

CLIENT SERVICE TECHNOLOGY

***Enterprise Testing:
The Wireless World***

Speaker: Scott Moore
ScottMoore@Deloitte.com
www.Deloitte.com

Hi, I'm Scott Moore from Deloitte & Touche. Today, I'll be talking about Wireless and Mobile computing technologies and how they affect you as a test professional. We'll discuss a lot of the new terms popping up about mobile computing, and hopefully put it all into perspective. Finally, we'll discuss some considerations of testing wireless solutions and a recommendation approach to testing.

How many of you have heard about or been following the recent trends of mobile computing as it applies to the wireless web? How many of you currently have WAP-enabled cell phones and can surf the web or do web transactions on your phone or PDA?

I want to talk about this new area of technology and how it works. We'll will talk about the various platforms and define some of the common terms, display the potential of the technology, as well as discuss the unique considerations wireless brings to the testing world.

The next generation of wireless services offers a richer experience on the cell phone, including broadband web access and multimedia. What does all this mean to you in the testing community? How should you prepare now to be ready for the next wave of applications and portals? What unique considerations should be on your list?

The first analog phone system was called the Advanced Mobile Phone Service (AMPS) which is also known as analog. In 1987, the FCC opened the 800MHz spectrum of radio frequencies. Over the next 10 years three digital standards were being used by a variety of carriers in North America. AT&T Wireless, and Southwestern Bell use Time Division Multiple Access (**TDMA**). Sprint, GTE, Air Touch, and Bell Atlantic use **CDMA**, or Code Division Multiple Access. Pacific Bell and Omnipoint use **GSM**, or Global System for Mobile Communications. Although there is no difference in sound quality, the systems process voice signals and encode information differently.

In 1994, the FCC opened the 1900MHz spectrum and Personal Communication Services (**PCS**) became available. Anyone heard of Sprint PCS? Unlike cellular services operating at 800MHz that include both analog AMPS technology and one of the digital formats (TDMA, CDMA, or GSM) the PCS spectrum was entirely digital. Once the 800MHz and 1900MHz spectrums were established, advanced features such as voice mail, fax capability, and paging became available to cellular users. Also, cell phones could be used as wireless modems for Internet connection from a laptop while on the go. These advanced services and capabilities paved the road for the eventual direct connection between the wireless world and the World Wide Web.

Europe for most part began with a digital standard known as **GPRS** (General Packet Radio Service), which is a faster version of GSM. You can get data transfer rates close to ISDN speeds, or 128kbps.

EDGE (Enhanced Data Rates for Global Evolution) is also a faster version of GSM and incorporates GPRS for transfer rates from 64kbps to allegedly 473Kbps. Japan's telecommunications company, NTT DoCoMo, is currently testing **WCDMA** (Wideband Code Division Multiple Access) and it could deliver transfer rates close to 384kbps.

My point in showing you all of these hard to remember abbreviations is to show you how many standards there are. Here in the US, no matter which technology is accepted as the new standard, it will be expensive from an infrastructure and implementation perspective.

Although some of these projections have become more conservative based on the US economy in the last 6 months, it's no secret that the wireless economy is still ready to explode. In 1999, more mobile phones were shipped worldwide than PC's and automobiles combined. According to the Gartner Group, by 2005 more than 1 billion mobile phones will be in use globally. PC-based Internet users will not even exceed 305 million before 2002. International Data Corporation predicts wireless net usage to increase 728% by 2003 (that is about 61.5 million users in the US alone). People who have been intimidated up to this point by PC's and technology probably already have a cell phone, and are more likely to consider the simpler device "user friendly". It is worth noting that many of the companies with the biggest push behind the mobile wave are the same companies who came late to the Internet explosion party. It's a second chance to get in on the ground floor of the new generation of technology.

A recent study by Anywhereyougo.com found that 28% of live (in production) WAP applications had critical errors, and 19% of wireless portals had errors. You would think that we would have learned our lessons from web development that it is better to come to the table with a quality product or service instead of rushing to the market with something immediately in need of “patches” and “fixes”. As many of you know, considering testing as an afterthought causes the project to increase cost. The later testing is done, the more expensive it is.

What are wireless portals?

Portals are Web sites that compile a wide variety of content, services and links to other sites. Microsoft's new portal, dubbed MSN Mobile, will let users receive personalized content via their interactive pagers and cell phones

What is WAP?

WAP is an open, global specification that offers a standard method to access Internet based content and services from wireless devices such as mobile phones and PDAs (Personal Digital Assistants). It transmits and formats web data for the small mobile device screen via a WAP gateway. Motorola, Nokia, Ericsson, and Phone.com (formerly Unwired Planet) first initiated WAP in 1997. These companies formed the WAP Forum. The WAP Forum now has over 500 member companies who make up 95% of companies providing solutions in the wireless space.

WAP has six layers that correspond to the OSI model:

OSI	WAP
Application layer –	WAE (Wireless application environment)
Session –	WSP (wireless session protocol)
Transaction –	WTP
Security –	WTLS
Transport –	WDP
Network, Link, & Physical –	Bearer services protocols such as GSM, CDMA, and CDPD.

What is Bluetooth?

Bluetooth wireless technology is a specification designed to enable wireless communication between small, mobile devices. Functionally, Bluetooth is no different than a physical cable. The key difference is that Bluetooth uses a radio link to connect devices instead of a cable. From that end, Bluetooth is an *enabling* technology and **not** an application. The inspiration behind this technology was the desire to eliminate the need for proprietary cables, which are currently required to enable device connectivity. For instance, in order to transfer images from a digital camera to a laptop PC, a cable is needed in order to connect the camera to the laptop. Each camera manufacturer and model has a different cable requirement. In fact every hand held device manufactured which allows connectivity with a PC has a different cable configuration. Imagine a scenario in which both the laptop PC and the digital camera use Bluetooth wireless technology. In this case there is no need for cables to transfer data between devices. Instead, the data can be transferred over a radio link.

What is WML?

WML Script is the scripting language for WAP-WAE (Wireless Application Environment). WML is a stripped down version of XML.

Like a web browser, micro-browsers submits requests, receives results, interprets, and presents them to the screen. A micro browser has both WML and WMLScript interpreters. WMLScript is a high level language that allows logic and functions to be put into applications, such as to verify/validate input from a form before submitting it to a server. Think of it like JavaScript or VBScript. Compiled WMLScript consists of machine-independent byte codes, much like Java's compiled class files. WMLScript obviously requires an operating environment where the byte codes are executed in an interpreted mode. This "virtual machine" is similar to the Java Virtual Machine (JVM).

WTA is Wireless Telephony application. This adds telephony features so you can receive calls while browsing without interruption. Push OTA (over the air) and PAP (Push Access Protocol) let WAP-enabled web servers push information to WAP clients. Can anyone smell advertising here?

Due to limited bandwidth of the wireless WAP network, WML pages are grouped together on the WAP gateway in sets of pages or decks. They can then be delivered in individual transmission.

To request Internet content, a user enters a URL into the WAP device, which sends a URL request to the WAP gateway. The WAP gateway converts it to an HTTP-based request. It forwards this content to the web server over either the Internet or an IP network. The web server does what it normally would to process and return an HTTP request. When it returns a response, it is in an HTML format. The WAP gateway will convert that HTML into WML, or may even encode the WML into binary to reduce the packet size. All this is to reduce the overhead and the information down the small wireless "pipe" as quickly and as efficiently as possible. This conversion is called *format transcoding*.

So we see that the WAP gateway performs 3 main functions:

1. Protocol translation from WAP to HTTP
2. HTML to WML conversion
3. Provides a (hopefully) secure tunnel for data between the WAP client and the Web server.

*Note – Microsoft has recently jumped into this market with their own solution. Microsoft Mobile Information 2001 Server will allow WAP clients access Exchange Server. It will work hand-in-hand with Active Directory and Exchange Servers.

What is 3G?

3rd Generation is the generic term used for the next generation of mobile communications systems. It is also known as UMTS (Universal Mobile Telecommunications System). 3G transfer rates are approximately 26 times faster than the current rates on North American digital networks. Currently connections are usually between 9.6 Kbps and 19.2 Kbps). The trade-off for faster data rates is a lower range - so more cell sites will be needed to provide total coverage. Obviously, bigger cities will experience this first.

When will it happen?

Some UMTS networks will start operating this year on an experimental basis, with full commercial service starting not before mid-2001. The telecom market research firm The Strategis Group predicts that Asia and Western Europe are poised to deploy 3G networks by 2002. In contrast, 3G services will not be rolled out in the US until 2004.

While most believe that Western Europe and some countries in Asia will lead the 3G bandwagon, quite a few are optimistic that the US will also be ready by 2003. Still others feel that some of the so called 2.5G technology—the technologies built on 2G standards like GSM and IS-95 and offering higher capabilities, like EDGE—will be passed off by many as 3G. That will make it a transition rather than a switch. Until issues are resolved, it's difficult to mention a time frame.

What can we expect?

Access to the Web, e-mail, local information service, mobile banking, mobile commerce, etc. will be offered by the operators. Plain vanilla voice service will be taken for granted. A cellular service provider essentially will become an Internet access/content provider. The additional services that may come to your wireless device with these speeds are global roaming, location-based services such as GPS, full graphics, download capability, and possibly video and video-conferencing.

MICROBROWSER SIMULATORS: HOW TESTING WORKS IN A WAP WORLD

Microbrowsers perform the same processes as regular browsers, but work with the smaller displays and memory limitations of handheld, wireless devices. Since development can't take place on the small screens of the mobile device, wireless application developers use microbrowser simulators. Microbrowser simulators are the development platforms for microbrowsers that have been ported to Windows, allowing developers to create and test wireless applications using PCs. A microbrowser simulator looks just like the wireless screen-it has push button keys like the phone or pager that it will be deployed on. Palm Inc., Phone.com, Nokia, Ericsson and others provide microbrowser simulators for their wireless devices

After the application has been developed, load testing, functional testing and monitoring of the application can be done with the microbrowser simulator. The simulator has a gateway to different WML sites. Plus, the simulator communicates from the PC through the WAP gateway-just like a real user-using binary WML. This enables you to test your application as though you were using the actual handheld device. Some application developers test their wireless applications only at the Web server connection and not at the WAP gateway. This is because the Web server connection is under their control, whereas the WAP gateway may be at U S West or Sprint. It is important, however, that you test at both of these connections to accurately determine the true end-user experience.

Results from testing the WAP gateway can vary due to fluctuations in traffic on the gateway. For example, you could test once and obtain a seven-second result, and then rerun the same test and obtain a 15-second result. Therefore, it's critical that you measure the application's true end-to-end response in order to pinpoint problem areas and correct performance issues.

Peak Usage will be higher

More cell phone users, and people are not as timid toward a phone as to a computer.

Users will not tolerate failed transactions

People will expect the same reliability as a TV or other “appliance”, not what has come to be accepted in the PC market.

Don't believe all of the hype:

CEO of Picofun AB, Swedish game company was about to show a crowd of reporters how a new online game, PicoFootball, worked on a WAP phone. When he tested the phone just 1- minutes before the news conference, he got a nasty jolt: He couldn't connect to the Web portal he needed. ----- Company was launching their WAP games and the service provide, Europolitan AB had a hard time keeping their WAP gateway up and running!!!

Another service dubbed “positioning” has proved even more disappointing for some. The idea is to allow a mobile user to request a list of restaurants or hotels close to where he or she is standing in a city. But when Swedish sales manager, Johan Brannmark recently tried the service in the center of Stockholm, the results were disappointing. A Swedish yellow pages for WAP phones -- a joint project between Sweden's traditional yellow pages supplier, GulaSidorna, and Swedish phone company Telia AB -- came up with several restaurants suggestions, but all were more than three blocks away. All the while, Mr Brannmark was standing on a sidewalk in front of a trendy eatery.

Because we are talking about using radio waves to transmit data, it is much easier to eavesdrop and hack into a wireless system, so there are certainly major areas of concern when it comes to security. I've listed the main ones here that companies are trying to address right now.

The encryption used in mobile communication links is based on security that has been proven vulnerable. This is where WTLS, or Wireless Transport Layer Security comes into play. It was derived from SSL, but it is much simpler and efficient. This secures the connection between the mobile device and the WAP gateway and once the data hits the WAP gateway, it changes to SSL (Secure Socket Layer) between the WAP gateway and the Web server. It uses PKI (Public Key infrastructure) so that WAP gateways and WAP clients can authenticate each other. WTLS is independent of any Bearer services.

PKI meets the 4 key requirements of electronic security (Confidentiality, Authentication, Integrity, and Non-repudiation) using cryptography, digital signatures, and digital certificates. Someone felt they were right. The WAP Forum will incorporate support for PKI security in the very next version of the specification, expected to be released Q3 of 2000. Support for PKI should help to boost confidence in the spec's suitability for online commerce and trading. The WAP Forum will continue developing in the area of security, however this will be a hot issue for a long time.

Before you even set up a lab with all of these combinations, you should be asking the question, what is it we should be testing. Are we concerning with cross browser and cross device compatibility. Are we committed only to one service provider's solution (i.e. Microsoft)?

2.3.3.2 Bearer Services

The bearer service is the wireless data link between the client and a server. Many different bearer services are possible: CDPD in the analog cellular system, SMS and GPRS in the GSM cellular system, and one-way (traditional) and two-way paging. Each one of these has its advantages and disadvantages in terms of maximum / typical throughput rates, round-trip delay times, and cost. Each client device must obviously have at least one bearer service and some client devices may have several, for example, with GSM phones.

Where is the data coming from?

With performance testing, the biggest issue is always the data. How do you retrieve data from rich databases, when you can only use (or display) a very limited subset of data. Will separate “light” versions of a database co-exist, or will only certain data be extracted just for mobile devices? What kind of overhead will pulling from a currently complex database and sending it to such a “thin” client will you see?

Additional places for bottlenecks:

In development, WML is more unforgiving than HTML and developers must comply with current standards. WAP gateways introduce another point of potential failure on the infrastructure side. What about false results from “location aware” application under load? For example, you are standing in front of 3 restaurants but none of them are on recommended eating list, but the ones 10 blocks away are. If this is because of high usage, you are toast.

More users

The total number of wireless subscribers in North America will more than double between 2000 and 2004, from about 89 million to 191 million, according to Ovum, an international consulting and research firm. In Europe, the growth rate is similar, from 162 million subscribers this year to 380 million by 2004, Ovum says. Growth for the installed base of mobile terminals is also substantial. In Europe, the number will increase from 129 million in 2000 to about 247 million in 2004. In North America, that figure will increase from 98 million to 194 million, Ovum says. With wireless applications, peak usage will be higher because there are more cell phone users than PC users. It will also be more unpredictable because network availability is generally less reliable. Users will be less tolerate of failed business processes when it concerns crucial transactions, like transferring money out of their bank account. Can we conclude that testing is even more critical?

As the market makers emerge, testing will be what separates the winners from the losers. This also means that IT departments may be deploying parallel web and wireless initiatives or totally redesigning existing infrastructure to meet the new type of traffic demands. All of this points back to job security for the testing department.

Content Compliance

This is the functional test of the content. This includes:

- HTTP MIME types
- Well-formed XML, and conformance to standards
- Validation of WML
- Broken links & system errors

Performance Testing

Confirm the application's performance across a number of different devices and gateways (the combinations listed earlier).

Usability

This includes the quality of the user experience, site navigation, structure, search capabilities, and general ease of use.

Consistency of language throughout site, readability of content, including spelling, correlation with existing web site, perceived speed of download of content, and handling of user errors (data validation).

Production Monitoring

It's important that an application be monitored on an on-going basis to ensure that users can access the application and that no interoperability issues have developed. This includes checking for bad links and adhering to changing standards in the industry.

Regression test per device – to assure different devices can handle the same content. Changes to the underlying code as well as dynamic content and transaction capabilities may cause interoperability problems — even after deployment. Obviously, this is ongoing.

Hopefully, you've learned a little bit about wireless technology and can walk away with the understanding that although it is not that different from the web, there are certain dependencies you should be aware of before testing it as if you would a web application.

We have seen where this technology is predicted to be the "next big thing" in the IT world. You should expect to start seeing more and more press coverage dedicated to it. It will be much faster to mature because it borrows so heavily from the web model. Once you understand the protocol and scripting language, you find it is not that much different than performing testing on web sites. On the other hand, you will need to learn the additional hardware (WAP Gateway, client hand sets), software (WML) and other testing considerations I've listed. Being prepared for this new technology through research and study is the best way to avoid a new world of frustration and test it correctly the first time.

Most important, the Mercury tool suite is designed to make your life easier as a tester, but won't solve the problem of not having QA processes in place already. In the wireless realm, the tools can help you get product out in a more timely way, but only if your standards are already set up in your QA shop.

