

The New Wave of Wireless Applications

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Do you remember how much fun it was to play with your first walkie-talkie? The ability to converse with your friend when he was around the block was the ultimate in high tech. I recently experienced this same excitement when I sent out email using my first wireless personal digital assistant (PDA), while I stood in line for a hamburger. Now that the future is here, I can't wait until I get my first Tricorder. (You do remember all the tasks that *Star Trek: The Next Generation's* Dr. Crusher could perform with hers?)

Seriously, widespread availability of wireless data services is fairly new. In fact, it was difficult to get Internet access for your PDA last year. Now that it's here, wireless technology is changing rapidly. The buzzwords are zinging around and, if we're going to be able to deliver wireless applications to our respective organizations, we had better keep up. This really will change the way we do business in the coming years – just as widespread Internet use has affected us over the last several years.

The acronyms in the wireless world are just as bad, if not worse, than the rest of the computer world and it can be somewhat overwhelming. To get you started thinking about wireless, this article should help to clarify some of this terminology and to provide an overview of the technologies involved with wireless networks, devices, and application deployment over the Web. Once you have this basic information in hand, you

can more confidently work in the Internet wireless environment.

Radio Frequency

Wireless communications are possible via radio frequency transmissions. You may remember from science class that the electromagnetic spectrum encompasses gamma rays, ultraviolet, visible light, radio, microwave, and infrared radiation. The wavelength or frequency of the waves determines the type of electromagnetic radiation. We are able to encode transmissions into the longer wavelengths, such as radio, microwave, and infrared radiation, which are in the frequency range of 20 MHz to 200 THz. (Sound waves are simply a vibration of matter and are not in the electromagnetic spectrum; however, sound transmissions

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can be encoded into radio waves). Generally speaking, higher frequency levels need more power to transmit but can be used for greater speed transmissions. With regards to cellular network architectures, this means that more base stations and repeaters are needed for uninterrupted reception and for transmissions at greater speeds.

Wireless Network Evolution

The wireless evolution, which has taken place over the last 15 to 20 years, is defined in terms of generations. Advanced Mobile Phone Service

(AMPS) is the widespread analog cellular service that is characteristic of first generation (1G) wireless networks. Today, most of our cellular phones and the services to which we are subscribed, are indicative of second generation (2G) wireless networks. These services are now digital and can operate at speeds of 14.4Kbps to 19.2Kbps. This speed is sufficient for voice communications and non-graphical data services.

The wireless industry greatly anticipates third generation (3G) wireless services. By the 2002/03, it is expected that broadband wireless access will be widely available at transmission speeds of 2Mbps. Once this service is in place, you can expect a significant evolution with regards to the types of hand-held devices and applications that will be available. Several vendors' concepts of handheld devices that are under development in read-

iness for 3G cellular digital are illustrated in **Figure 1**, which I acquired from the **GSM Association** Web site (www.gsmworld.com). GSM – Global System for Mobile communications is described in the Wireless Networks section.

In the interim, until 3G cellular services are a reality, many vendors are coming out with solutions that fall between 2G and 3G. The 2.5G wireless offerings will operate at higher speeds. For example, the global system for mobile communications (GSM) networks will be offer-

ing services at speeds of up to 384Kbps using the General Packet Radio Services (GPRS) technology. In addition, a proposed standard for a fourth generation wireless (4G) service – mobile broadband system – is under development. When this service becomes available, it could offer wireless data transfer speeds of up to 155 Mbps, which will mean full multimedia transmission.

Wireless Networks

Although many analog cellular services continue to use AMPS and other related technology, this has largely been replaced by digital services. Code-division multiple access (CDMA), global system for mobile communications (GSM), Cellular Digital Packet Data (CDPD), Wireless Application Protocol (WAP), and the Institute of Electrical and Electronics Engineers (IEEE) 802.11b for wireless LANs are some of the key wireless services and network architectures that are predominate today.

CDMA is both a specification for spread spectrum wireless networking and the media access method that a CDMA network uses. A number of popular cellular providers in North America use



Figure 1: These are some of the exciting sample 3G devices that could be in the works (graphic courtesy of GSMWorld.com).

the CDMA technology, including **Bell Mobility** and **Ameritech**.

GSM is the standard throughout most of the world – except in North America. It has been adopted by approximately 150 countries and has more customers than

any other service. Around 330 million customers subscribe to a GSM service. There are some GSM implementations in North America, but they are generally incompatible with the rest of the world as they are transmitted at a higher frequency range. GSM subscribers use a Subscriber Identity Module (SIM) that can be transferred between different phones and services. In this way, a customer can keep their phone number and identification regardless of the service provider.

One of the owners of our company lives in Australia and has a cellular phone on a GSM Network. During his extensive travels – throughout Europe, Asia, and Australia – his cellular phone works wherever he goes – except when he comes to North America. The worldwide adoption of this standard helps to explain why Europe is ahead of us in wireless data technology.

CDPD was designed in the mid-90s as a method to overlay digital data transmissions over the existing analog cellular networks like AMPS.

WAP is a specification – designed by a consortium of telephony vendors – to enable Web content to be served in cell phones. Wireless Markup Language (WML) is a specialized version of XML that would be interpreted by a cell phone browser. The specification calls for a gateway that would translate WML requests into HTML and send them over the Internet.

Wireless LANs have been used for many years to deploy warehouse and dispatch applications. In order to implement a wireless LAN, Access Points need to be wired into your network – which would act as the gateway for the wireless device. **Figure 2** illustrates an access point on a wireless LAN. Typically, the devices would need to be anywhere from 30 feet to a couple of miles from an Access Point or Repeater to work. The latest specification for wireless LANs is IEEE 802.11b. This specification uses Spread-spectrum technology to deliver data transmissions at speeds of up to 11 Mbps. Both **Symbol Technologies**

and **Intermec** offer powerful wireless LAN solutions that can be integrated with your AS/400 applications. Another exciting offering for globetrotters is satellite cellular services. Using the latest satellite technologies, such as LEO (Low Earth Orbit), companies like **Qualcomm** and **Teledisc** can offer cellular voice and data services to travelers on a global basis, even if they're in the middle of the Sahara desert!

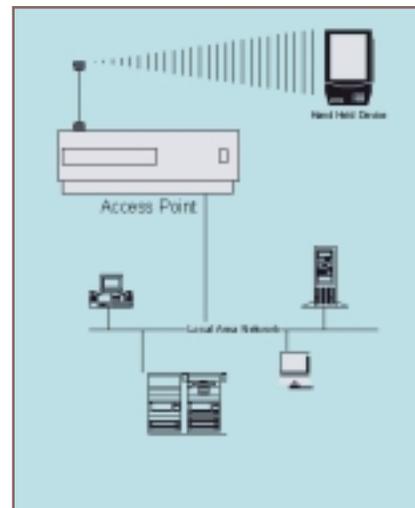


Figure 2: This is how a typical wireless LAN works.

Wireless Devices

There is a wide range of wireless devices that can be used to access browser-based applications and email. These devices are based on pager technology, cell phones, PDA, or specialized wireless LAN devices that include other capabilities such as barcode reading, scanning, and printing functions. Older handheld devices typically run either straight terminal emulation or DOS-based textual interfaces. In many cases, the handheld devices are merely data collection devices that need to be synchronized with a server via a wired connection. The latest models of handheld devices that are offered for wireless LAN solutions, tend to run either Palm OS or Windows CE operating systems and can deploy a variety of different applications.

The **Palm Pilots** are currently the most popular PDA devices on the market, enjoying a global market share of just

over 70 percent. The three main models, Palm III, Palm V, Palm VII, run the Palm OS operating system. Palms can be connected to wireless data services via **Novatel Wireless's** Minstrel wireless modems, modems connected to phone lines, and cellular phones.

The Palm's main competitor, the Pocket PC, was released in April 2000, with much excitement. The Pocket PC, a **Microsoft** specification, uses Windows CE. Manufacturers of Pocket PC's include **Casio, HP, Symbol, and Compaq.**

Pocket PC's offer color screens and handheld versions of Excel and Word. Because they are so new, Pocket PC's do not have as many options for connectivity to wireless data services yet, but this will change very rapidly over the coming months.

Because I live in Canada and had trouble getting data services for a Palm, I got a **Research in Motion (RIM)** Blackberry 957. This device is very compact and has full email and browser capabilities. Separate modems and hardware items are not needed for connectivity. Because the Blackberry has evolved from a pager, it typically will stay connected all the time. Providers for this service are **Rogers AT&T** in Canada and **BellSouth** in the U.S.

Wireless Applications

Up to this point, many of the applications that have been deployed in a wireless LAN scenario are installed onto a handheld device in batch terminal mode. This means that the user would input data into the device (via either keyed entry or scanners) and it would be stored directly on the device. To synchronize the data captured with the server, the device would be placed in a cradle with wired connection into the network. There are a number of newer technologies – including **IBM's** DB2 Everyplace, Sync Server, and Personal Application Builder products – coming out on the market for developing this type of solution. At LANSA we have developed integrated solutions for standalone/synch and wire-

less web with a PDA. Although a variety of architectural options for an application targeted for handheld devices exist, the main hype in recent times is the new browser-based applications that can be deployed, via wireless data services, to a PDA. This means synchronization is not

By the year 2002, it is expected that broadband wireless access will be widely available at transmission speeds of 2Mbps.

necessary as the application is interacting in real time with the host server. Deploying an AS/400 Web-based application targeted for a PDA will be easy if you have experience developing other Web applications. You are going to have to forget about the frills – fancy graphics, JavaScript, and frames – and get back to very basic screen design. Depending on the browser, there will be different restrictions for the HTML and JavaScript that it will support. You should use the metatag `<META name= "Hand-`



heldFriendly" content= "True"> in your pages.

Keep in mind that a typical PDA has a much smaller screen size than your PC and often does not have a keyboard. Pen-based entry or character selection is a common input mechanism. You must consider this when designing your application interface. When possible, provide simple lists for filling in forms. Web applications that serve large graphics files will not appear the same in a wire-

less browser, as many of the graphics files will simply not be delivered to the wireless device by the proxy server. They require too much space both for transmission and for display. Web Clipping is a method devised by Palm to store certain pages of a Web application on the Palm device. This limits the amount of downloading required in a typical browser based application. Basically, Palm provides a free utility that will take an HTML file and compress it into a Palm Query Application (PQA) file. The .pqa file can be stored on a Palm VII and launched directly by the user

without accessing the Internet. Typically, the .pqa file would be a query-style page and submitting it would hit a Web server for the resultant page. The basic concept behind this format is that most user interactions will be in the form of a query and response.

The number of applications and freeware available for the Palm and Pocket PC PDA devices are growing daily. With this rapid growth of application offerings, it is inevitable that we will start to see viruses. Last year, the first virus targeted at PDA's was discovered. The LibertyCrack bug, or Crack 1.1, is a Trojan Horse-style virus – which means that it is disguised as something else. Once loaded on a Palm device, Crack 1.1 will delete data from the PDA. This particular virus was embedded in a downloadable piece of freeware that could be used to operate Game Boy games on a PDA.

PDA Browsers

Most of the wireless browsers that are bundled with PDA's today require that a proxy server be hit before the user's request actually hits the Internet. This is the case with both **AvantGo** (which is bundled with the **Palm/OmniSky** solution) and **Go.Web** (which is bundled via the **Go.America** service).

The **Eudora** browser does not have this restriction and can be downloaded from the Internet, for use on any PDA. Internet Explorer comes loaded with Pocket PC's that run Windows CE.



There are a number of different browsers on the market for use on handheld devices. Typically, most wireless data services have partnered with a provider who uses their own browser and you will have the browser pre-loaded on your PDA.

Emerging Technologies

In addition to 3G, and possibly 4G, technologies for high-speed wireless data services, there are some other exciting specifications and plans that are in the works. These technologies will continue to change our world very dramatically in the coming years.

Bluetooth is a specification for short-range wireless transmission of voice and data, which will enable various devices including laptops, phones, PDA's, electronic devices, and appliances to communicate via a 2.4 GHz frequency, which is an unlicensed scientific band. The transmission rates will be 721 Kbps. The **Bluetooth Special Interest Group (SIG)** is a consortium of vendors with some big names, like: **IBM, Ericsson, Intel, and Nokia.**

Wireless Fidelity (Wi-Fi) is a spec that is monitored by the standards board: **Wireless Ethernet Compatibility Alliance (WECA)**. The Wi-Fi specification is a standard for the interoperability of various devices over IEEE 802.11b wireless LAN technology for short-range wireless transmissions. If Wi-Fi proves successful, you may be able to tap your wireless laptop or PDA into wireless LANs wherever you go for easy access to your email or browser applications. Telematics refers to telecommunications and information systems capabilities for cars. This area is expected to grow phenomenally over the next several years. Some of the main functionality that may be available from your car dashboard in a few years include the Global Positioning System, wireless services (e.g., roadside assistance), and in-car computing (e.g., voice recognition applications, entertainment services, and wireless networking/data services). Just imagine, soon your sales reps will be able to interact with your order systems from the dashboard of their cars.

Going Places

I've seen analyst predictions that users of wireless data services will grow from 4 million to 18 million in just two years. This is a growth of over 400 percent in a fairly short period of time. As 3G wireless services become available in the year 2002 time frame, the depth and breadth of the applications that we can deploy to wireless devices will evolve very rapidly.

Developing applications for PDAs and cell phones are a reality and an exciting new platform for user deployment. Wireless LANs can offer very fast speeds for data transmissions while wireless data services are becoming widely available now (at slower speeds, initially but the speed should soon increase). The technology is here today, although it is still in its infancy stages as compared to where it will be in just two years. But consider this. Given how long a typical IT project takes from conception to implementation, it's definitely time to start planning! 

Some reference sites:

AvantGo Web site, www.avantgo.com
Microsoft PocketPC Web site, www.microsoft.com/pocketpc
Palm, Inc. Web site, www.palm.com
GoAmerica Web site, www.goamerica.net
www.symbol.com
www.gsmworld.com
www.omnisky.com
www.palmos.com/dev/tech/webclipping/wireless_bizcase.ppt
www.common.org/wireless/index.htm
www.eudora.com
www.lansa.com

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