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“Success 4 WAP” White Paper

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www.Success4WAP.com

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1. INTRODUCTION

The Wireless Application Protocol (WAP) is a hot topic that has been widely hyped in the mobile industry and outside of it. WAP is simply a protocol- a standardized way that a mobile phone talks to a server installed in the mobile phone network.

WAP is hot for several reasons:

- It provides a standardized way of linking the Internet to mobile phones, thereby linking two of the hottest industries anywhere.
- Its founder members include the major wireless vendors of Nokia, Ericsson, Motorola and Openwave (formerly Phone.com)
- Mobile information services, a key application for WAP, have not been as successful as many network operators expected. WAP is seen as a way to rectify this situation.

WAP also has its detractors and controversies:

- It is very difficult to configure WAP phones for new WAP services, with 20 or so different parameters needing to be entered to gain access to a WAP service.
- Compared with the installed base of Short Message Service (SMS) compliant phones, the relative number of handsets supporting WAP is tiny.
- WAP is a protocol that runs on top of an underlying bearer. None of the existing GSM bearers for WAP- the Short Message Service (SMS), Unstructured Supplementary Services Data (USSD) and Circuit Switched Data (CSD) are optimized for WAP.
- There are many WAP Gateway vendors out there competing against each other with largely the same standardized product.
- Other protocols such as SIM Application Toolkit and Mobile Station Application Execution Environment (MexE) are respectively already widely supported or designed to supercede WAP.
- WAP services are expected to be expensive to use since the tendency is to be on-line for a long Circuit Switched Data (CSD) call as features such as interactivity and selection of more information are used by the end user. Without specific tariff initiatives, there are likely to be some surprised WAP users when they see their mobile phone bill for the first time after starting using WAP.

2. BACKGROUND

FORMATION

Motorola, Nokia, Ericsson and Openwave (formerly Phone.com) were the initial partners that teamed up nearly four years ago in mid 1997 to develop and deploy the Wireless Application Protocol (WAP). WAP is an attempt to define the standard for how content from the Internet is filtered for mobile communications. Content is now readily available on the Internet and WAP was designed as the (rather than one) way of making it easily available on mobile terminals.

The WAP Forum was formed after a US network operator Omnipoint issued a tender for the supply of mobile information services in early 1997. It received several responses from different suppliers using proprietary techniques for delivering the information such as Smart Messaging from Nokia and HDML from Openwave (formerly Phone.com). Omnipoint informed the tender responders that it would not accept a proprietary approach and recommended that that various vendors get together to explore defining a common standard. After all, there was not a great deal of difference between the different approaches, which could be combined and extended to form a powerful standard. These events were the initial stimulus behind the development of the Wireless Application Protocol, with Ericsson and Motorola joining Nokia and Openwave (formerly Phone.com) as the founder members of the WAP Forum.

PHILOSOPHY

The Wireless Application Protocol takes a client server approach. It incorporates a relatively simple microbrowser into the mobile phone, requiring only limited resources on the mobile phone. This makes WAP suitable for thin clients and early smart phones. WAP puts the intelligence in the WAP Gateways whilst adding just a microbrowser to the mobile phones themselves. Microbrowser-based services and applications reside temporarily on servers, not permanently in phones. The Wireless Application Protocol is aimed at turning a mass-market mobile phone into a “network-based smartphone”. As a representative from Openwave on the board of the WAP Forum commented “The philosophy behind Wireless Application Protocol’s approach is to utilize as few resources as possible on the handheld device and compensate for the constraints of the device by enriching the functionality of the network”.

The Wireless Application Protocol is envisaged as a comprehensive and scaleable protocol designed for use with:

- any mobile phone from those with a one line display to a smart phone,
- any existing or planned wireless service such as the Short Message Service, Circuit Switched Data, Unstructured Supplementary Services Data (USSD) and General Packet Radio Service (GPRS),

Indeed, the importance of WAP can be found in the fact that it provides an evolutionary path for application developers and network operators to offer their services on different network types, bearers and terminal capabilities. The design of the WAP standard separates the application elements from the bearer being used. This helps in the migration of some applications from SMS or Circuit Switched Data to GPRS for example.

- any mobile network standard such as Code Division Multiple Access (CDMA), Global System for Mobiles (GSM), or Universal Mobile Telephone System (UMTS). WAP has been designed to work with all cellular standards and is supported by major worldwide wireless leaders such as AT&T Wireless and NTT DoCoMo,

- multiple input terminals such as keypads, keyboards, touch-screens and styluses.

3. TECHNICAL INTRODUCTION

Please note that it is the purpose of this report to supplement the content of the WAP standards with context that allows readers to understand WAP's importance and related issues. As such, we will not be spending much time reproducing the published WAP standards that can be freely downloaded from the WAP Forum web site www.WAPforum.org by readers.

The Wireless Application Protocol embraces and extends the previously conceived and developed wireless data protocols. Openwave created a version of the standard HTML (HyperText Markup Language) Internet protocols designed specifically for effective and cost-effective information transfer across mobile networks. Wireless terminals incorporated an HDML (Handheld Device Markup Language) microbrowser, and Openwave Handheld Device Transport Protocol (HDTP) then linked the terminal to the UP.Link Server Suite which connected to the Internet or intranet where the information being requested resides. The Internet site content was tagged with HDML.

This technology was incorporated into WAP- and renamed using some of the many WAP-related acronyms such as WMLS, WTP and WSP. Someone with a WAP-compliant phone uses the in-built microbrowser to:

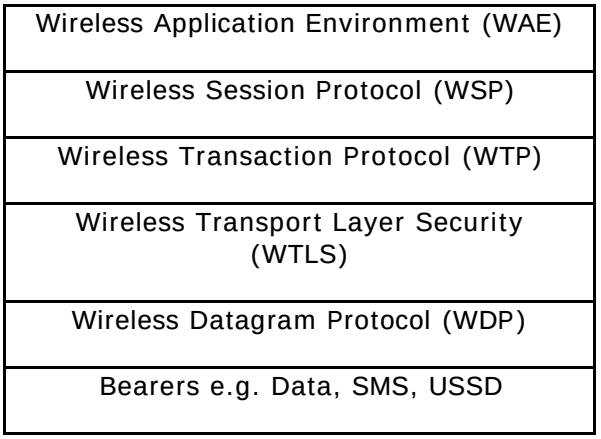
1. Make a request in WML (Wireless Markup Language), a language derived from HTML especially for wireless network characteristics.

2. This request is passed to a WAP Gateway that then retrieves the information from an Internet server either in standard HTML format or preferably directly prepared for wireless terminals using WML. If the content being retrieved is in HTML format, a filter in the WAP Gateway may try to translate it into WML. A WML scripting language is available to format data such as calendar entries and electronic business cards for direct incorporation into the client device.

3. The requested information is then sent from the WAP Gateway to the WAP client, using whatever mobile network bearer service is available and most appropriate.

4. WAP PROTOCOL STACK

WAP has a layered architecture as shown in the diagram below:



Let us take a look at each layer in the WAP protocol stack:

WIRELESS APPLICATION ENVIRONMENT

The WAE defines the user interface on the phone. The application development environment to facilitate the development of services that support multiple bearers. To achieve this, the WAE contains the Wireless Markup Language (WML), WMLScript- a scripting micro-language similar to JavaScript- and the Wireless Telephony Application (WTA). These are the tools that allow WAP-based applications to be developed.

WIRELESS SESSION PROTOCOL

A sandwich layer that links the WAE to two session services- one connection oriented operating above the Wireless Transaction Protocol and a connectionless service operating above the Wireless Datagram Protocol.

WIRELESS TRANSACTION PROTOCOL

Runs on top of a datagram service such as User Datagram Protocol (UDP); part of the standard suite of TCP/IP protocols, to provide a simplified protocol suitable for low bandwidth mobile stations. WTP offers three classes of transaction service: unreliable one way request, reliable one way request and reliable two way request respond. Interestingly, WTP supports Protocol Data Unit concatenation and delayed acknowledgement to help reduce the number of messages sent. This protocol therefore tries to optimize the user experience by providing the information that is needed when it is needed- it can be confusing to received confirmation of delivery messages when you

are expecting the information itself. By stringing several messages together, the end user may well be able to get a better feel more quickly for what information is being communicated.

WIRELESS TRANSPORT LAYER SECURITY

WTLS incorporates security features that are based upon the established Transport Layer Security (TLS) protocol standard. Includes data integrity checks, privacy on the WAP Gateway to client leg and authentication.

WIRELESS DATAGRAM PROTOCOL

Allows WAP to be bearer independent by adapting the transport layer of the underlying bearer. WDP presents a consistent data format to the higher layers of the WAP protocol stack thereby conferring the advantage of bearer independence to application developers.

5. OPTIMAL WAP BEARER

SHORT MESSAGE SERVICE

See www.mobileSMS.com from Mobile Streams for more information.

Given its limited length of 160 characters per short message, SMS may not be an adequate bearer for WAP because of the weight protocol of the protocol. The overhead of the WAP protocol that would be required to be transmitted in an SMS message would mean that even for the simplest of transactions several SMS messages may in fact have to be sent. This means that using SMS as a bearer can be a time consuming and expensive exercise.

CIRCUIT SWITCHED DATA

Most WAP based services use CSD as the underlying bearer. Since CSD historically had relatively few users currently, WAP has kickstarted usage of and traffic generated by this bearer.

However, CSD lacks immediacy- a dial up connection taking about 10 seconds is required to connect the WAP client to the WAP Gateway, and this is the best case scenario when there is an complete end to end digital call- in the case of the need for analog modem handshaking (because the WAP phone does not support V.110 the digital protocol, or the WAP Gateway does not have a digital direct connection such as ISDN into the mobile network), the connect time is increased to about 30 seconds.

UNSTRUCTURED SUPPLEMENTARY SERVICES DATA

See www.mobileUSSD.com from Mobile Streams for more information.

Unstructured Supplementary Services Data (USSD) is a means of transmitting information or instructions over a GSM network. USSD has some similarities with SMS since both use the GSM network's signaling path. Unlike SMS, USSD is not a store and forward service and is session-oriented such that when a user accesses a USSD service, a session is established and the radio connection stays open until the user, application, or time out releases it. This has more in common with Circuit Switched Data than SMS. USSD text messages can be up to 182 characters in length.

USSD has some advantages and disadvantages as a tool for deploying services on mobile networks:

- Turnaround response times for interactive applications are shorter for USSD than SMS because of the session-based feature of USSD, and because it is NOT a store and forward service. According to Nokia, USSD can be up to seven times faster than SMS to carry out the same two-way transaction.

- Users do not need to access any particular phone menu to access services with USSD- they can enter the Unstructured Supplementary Services Data (USSD) command direct from the initial mobile phone screen.

- Because USSD commands are routed back to the home mobile network's Home Location Register (HLR), services based on USSD work just as well and in exactly the same way when users are roaming.

- Unstructured Supplementary Services Data (USSD) works on all existing GSM mobile phones.

- Both SIM Application Toolkit and the Wireless Application Protocol support USSD.

- USSD Stage 2 has been incorporated into the GSM standard. Whereas USSD was previously a one way bearer useful for administrative purposes such as service access, Stage 2 is more advanced and interactive. By sending in a USSD2 command, the user can receive an information services menu. As such, USSD Stage 2 provides WAP-like features on EXISTING phones.

- USSD strings are typically complicated for the user to remember, involving the use of the "*" and "#" characters to denote the start and finish of the USSD string. However, USSD) strings for regularly used services can be stored in the phonebook, reducing the need to remember and reenter them.

As such, USSD could be an ideal bearer for some WAP applications on GSM networks.

GENERAL PACKET RADIO SERVICE

See www.mobileGPRS.com from Mobile Streams for more information.

The General Packet Radio Service (GPRS) is a new packet-based bearer that has been introduced on many GSM and TDMA mobile networks from the year 2000 onwards. It is an exciting new bearer because it is immediate (there is no dial up connection), relatively fast (up to 172 kbps in the very best theoretical extreme) and supports virtual connectivity, allowing relevant information to be sent from the network as and when it is generated.

Since most new WAP enabled phones will also support the General Packet Radio Service, WAP and GPRS could well be synergistic and be used widely together. For the kinds of interactive, menu based information exchanges that WAP anticipates, Circuit Switched Data is not immediate enough because of the need to set up a call. SMS on the other hand is immediate but is ALWAYS store and forward, such that even when a subscriber has just requested information from their microbrowser, the SMS Center resources are

used in the information transfer. As such, GPRS and WAP are ideal bearers for each other.

Additionally, WAP incorporates two different connection modes- WSP connection mode or WSP connectionless protocol. This is very similar to the two GPRS Point to Point services- connection oriented and connection less.

WAP certainly will be important for the development of GPRS-based applications. Because the bearer level is separated from the application layer in the WAP protocol stack, WAP provides the ideal and defined and standardized means to port the same application to different bearers. As such, many application developers will use WAP to facilitate the migration of their applications across bearers once GPRS based WAP protocols are supported.

6. WAP DEVELOPMENT ISSUES

WAP version 1.2 may be the first version of the protocol that is actually workable in terms of delivering easy to use and innovative non-voice mobile services. It will support Push services (proactive delivery of information from a WAP Gateway to a WAP terminal), User Profiles, WDP Tunneling, WMLscript, CryptoLibrary, Wireless Telephony Application, Wireless Application Environment enhancements and other features. There are several non-standardized or unresolved issues relating to WAP that application developers should be aware of:

LACK OF COOKIES FOR SESSION MANAGEMENT

There are no "cookies" for session management, i.e. to hold the session together. Cookies are used on the fixed Internet to identify the web browser and thereby assist in providing customized and streamlined services. Instead, some WAP applications use indexes in the URL as an alternative.

The cookie information is transmitted via HTTP headers. Because WAP WSP is based on HTTP headers, it should be possible to transmit cookie information to the clients. The problem may be the clients itself, which may currently not support the handling of cookie HTTP header information or to save this information to a persistent storage in the mobile phone.

PREMATURE ENCRYPTION ENDPOINT

The Wireless Transport Layer Security defines encryption between the Mobile Station and the WAP Gateway. The "endpoint" of the encrypted WTLS data is the WAP Gateway proxy server. To have a secure connection to a content host (e.g. banking server) the Gateway proxy server has to establish secure (https) connections to this hosts. In this case the proxy server has access to the decrypted data received via WTLS from the mobile station or from the content host via https.

SMALL DOWNLOADABLE UNIT SIZE

WAP incorporates no compression techniques for the textual content, although the WML markup commands are compressed. Additionally, the "deck"- the smallest unit of downloadable information in Wireless MarkUp Language- is limited to a maximum of 1400 bytes. This means that applications need to be specifically designed to be very code efficient by using templates and variables and keeping information on the server and using the cache on the phone.

WML byte code converting defines a (maybe inefficient) compression technique by string tables. With this technique duplicate strings in the WMLC bytecode are avoided. This reduces the size of the data to transfer to the mobile client. The WSP SDU size of 1400 bytes is a default value. An increased size may be negotiated by a mobile client within

the WSP capabilities. The WAP transport layer (WTP) is able to handle greater SDU sizes than 1400 too, by using SAR (Segmentation and Re-assembly).

Clearly, as the WAP specifications evolve, some of these issues will be resolved. However, programmers need to be aware of them when they commence WAP application design.

7. APPLICATIONS

WAP is being used to develop enhanced forms of existing applications and new versions of today's applications. Existing mobile data software and hardware suppliers are adding WAP support to their offering, either by developing their own WAP interface or more usually partnering with one of the WAP Gateway suppliers. WAP is also given a significant impetus for new players to add mobile as a new distribution channel for their existing products and services- for example, CNN and Nokia teamed up to offer CNN Mobile and Reuters and Ericsson teamed up to provide Reuters Wireless Services. The Wireless Application Protocol will allow customers to easily reply to incoming information on the phone by allowing new menus to access mobile services. This is part of the business case for network operators- by making the value-added services more easily to reply to and request (using menus instead of keywords, for example), WAP can help generate additional traffic on the network and therefore revenue.

Previously, application developers wrote proprietary software applications and had to port that application to different network types and bearers within the same platform. By separating the bearer from the application, WAP facilitates easy migration of applications between networks and bearers. As such, WAP is similar to Java in that it simplifies application development. This reduces the cost of wireless application development and therefore encourages entry to the mobile industry by software developers.

Corporate applications that are being enhanced and enabled with a WAP interface include:

Job Dispatch
Remote Point Of Sale
Customer Service
Remote Monitoring Such As Meter Reading
Vehicle Positioning
Corporate Email
Remote LAN Access
File Transfer
Web Browsing
Document Sharing/ Collaborative Working
Audio
Still Images
Moving Images
Home Automation

Consumer Applications that are being enhanced and enabled with a WAP interface include:

Simple Person to Person Messaging
Voice and Fax Mail Notifications
Unified Messaging
Internet Email
Prepayment
Ringtones
Mobile Commerce
Affinity Programs
Mobile Banking
Chat
Information Services

These applications are described in the “Yes 2 GPRS” book from Mobile Streams (www.mobileGPRS.com).

8. SUMMARY

The Wireless Application Protocol (WAP) is an important development in the wireless industry because of its attempt to develop an open standard for wireless protocols, independent of vendor and airlink.

This guide is a cut down version of a 190 page 495 US dollar report called “Success 4 WAP”, published by Mobile Streams in January 2001. The full report contains detailed profiles of the WAP Gateway vendors, other wireless protocols, plus case studies from around the world. To order this or “Success 4 SMS” or “Yes 2 GPRS”, contact Mobile Streams by any of the methods listed below:

Internet site: http://www.Success4WAP.com

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ALSO PUBLISHED BY MOBILE STREAMS

SUCCESS 4 SMS – SIMON BUCKINGHAM

Published: January 2001 (370 A4 pages)

"Success 4 SMS" is the third edition of Mobile Streams' renowned SMS report series, to be published. The intention of this report is to show how to maximize the use of, and therefore the revenue from, the Short Message Service. "Success 4 SMS" explains and interprets both the existing and future aspects of SMS by providing both an explanation of these developments and analysis to help interpret them. The idea is to identify the critical success factors for Service – now and in the future.

For more information visit: http://www.mobileSMS.com
Price: 495$US
ISBN: 1929105231

Yes 2 GPRS – Simon Buckingham

Published: August 2000 (218 A4 pages)

This report shows how to make mobile data a success by maximizing the use of, and therefore the revenue from, the General Packet Radio Service (GPRS). Education is the principle means of achieving this objective- by providing the first and only single source for accurate and comprehensive information about the development and deployment of GPRS around the world. "YES 2 GPRS" explains and interprets both the existing and future aspects of GPRS. It provides both an explanation of these developments, and analysis to help interpret them. The idea is to identify the critical success factors for the General Packet Radio Service- now and in the future

For more information visit: http://www.mobileGPRS.com
Price: 495$US
ISBN: 1929105258

Data on Prepaid – Gerald T. Christensen

Published: August 2000 (370 A4 pages)

Written by Mobile Streams' Prepaid expert, Gerry Christensen, this 131 page report has been designed to help product and service providers and those investing in systems/solutions to make more informed business decisions.

For more information visit: http://www.mobilePREPAY.com
Price: 250$US
ISBN: 1929105231

Success 4 WAP – Simon Buckingham
Published: January 2001 (190 A4 pages)

The Wireless Application Protocol (WAP) is a hot topic that has been widely hyped in the mobile industry and outside of it. Mobile Streams originally produced its first WAP book, “Data on WAP”, in July 1999. Due to rapid changes and developments this book was reissued in December 1999 before being reissued as "Yes 2 WAP" in May 2000.

For more information visit: http://www.yes2WAP.com
Price: 495$US
ISBN: 1929105215

Yes 2 3G – Simon Buckingham
Published: February 2001 (245 A4 pages)

"Data on 3G" presents an optimistic bok at tremendously exciting possibilities that Third Generation/ UMTS technologies and applications enable. Timescales, profiles of all the major infrastructure vendors including the Japanese vendors, every mobile multimedia application, "At home with your futurephone"- mobile communications in the next few years, 3G Talking Points, all the 3G contracts awarded, the standards, handset alliances and partnership opportunities and much, much more are included in this report.

For more information visit: http://www.mobile3G.com
Price: 495$US
ISBN: 1929105150

Mobile Positioning – Stephen M Dye and Dr Frank Baylin
Published: November 1999 (273 A4 pages)

"Mobile Positioning" is a book about mobile positioning systems- in particular, the Global Positioning System (GPS), non-GPS location techniques and Cell Broadcast. Although the book focuses primarily on the Global Positioning System (GPS), appendixes cover other non-GPS location schemes and Cell Broadcast in considerable detail.

For more information visit: http://www.MobilePositioning.com
Price: 250$US
ISBN: 1929105134

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