

Will WAP Deliver the Wireless Internet?

Neal Leavitt

With users increasingly adopting Internet-enabled cellular phones and other handheld devices, vendors are looking for platform-independent wireless technologies to help these devices effectively access Internet content and services, and communicate with each other.

Providing this access is particularly challenging for handheld devices because of their small screens, low memory and power, and differing platform technologies. It is also challenging for wireless networks because of their low bandwidth and high latencies. These limitations keep some older Internet protocols, such as HTML, from working efficiently and effectively for mobile Internet-based communications.

Now, however, proponents and many industry observers are touting WAP (the Wireless Application Protocol) as the technology that will become the standardized basis and future of the mobile Internet.

Before WAP, mobile users could access the Web via such technologies as the UP Browser, by Unwired Planet (now Phone.com), which ran only on AT&T Pocket-Net CDPD (cellular digital packet data) phones.

WAP, on the other hand, is designed to address small devices' technical limitations and work with a variety of wireless platforms. WAP offers a scalable, extensible protocol stack that handles security, the establishment of sessions, and other aspects of mobile communications.

The WAP Forum (<http://www.wapforum.org>)—a consortium of hard-



ware, software, and other wireless-industry vendors—claims that 95 percent of the world's handset manufacturers are committed to rolling out WAP-enabled devices over the next 12 to 24 months.

Vendors have already developed a number of WAP-based applications and devices. However, some observers say the number of devices is small relative to the protocol's hype, and they jokingly say WAP stands for "where are the phones?"

Meanwhile, widespread WAP adoption faces numerous obstacles, such as competing technologies. For example, NTT DoCoMo's iMode technology has more than 3.7 million users in Japan.

And WAP may face even stiffer competition from other sources, said Andrew Seybold, senior partner at the Andrew Seybold Group, a wireless and mobile computing consultancy.

For example, he said, "Microsoft is close to releasing a browser that will support both WAP and XML, to provide an easy transition from one standard to another."

Others question WAP's long-term use-

fulness, such as whether it will be scalable, will offer appealing content, or will be made obsolete by other technologies.

However, said WAP Forum CEO Scott Goldman, both WAP and the handheld devices themselves will improve and address these concerns. Meanwhile, he added, the protocol has already generated considerable support.

THE ROAD TO WAP

The phenomenal growth in wireless Web phones, personal digital assistants (PDAs), and other handheld devices has provided the momentum behind WAP. Datacomm Research estimates that 350 million of these devices will be shipped by 2003.

Wireless data subscribers are projected to increase 1,400 percent from 2000 to 2003, according to Cahners In-Stat Group, a market research firm.

Internet access via handheld devices was possible before WAP, but the technologies never took off commercially because they used proprietary technologies that didn't work across platforms.

Ericsson, Motorola, Nokia, and Phone.com launched the WAP Forum in December 1997. The forum currently has 335 members worldwide, including such major companies as AOL, AT&T Wireless Services, Hewlett-Packard, IBM, Intel, and Microsoft.

The WAP Forum released WAP 1.1 in June 1999 and ratified version 1.2 last November.

THE PROTOCOL

WAP was designed to solve some of the problems caused when small, low-powered devices on different platforms try to use low-bandwidth wireless network technology to access services or data-intensive content via the Internet.

For example, said Bob Egan, vice president and research director at the Gartner Group, an IT market research firm, "WAP has optimized ways of compressing text and making transactions over bandwidth-constrained networks."

For example, WAP uses binary transmission for greater data compression.

Also, said the WAP Forum's Goldman, WAP makes more efficient use of the available bandwidth. WAP removes graphics

and other Web site elements that are not part of the essential material, to reduce transmission overhead, he explained.

Meanwhile, WAP uses proxy technology to connect wireless technology with the Web, said Michael Luna, Phone.com's director of product-line strategy and chair of the WAP Forum's interoperability committee.

As shown in the figure on this page, the WAP proxy server consists of a gateway, encoders, and decoders. The gateway translates requests from the WAP protocol stack to the WWW stack, so they can be submitted to Web servers. Encoders and decoders translate WAP content into compact encoded formats that reduce the amount of data being sent over the low-bandwidth wireless network.

Wireless technology's bandwidth and latency constraints cannot support such longtime Internet standards as HTML, HTTP, IP, TCP, and TLS (transport layer security), which are inefficient over mobile networks.

For example, HTTP sends its headers in a text format, instead of a compressed binary format. Meanwhile, to work with HTTP and HTML, machines must have fast network connections, powerful processors, and large memories, elements not currently found in handheld devices.

Proponents say the WAP protocol stack addresses these challenges and, in many cases, optimizes protocols to function in a wireless environment.

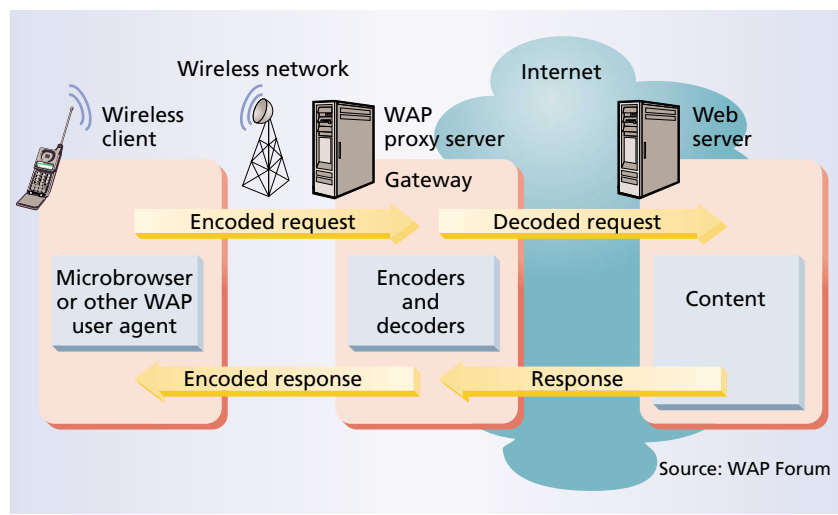
Wireless Transaction Protocol

WTP manages transactions by facilitating requests and responses between a user agent (such as a WAP microbrowser) and an application server for such activities as browsing and e-commerce transactions.

WTP works well in the low-bandwidth wireless environment, Luna said, because it requires the wireless device and the gateway to send each other relatively few packets to manage or maintain the connection.

Wireless Session Protocol

WSP provides applications with a consistent interface for both connection-oriented and connectionless session services. WSP lets client and server applications



A request from a wireless WAP-enabled client to a Web server for Internet-based content or services must first pass through a WAP proxy server. The proxy server translates the request from the WAP protocol stack to the WWW stack for use on the Internet. The proxy also handles the data encoding and decoding that lets the WAP client transmit and receive standard Internet-based information in a compact encoded format. This reduces the amount of data that is sent over the low-bandwidth wireless network.

establish and terminate reliable sessions, agree on common protocols to work with, and access HTTP functionality.

WSP also includes extensions that facilitate wireless transmissions. For example, WSP's compact binary headers reduce the overhead and number of transactions necessary to support session services.

Wireless Transport Layer Security

WTLS secures, authenticates, and encrypts data transmissions between the WAP gateway and mobile devices. To support mobile networks, WTLS was designed to be more efficient than TLS, which requires client and server to exchange many messages. In wireless networks, which frequently experience considerable latency, this requirement can greatly slow response time.

WAP systems translate WTLS data to TLS data for transmission over the Internet within the WAP gateway. Therefore, although WTLS doesn't provide end-to-end security, said the WAP Forum's Goldman, the chances of a problem are small because hackers can breach security only when sensitive data passes through the gateway.

WTLS thus helps provide the security necessary to conduct e-commerce on

handheld devices, according to Luna.

"In the context of today's early market," said the Gartner Group's Egan, "it's considered good enough, but it's not fool-proof."

Wireless Application Environment

The WAE's primary elements are WML (Wireless Markup Language) and WMLScript, a lightweight scripting language based on ECMAScript but modified for the wireless environment.

Application and Web-site developers use WML and WMLScript much as they use HTML and ECMAScript.

WML. WML has evolved from XML, HTML, and Phone.com's Handheld Device Markup Language. WML was designed for developing Web pages that can be easily rendered on wireless devices with small screens and no keyboards for navigation.

According to Phone.com's Luna, WML and its tags permit smaller, more flexible information displays than HTML and let users input commands without keyboards.

WML permits the scaling of displays for use on the two-line screens found in some small devices, as well as the larger screens found on smart phones.

Currently, if users want a Web site rendered properly on WAP-enabled devices, it must be written in WML or translated by a server that converts HTML to WML.

Meanwhile, because it is based on XML, WML is scalable and extensible. This is because WML, like XML but unlike earlier versions of HTML, lets users add new markup tags to meet changing needs.

The WAP Forum is working with the World Wide Web Consortium to ensure that WML and XHTML (the most recent version of HTML, reformulated as an XML application) will work together.

WMLScript. WMLScript is an ECMA-Script-based language for writing programs that work within the WAP environment's bandwidth, memory, and other limitations.

Designers dropped many of ECMA-Script's advanced features to make WMLScript smaller, easier to compile into bytecode, and easier to learn.

PLATFORM INDEPENDENCE

The Wireless Datagram Protocol (WDP) lets WAP support many network technologies, explained Luna.

WAP works with the major wireless network technologies used in different parts of the world, including CDMA (code-division multiple access), GSM (global system for mobile communication), and TDMA (time-division multiple access). WAP also supports the major operating systems used in handheld devices, including EPOC, JavaOS, PalmOS, and Windows CE.

When working with IP bearer services, Luna said, WDP functions just like the User Datagram Protocol. With non-IP bearer services, such as CDMA, he said, WDP performs the adaptation necessary to carry transmissions.

Goran Nilsson, technical director of EHPT (a Swedish joint software venture between Ericsson and Hewlett-Packard), said platform independence is critical to

WAP's long-term success.

"It's a way to merge the industry and get everyone to work together," Nilsson said. "There has to be a common denominator so all portable devices will be interoperable."

ADOPTION

Vendors have begun rolling out WAP-enabled applications and devices.

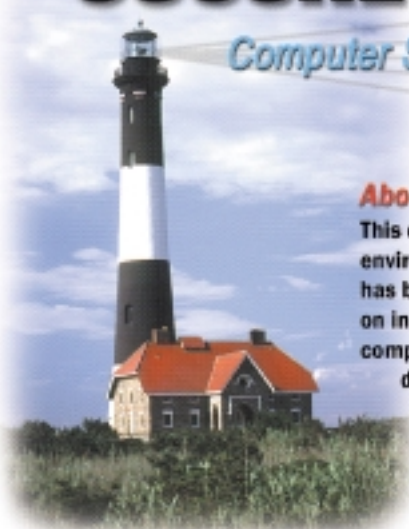
Craig Mathias, principal of Farpoint Group, a firm that provides advisory and systems-integration services for communications technologies, said WAP technology could well reach a mass market because the protocol is based on numerous existing Internet standards.

Also, he said, "Manufacturers of WAP-enabled devices are building what will be a huge installed base, which, by its very nature, dictates a de facto standard."

The browsing experience is not as rich with handheld devices as with PCs, and this disappointment could hurt long-term

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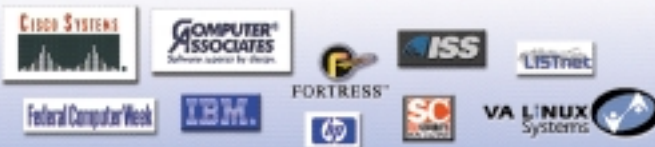
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adoption, he said. However, WAP will have many users, at least for a couple of years, until more mainstream protocols, like HTML and XML, can be used effectively with mobile devices.

But adoption will be triggered only in part by the technology, he said. According to Mathias, what will drive WAP are pricing, marketing, and merchandising issues.

WAP-enabled applications

Vendors are rolling out such WAP-enabled applications as browsers and corporate clients, as well as e-mail, calendar, and extranet programs.

Also, vendors are rolling out WAP-based e-commerce applications, particularly in Europe, where the use of GSM as a continent-wide wireless standard has led to faster overall wireless adoption than in the US, which uses several standards.

Deutsche Bank, Swiss Handelsbank, and some other European banks are starting to use WAP to give customers with

handheld devices real-time access to account information. And in some parts of Scandinavia, insurance companies are using WAP to let customers adjust coverage and handle other transactions.

Finland's Sonera Oy company has even rolled out a WAP-enabled soft-drink machine that lets users purchase beverages via WAP-enabled mobile telephones and charge purchases to their phone bill.

WAP-enabled devices

Several WAP-enabled devices are on the market. The first was Nokia's 7100 phone, released in November 1999. Ericsson and Motorola have also recently introduced WAP-enabled phones.

Although vendors have been slow to ship WAP-enabled devices, that may soon change.

For example, Skip Bryan, director of Ericsson's North American Cellular Terminals Group, said his company has delivered more than 50 WAP systems to op-

erators worldwide so they can perform trials in preparation for commercial services.

As shown in the figure on the next page, Phone.com predicts that a rapidly growing percentage of handsets will be WAP-enabled through 2003.

CONCERNS

Despite the investment that companies are beginning to make in WAP, there are concerns about the technology's usefulness and appeal.

For example, the text-based content that fits on small-screen WAP devices may not be very appealing to many users, said Seybold.

Furthermore, he said, because wireless network coverage is not as robust in the US as elsewhere, many US users may become frustrated trying to access the Web when they need information.

Jacob Christfort, chief technology officer of OracleMobile.com, Oracle's wireless-Internet-technology subsidiary, said

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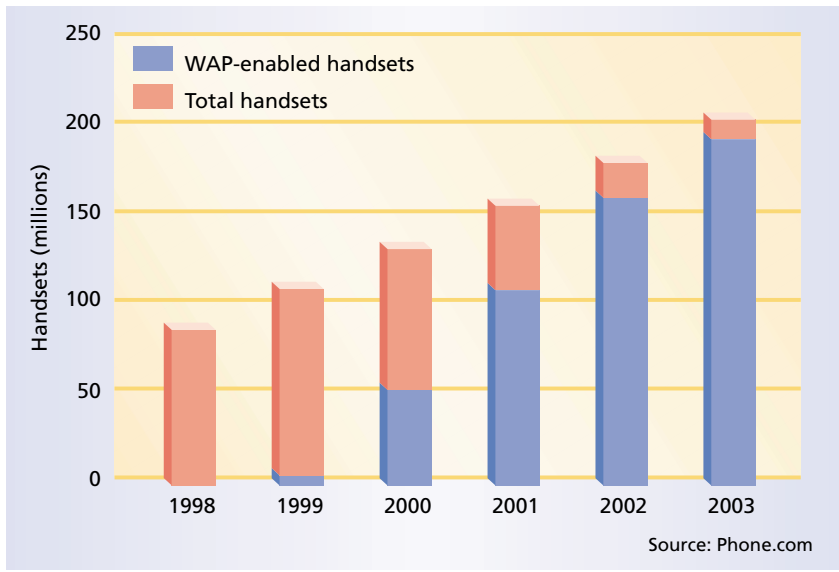
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Phone.com, a provider of software that enables the delivery of Internet-based services to wireless phones, predicts that an increasing percentage of all handsets will be WAP-enabled.

that while WAP helps mobile phones access the Internet, having to write Web sites in native WML is not a good approach. With this approach, Christfort said, organizations would have to maintain separate sites written in WML, as well as sites written in HTML.

However, said Roger Snyder, senior product marketing manager for Phone.com, “There are going to be more and more WAP-enabled devices, and writing WML content for them isn’t an issue. We have about 47,000 registered developers currently doing this.”

Nonetheless, WAP may have to compete in the marketplace with other technologies.

For example, Aether Software has released ScoutWeb, which dynamically converts existing Web content so it will work with the browser used by a requesting handheld client. ScoutWeb works with WML, as well as HTML, XML, and XHTML. It thus gives users an alternative to deploying WAP.

Meanwhile, Oracle has released Portal-to-Go, server software that lets any device connected to the Internet—including those that don’t use WAP—access databases and Internet applications. Portal-to-Go renders the applications device-independent by extracting the output, and then converting it to XML and subse-

quently to the markup language supported by the user’s device.

FUTURE

WAP 1.3 will be released within six months, according to the WAP Forum’s Goldman. “It will address interoperability testing and update security, graphics, and multimedia issues,” he said.

WAP 1.3 will also help increase e-commerce security by letting users navigate from the WAP gateway to e-commerce applications’ secure gateways.

Ultimately, said Iain Gillott, vice president of worldwide consumer and small-business telecommunications for IDC, a market research firm, WAP will support multimedia, potentially an important consideration for the technology’s future. “Video, in particular videophones, will be a major WAP multimedia application,” he said. “As bandwidth improves we’ll also see video e-mail devices from manufacturers like Nokia and Ericsson.”

Meanwhile, the WAP Forum is working on formal standardization of the protocol with several major standards bodies: the European Computer Manufacturers’ Association (ECMA), the European Telecommunications Standards Institute (ETSI), the Internet Engineering Task Force (IETF), the Telecommunications Industry Association (TIA), and the World

Wide Web Consortium.

The WAP Forum also plans to make its protocol work with the upcoming third-generation (3G) wireless networking standards that are expected to emerge in the next couple of years.

And to enable interoperability, the WAP Forum is working on compliance specifications and interoperability test suites for products.

According to the WAP Forum’s Goldman, manufacturers have agreed to test their products and services against a standardized test suite developed by the Open Group, an organization that promotes conformance to open standards through product testing and certification.

The Gartner Group’s Egan said WAP will be useful for about 24 months because it will serve only as a technical bridge.

Industry observers expect that within two years, developers will focus on 3G wireless technologies, which promise to offer mobile-network bandwidth up to 2 Mbits per second, which would eliminate many of handheld devices’ current performance limitations.

Added Seybold, “WAP will be a very short-lived technology and will be replaced by XML. Unlike WAP, XML will require no [proxy] server between the wireless user and the Internet.”

However, proponents say, WAP will still be useful because it was designed specifically for handheld devices, which will continue to have small screens, low power, and input restrictions. Meanwhile, Goldman said, WAP already uses WML, which is based on XML, and will support 3G wireless technologies.

Because of this, he said, “We’re confident that WAP will be the preeminent technology for mobile devices.” *

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