. In addition to corporate- and university campus-wide W-LANs, in the past year we have seen the introduction of the so-called "café" network, a new type of W-LAN marketed as a value-added service in private clubs and in public venues, such as Starbucks and hotels.

> W-LANs provide a wireless connection to a wired environment.

As stated above, 802.11b is the industry standard for W-LANs, including café networks, although the research firm Jupiter Media Metrix offers the following interesting observation: "Since it is likely there will be more Bluetooth-enabled PDAs than Wi-Fi-equipped laptops on the street, the natural network for a café to install for example, might not be Wi-Fi, but Bluetooth." *

Wide Area Networks

The WAN is what enables people to stay connected while on the road. Internet and extranet access that allows you to "pull down" essentially whatever information you want, email, instant messaging, "buddy chats"—all these are enabled by the WAN.

> The primary purpose of a WAN is to connect to a network remotely.

Of PANs, W-LANs, and WANs, the WAN space is probably the area where Palm has had the greatest impact to date. Not only was the Palm VII handheld the first successful wirelessly enabled handheld, but most Palm handhelds today can connect to the Internet using the Palm Mobile Connectivity Kit and a cell phone as a wireless modem. Palm Powered handhelds can connect via the Mobitex, GSM, GPRS, PHS, CDPD, and CDMA networks.

* Jupiter Media Metrix., *Wireless Internet Access: No Need to Wait for 3G*, March 28, 2001.

Where WANs Are Going

The two major hurdles to ubiquitous wireless connectivity are 1) WANs' slow data transfer rates using what had been essentially voice technology; and 2) a geographically and technologically fragmented market, which has produced an alphabet soup of incompatible technologies: WAP and GSM in Europe, CDMA and GSM in the U.S., CMDA and PDC in Japan. Recently, however, we have seen the emergence of industry initiatives designed to overcome both these hurdles.

Both the GSM and CDMA networks are rolling out what they call 2.5G ("2 1/2-generation"), new voiceless data services that are about four times as fast as current rates—not as fast as the much-touted and elusive 3G, but comparable to the difference between your screeching dial-up modem and DSL. Downloads will be faster, Web pages will "paint" faster, allowing richer websites. AM-quality, streaming audio also becomes practical. In other words, plenty fast for just about everything but streaming video and highly interactive entertainment offerings.

The second development has to do with open standards. In what *The Weekly Mobile Computing & Wireless News* called an "unprecedented" move, companies across the wireless industry recently announced that they have committed themselves to a global set of open standards and a broad framework to foster cooperation. (Microsoft, which is promoting its own .NET Program, was conspicuously absent from the list of participating network operators and hardware manufacturers.)

The Promise of 3G

Third-generation networks will provide higher speeds and greater compatibility. Whereas the current generations of GSM and CDMA (as well as their 2.5G versions, GPRS and 1XRTT, respectively) are incompatible, in 3G we see greater interoperability. In addition to enabling people to access their information from any of the major markets around the world, the higher speeds will also enable high-bandwidth applications, such as streaming video and enhanced synchronization capability.

The higher speed and high-bandwidth capabilities will require a more powerful processor. Last year, Palm selected Texas Instruments' OMAP™ processor platform to power a set of next-generation handheld solutions, and TI's wireless GSM/GPRS technology to enable seamless connections of Palm handheld computers. By working with TI, the market leader in wireless technology, Palm executes on a key objective of moving product lines to the more powerful ARM®-based processors and delivering wireless solutions to large enterprises. We expect to offer a beta release of the first ARM-based version of Palm OS to Palm licensees sometime in the first quarter of calendar year 2002.

3G's promise of greater interoperability notwithstanding, however, Palm believes flexibility is critical in a diverse world. In keeping with our strategy of providing communication solutions that fit within today's IT environment, we will continue to focus on solutions that are compatible with multiple existing standards as wells those that capitalize on emerging technologies. Our focus will remain on facilitating fluid connectivity and on enabling handheld users to stay connected to their information wherever they are.

III. Wireless Applications—Delivering the Internet to the Handheld

Much of Palm's success can be attributed to the fact that we have always treated a handheld as a handheld, rather than as a shrunken PC. How does the interplay of PANs, W-LANs and WANs affect the mobile-device experience? Well, in addition to the thorny problem of having people connect via multiple technologies, the applications themselves must negotiate these diverse "data transport" protocols. No application does this better than Web clipping, developed by Palm.

In keeping with our focus on delivering mobile communication solutions that fit within existing IT infrastructures, Web clipping provides the best wireless experience given the state of today's WANs. It is a very efficient technology that enables Palm handheld users to access any URL on the Internet quickly and retrieve information in a format they can use. (Users of the new Palm i705 handheld can do this directly; users of other Palm handhelds can do this by downloading a third-party application, available free from the Internet.)

Equally important, Web clipping is based on a thorough understanding of the way people use handhelds as opposed to the way they use their PCs. People on the go don't have time to browse leisurely. They want the answer to a specific

question—NOW. And that's what web clipping technology provides. It gives you just the information you've asked for, in a consistent format that can be quickly transported over the existing wireless infrastructure and easily read on the handheld screen. Not only is it faster and easier to use than other mobile platforms, web clipping is also transparent.This means that regardless of the technology you use to get to the Internet, and regardless of the Palm Powered device you use, the applications look and work the same—a huge advantage over even some of the most well-known PC-centric applications.

> Web clipping is a very efficient technology that enables handheld users to access any URL on the Internet quickly and retrieve information in a format they can use.

In the future we expect that, in addition to being able to access the Internet using different technologies, Palm handhelds will be intelligent enough to know automatically which type of network you are using. And if you switch networks, if you walk out the door and you're away from your corporate network, it will know to switch over to your wide area network. So, even if the network itself isn't seamless, the Palm user experience will be.

Next-generation Wireless

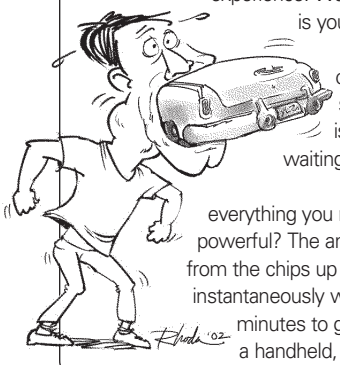
Higher network speeds, increased bandwidth and enhanced processing power will enable a host of new capabilities and applications, especially for the enterprise, and Palm has already begun executing on its wireless strategy to take advantage of the improved wireless environment.

In January 2002, Palm introduced the Palm i705 handheld—at the time of this writing, the only wireless handheld solution in the marketplace today that integrates secure, always-on "push" email with full-featured Personal Information Management (PIM) capabilities, web browsing, instant messaging, and expansion, and which allows the use of thousands of software applications.

Along with the Palm i705 handheld, Palm also announced the beta test of the Palm Wireless Messaging Solution, an end-to-end Palm-branded, enterprise-quality, secure, centrally managed solution for always-on email. The solution comprises four elements: the Palm i705 handheld, Enterprise Software Suite, Palm Wireless Messaging Server, and Palm services.

Taken together, these introductions marked a major milestone in the delivery of next-generation wireless products and services, combining all the benefits of Palm's unmatched wireless integration and comprehensive information management with secure wireless email and Internet access.

The whole Internet on a handheld? Whoa, that's hard to swallow.



Microsoft OS based handhelds do not offer web clipping, something that PC-centric handheld manufacturers have tried to turn into a virtue. The implication is that web clipping offers a somehow diminished experience. Well, we beg to differ—unless waiting online is your idea of a good time.

The fact is, accessing the web clipping version of a website, which is specifically intended for use in handhelds, is almost always going to be faster than waiting for the desktop version.

How is this possible, you ask, when everything you read says that Microsoft is so much more powerful? The answer is simple: the Palm OS was designed from the chips up for mobile use. A page that appears instantaneously when you are sitting at your desktop can take minutes to get to your handheld. And when you're using a handheld, even 30 seconds can be a very long time.

What about those claims that Microsoft gives you the "whole" Internet? PC-centric applications like to say that they're industry standards; you'll see the same page on your handheld as you do on your desktop. Well, that's simply not the case. In the first place, it'll take several LONG minutes to download, and when it gets there you still won't be able to see the whole page. Someday, it'll probably be good, but right now? It just doesn't work very well.

But what about those great Internet experiences using Microsoft OS based handhelds? Well, you might want to check out what's behind the curtain. Sometimes, "demonstrations" are conducted in wirelessly enabled environments using carefully selected networks or even 802.11b (which, as you now know, is actually a wireless LAN connection and not a WAN at all!).

So, find out what type of network is being used. If that infrastructure doesn't exist on the road, it's not real. If it's not available in your area, it won't work for you. Don't let'em fool you: trying to download the "whole" Internet onto your handheld is like trying to swallow a Buick.

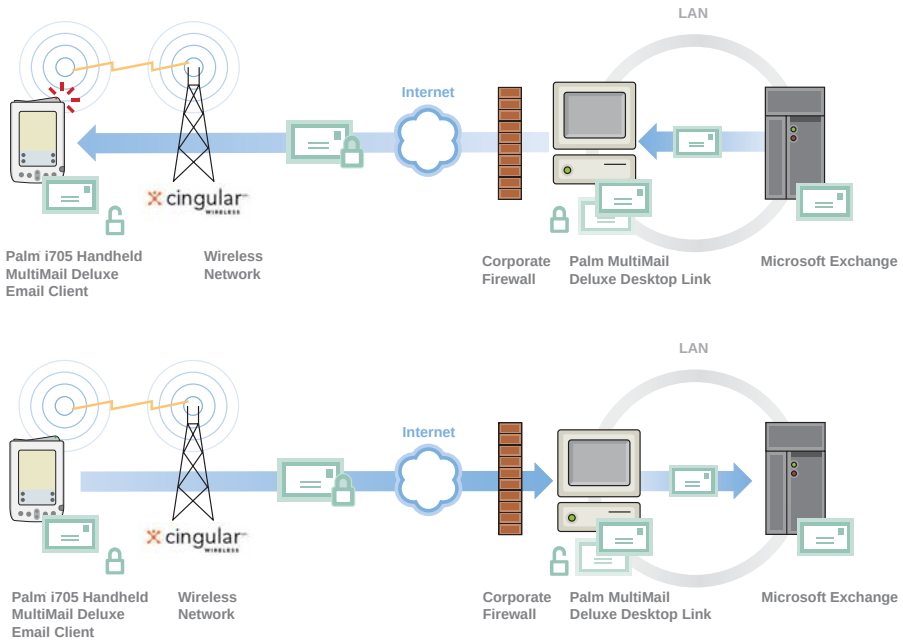


Figure 2. Palm i705 Handheld Solution: A secure solution for individual mobile professionals

"Push" email and Instant Messaging

The Palm Wireless Messaging Solution provides users of the Palm i705 handheld with always-on, wireless email, enabling them to send email and to receive business and personal email instantly and automatically. The device also alerts the customer to the arrival of email, even when the device is turned off. The wireless email solution supports multiple industry standard protocols, and supports such popular email browsers as Microsoft Outlook and Microsoft Exchange. Business email is encrypted end to end, using a beefed-up version of Data Encryption Standard to deliver industrial-strength security. The Palm Wireless Messaging Server provides our enterprise customers with full "behind the firewall" server-based email capability. And with AOL's popular Instant Messenger, Palm device users can check to see who's online and send and receive text messages instantly.

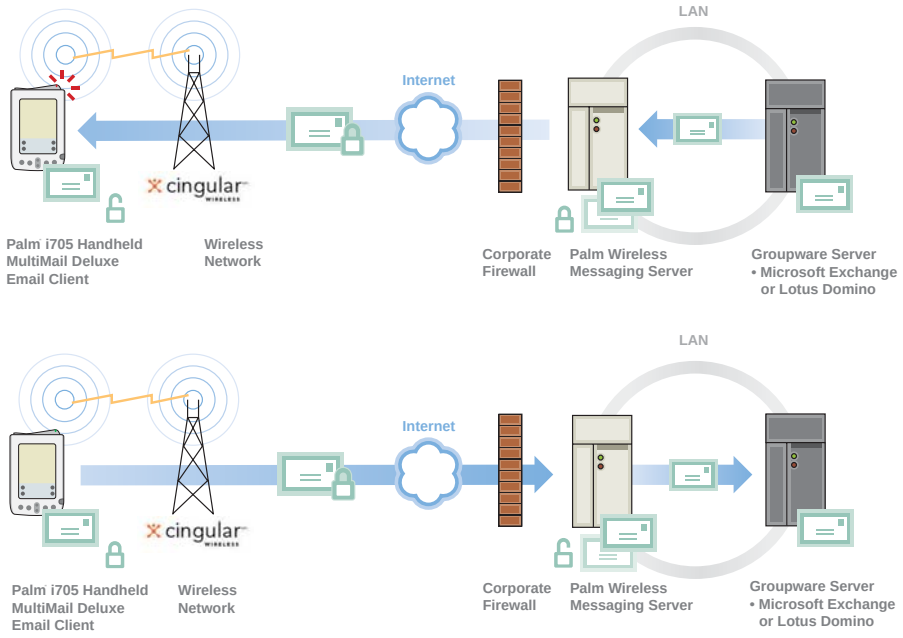


Figure 3. Palm Wireless Messaging Solution: A secure solution for enterprises

Wireless Synchronization

Real-time wireless synchronization of data on the handheld with data on the desktop is one of the greatest benefits of wireless "always on" connectivity. Synchronization applications—calendar updates, alerting the handheld user to a change in the calendar, backup, and so forth—require a good deal of bandwidth, however, which means that they really need a wireless infrastructure that can deliver speeds comparable to those of a wired desktop. Since no such wireless infrastructure exists yet, and since Palm's focus is on delivering wireless solutions that fit within the existing IT infrastructure, we are beginning by adding the highest-value synchronization capabilities first in order to maximize benefit.The first of these is email synchronization, introduced with the Palm i705 handheld. This feature notifies the user of new email at virtually the same time it arrives on your desktop. By the end of 2002, Palm handhelds will add real-time calendar synchronization and automatically provide alerts to reflect calendar and appointment changes. We will continue to enhance synchronization capabilities, including such features as remote back-up, as wireless networks evolve.

The Evolution of Wireless Security

Palm has selected the DESX security protocol because—again—it produces the best mobile experience within the wireless infrastructure as it currently exists. At the time of this writing SSL encryption is not appropriate for wireless handheld use due to the slow transmission rates of today's WAN networks. As 2.5 and 3G networks evolve, and as wireless mobile devices evolve into true Internet-protocol devices, the security protocols available today for the desktop will become appropriate in the wireless world and will be adopted at that time.

A Word About VPNs

Many enterprises are turning to the Virtual Private Network (VPN) as a way to ensure that different types of devices have the same secure access to intranet and extranet resources and data. A VPN may be launched in any of the three wireless environments, PAN, LAN, or WAN. In some cases, a VPN may not be required to reach the Internet or certain "public" portions of the network, but may be required to access a proprietary intranet or other private services.

That being the case, why has Palm chosen not to incorporate a VPN into the Palm OS when other platforms do? Unfortunately, from the customer's perspective, one size of VPN does not fit all. There are probably a couple of dozen different flavors of VPNs out there, each of which was designed to work with a different VPN gateway. So the VPN that's right for a particular organization will depend on the IT environment. That's why—once again—we at Palm have refrained from stuffing a VPN *that might not work in your IT environment* onto the Palm OS. Instead, we have incorporated a security architecture into the OS and allow you to select the appropriate VPN solution for your network from among the many third-party products available.

IV. Looking Ahead—Up-to-the-Minute Information

Going forward, the evolution of more sophisticated "push" functionality will continue to be a significant value-add for handhelds. Whereas today people have to think about getting their information and actively bring it to the handheld, the Palm handheld of the future will provide updated information effortlessly. In addition to wireless email, for example, handhelds of the future will allow secure access to corporate databases, such as field service and sales automation applications. Automatically and seamlessly updated in the background, these powerful tools will enable enterprises to offer customers enhanced services. And rather than require the user to negotiate PANs, LANs, and WANs to get to his or her information, the device will know where the user is and automatically bring the information it knows the user wants.

Voice

Palm will continue to work toward tighter integration of the radio and the device in order to further reduce power consumption and provide the sleekest, most wearable handheld. At Palm, we believe that wireless devices will continue to fall into two categories: voice-centric devices and data-centric devices. Although there is space for a hybrid device (and both technology and the market permit the development such a device), we believe use will dictate the form an individual prefers: to put it simply, someone who uses primarily data-centric applications will prefer a larger screen than a person who uses a wireless device primarily as a phone. Palm intends to make sure that customers who prefer a voice-centric device are satisfied. Although we will continue to focus on wireless solutions that leverage our core strength of mobile information management, we are mindful that the future also presents attractive opportunities for voice/data integration. We will be looking into ways that integrate voice and data seamlessly so that the one complements the other to bring wireless products and services to new levels. And since it is easier to add voice to a data device than the other way around, we are well-positioned to add voice capability to our handheld devices.

Further, we will continue to develop customer-oriented solutions that transcend network protocols. In this regard, we will continue to support multiple radio standards, such as 802.11b, GSM/GPRS, and Bluetooth. Generally speaking, technologies that are earlier in the development and acceptance cycle will appear as plug-ins and add-on hardware modules. The 802.11b "sled" and Palm Bluetooth card are good examples of this stage. As the technology evolves and hardens, some of these functionalities will be integrated into products, but Palm will also continue to leverage the strength of the 175,000+ registered developers in the Palm Economy who deliver customized functionality through their third-party solutions. Further, Palm will hew to its tradition of enabling choice through reliance on open, standards-based technologies.

V. Conclusion—The Leader in Handhelds is Now Leading Mobile Wireless

Palm made history as the company that brought mobile information management to the digital age. In extending our leadership to encompass wirelessly connected mobile devices, our focus is to add new functionalities to the Palm platform while retaining the qualities—simple, elegant and useful—that continue to delight our customers.

Connectivity extends the handheld's reach beyond personal information management (PIM) to CIM, *comprehensive* information management. Connected, the handheld ceases to be a resource exclusively for personal information. Think about how connectivity has changed the way we use our PCs. Remember how cumbersome it used to be just to transfer a word processing document? Remember floppy disks? Today, by contrast: email. Need to look up some arcane fact? In the old days, we headed to the library; today we click on "Search." When you translate these examples into time saved, you begin to see how technology contributes concretely to productivity. But connectivity will not only make work easier and faster, it will change the way we use handhelds, creating opportunities and possibilities even greater than we can imagine from our vantage point today.

Glossary of Handy Wireless Terms

1G: Analog cellular (AMPS - American Mobile Phone Standard), pretty much gone everywhere except as backup and in some Latin American/Asian countries.

2G: Second-generation Wide Area Network technology. Where we are today. Digital, primarily circuit-switched.

2.5G: Not quite third-generation. Puts packet-switching onto circuit-switched network.

3G: Third-generation Wide Area Network technology

CDMA: Code Division Multiple Access (U.S., Asia)

CDPD: Cellular Digital Packet Data.

GPRS: General Packet Radio Services (next-generation GSM; expected in Europe and Asia late 2002) Uses the existing GSM infrastructure to send packet-switched data.

GSM: Global System for Mobile Communications (Europe, Asia)

i-mode: NTT DoCoMo network (Japan)

Instant Messaging: Text messaging and immediate presence awareness (tells your buddies you're on the system); a private "chat room" for you and your friends, in a way. Made popular by AOL and Yahoo.

Packet-switched: Much more efficient way to transfer data than the current method of "circuit" switching. Circuit switching ties up a whole channel throughout the transmission; packet switching, on the other hand, uses the channel only to push the packet of data across and then releases the channel so it's free to handle other packets.

SMS: Short Message System, GSM text messaging capability, wildly popular

TDMA: Time Division Multiple Access (U.S., Latin America)

WAP: Wireless Application Protocol (Great Britain)

WCDMA: Wideband Code Division Multiple Access, 3G CDMA (Europe, Japan, U.S.)

1XRTT: Uses CDMA infrastructure to send packet data, expected late 2002 (Korea Japan, U.S.)

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