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Wireless Application Protocol (WAP) Technology For Improved Communication And Internet Access

F.K. Opara* and J.N. Chukwu
Department of Electrical and Electronic Engineering, Federal University Technology, Owerri, Nigeria.
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Abstract

The world of wireless telecommunication is rapidly evolving. New technologies which promise to deliver better and faster services are continually being developed. This paper presents the wireless Application Protocol (WAP) technology, as one of the emerging broadband technologies, designed to provide high speed wireless, internet and data network access over a wide area. WAP is an enabling technology, which, through the use of a proxy infrastructure, bridges the gap between the mobile world and the Internet. It is mostly used to provide Internet access to wireless devices such as cell phones and Personal Digital Assistants (PDAs), scaling through the obvious limitation posed by these handheld devices. The paper therefore considers the challenges of wireless Internet access, and then, outlines how the WAP specification addresses these limitations. It further suggests how the technology can be more effectively deployed to deliver the multitude of emerging wireless Internet services.

Keywords: Personal Digital Assistants, TCP/IP, HTML Java Script, XHTML, WAP Micro Browser.

1.0 Introduction

The Internet has gained prominence in every computer user's life. Its applications are found in nearly every field, ranging from communication, information, entertainment, education to e-commerce. Initially, Internet connectivity was achieved using the dial-up modem, which offered a maximum data transmission speed of only 56kilobits per second (kbps). However, with the Internet growing at exponential rates, and demanding higher transmission speeds, the broadband technology was subsequently introduced. Broadband is a general term used to describe any high speed Internet access (Rutter, 2009) having a minimum data transmission speed of 200 kbps. Broadband connection therefore enables faster and more efficient communication and Internet access. Broadband Internet access can be wired (fixed line), or wireless (mobile). Wireless Internet provides fast Internet access "on the go" for services such as e-mail and instant messaging, using mobile devices like cell phones and personal Digital Assistants (PDAs). The proliferation of Internet-enabled phones necessitated the introduction of the wireless Application Protocol (WAP), as the worldwide standard for providing Internet communication for wireless devices. WAP provides users with fast, convenient, and efficient access to Internet services through their mobile devices. WAP may have problems, but it will continue to be useful because it was designed specifically for handheld devices, which will always have small screens, low power and input restrictions.

2.0 Overview Of Wap Technology

Wireless Application Protocols (WAP) is a broad-band wireless technology developed for providing Internet communications and advanced telephony services on mobile phones, PDAs, and other wireless terminal. It is simply a protocol (techalone.Blogspot.com, 2009), and therefore defines the set of rules, which dictates how wireless devices like mobile phone can access the Internet. Internet access via handheld devices was possible before WAP, but the technologies never took off commercially because they used proprietary technology that did not work across platforms. The WAP forum, was originally founded by Ericsson, Motorola, Nokia and Phone.com in December 1997, and after the release of the WAP1.0 specification in April 1998, became open to all. By encouraging full industry participation and closely aligning the WAP architecture with the Internet and the web, the WAP forum has succeeded in developing a standard that scales across a wide range of wireless devices and network. As a solution,

* Corresponding Author's e-mail: kefelop@yahoo.com

WAP compresses text and makes more efficient use of the available bandwidth.

3.0 Key Features Of Wap

The WAP specifically evolves continually, and in such a way as to accommodate changes in market requirements and improvements in network devices and new technologies. WAP2.0 released in 2002 (Bruce, 2002), unlike previous versions, provides support for standard Internet communications protocols such as Internet Protocol (IP), Transmission Control Protocol (TCP), and Hyper Text Transfer Protocol (HTTP), as well as richer application environment, which enables delivery of interaction services to wireless devices. Table 1, presents the key feature of WAP 1.0 and WAP 2.0 specifications.

3.1 The WAP Model

The WAP model closely resembles the Internet model, except that a WAP proxy/ Gateway is placed between the mobile network and the Internet content servers. In the Internet model, illustrated in figure1, a www client requests a resource stored on a web server by identifying it using unique Uniform Resource Locator (URL). Standard communication Protocol like HTTP and Transmission Control Protocol/ Internet Protocol (TCP/IP) manage these requests and transfer of data between the two ends. These Internet Protocols, however, require large amounts of data to be sent which presents a major challenge in bandwidth constrained mobile systems.

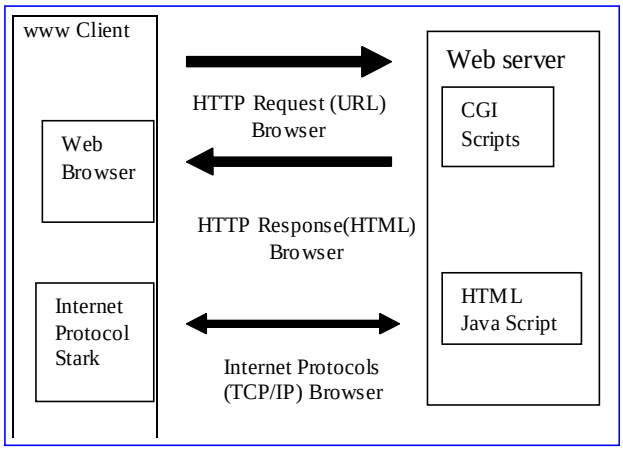

Figure 1: The Internet Model

Table 1:Key Feature Of Wap Specifications

FEATURES	DESCRIPTION	
	WAP 1.0	**WAP 2.0**
Programming Model	Uses the standard Web architecture, in addition to a WAP proxy, to provide the pull model, where the client requests contents from the server.	Uses an optional proxy model, and equally incorporates a push model, where a server can proactively send content to the client
Protocol Stack	The protocols do not provide support for internet Protocols such as IP,TCP, and HTTP.	Provides support for Internet Protocols when IP connectivity is available to the mobile device.
Markup Language	Uses the Wireless Markup Language (WML), which is based on the eXtensible Markup Language (XML).	Enable enhanced functionality by adopting eXtensible HyperText Markup Language (XHTML), for its markup language, XHTML Mobile Profile (XHTMLMP)
Micro Browser	Defines a standard micro browser optimized to work in a wireless environment.	Support the use of XHTML based browsers for cell phone, enabling the creation of a single dynamic interface that can be used for both fixed and mobile browsers.
WML Script	Client – side scripting language for WML, which is based on ECMA Script.	Improves efficiency before by enabling the compilation of WML Script before the gateway sends the content to the device.

The WAP model, shown in Figure 2, incorporates a proxy, is essentially considered an extension of the Internet model. The WAP proxy/ Gateway is the entity that bridges the gap between the wireless domain and the Internet. 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. The proxy receives the WAP request using the binary WAP communication protocols, which reduce the amount of data that is sent over the low bandwidth wireless network. The proxy equally translates these requests from the WAP binary protocols to the text based WWW protocols and forwards the translated requests to the content servers using the TCP/IP network protocols. The WAP proxy then receives the HTTP response via TCP/IP, and then reformats it back to the binary WAP protocols. The WAP proxy finally sends the reformatted response to the WAP client via the Wireless Datagram Protocol(WDP).

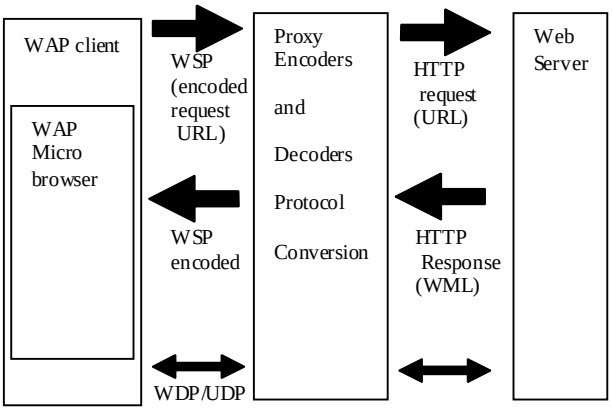

Figure 2: WAP Communications Model

3.2 Wap Protocol Stack Architecture

The Wireless Application Protocol (WAP), is designed in a fashion similar to the design of the TCP/IP protocol stack. A list of the legacy Protocol Layers is given as follows:-

i. **Application Layer:** Wireless Application Environment (WAE),
ii. **Session Layer:** Wireless Session Protocol (WSP)
iii. **Transaction Layer:** Wireless Transaction Protocol (WTP)
iv. **Security Layer:** Wireless Transport Layer Security (WTLS)
v. **Transport Layer:** Wireless Datagram Protocol (WDP)

3.3 Wap Key Solutions

The WAP specification addresses the challenges of wireless Internet access by providing the following solutions:(Johan, Bruce and Peter, 2009)

i. It defines a powerful and functional user interface model that is appropriate for handheld devices.
ii. It uses smart web Proxies to connect mobile networks to the Internet.
iii. The WAP Protocol Stack optimizes standard Web protocols such as HTTP, for use under the low bandwidth, high latency conditions often found in wireless networks.
iv. The plain text header of HTTP are translated into binary codes that significantly reduce the amount of data that must be transmitted over the air interface.
v. The use of proxy technology reduces the processing load at the handheld device.

4.0 Comparison Of Wireless Technologies

Even though WAP technology has successfully improved Internet access through the use of mobile devices, there are still concerns about its continued usefulness and appeals. The greater success enjoyed by competing technologies such as the i-mode diminishes the worldwide dominance of WAP technology. The i-mode definitely offers more affordable access rates, more robust content, and higher connection speed (Schaumann, 2000).However, WAP still has its good points. A comparison of the two technologies is presented in table 2.

5.0 Improving WAP For Better Internet Access

The two speed measures for Internet connections are bandwidth and latency. Bandwidth is how much data can be transferred at a given period of time. While latency is how long it takes for the data to be transferred. For efficient connectivity, high bandwidth and low latency are therefore desirable. The deployment of third Generation (3G) wireless system with WAP 2.0 allowed much higher capacity and data rates, than was possible with the previous versions of the WAP standard.

As bandwidth increases, however, the handsets power consumption equally increases. Much as

Table2: Comparison of Wireless Technologies

	WAP	i-mod
Definition	Wireless Application protocol	Information mode
Developer	Developed by Wireless forum	Developed by NTTDoCoMo Japan
IP Protocol used	TCP/IP	WDP,WTP,WCMP.
Markup Language	WML/HTML	Compact HTML (cHTML)
Billing	Based on time of being "on line"	Based on amount of information Being downloaded
Compatibility with HTML	Incorporated in WAP 2.0	Very compatible
No of sites	Fewer WAP accessible sites.	Large, including unofficial sites
Access Rate	Lower, between 40kbps - 80kbps	Higher, between 172.2kbps – 2Mbps, Retrieving Web content is much easier.
Connectivity	Average connection speed	Higher connection speed ,and \constantly
Status	Open market standard	Japanese proprietary, closed standard
Device capabilities	1) Support WAP browser 2) Display only Text	Display information from CHTML. Display multi-colour images
Support	Navigation between Layer	Navigation through hyper links
Architectures Gateway	Non – Transparent bridging Gateway	Utilizes overlay Packet Network hence, direct link communications.

higher bandwidth is required for better services, the power of a handset will always be limited by battery capacity and size. Apart from using simple Central Processing Units (CPUs) that reduce the processing load at the handheld device, the solution could also lie in deploying the WAP technology with access technologies such as the World Wide Inter Operability for Microwave Access, WiMAX, which permits higher data rates and an efficient use of bandwidth. This will improve both the access rate and transfer speed of WAP, bringing it at par with the i-mode.

6.0 Conclusion

This paper has presented an overview of the WAP technology, WAP is the standard that makes mobile Internet access possible. Mobile user can now have access Internet at any time, and in any place. Backed by 95 percent of the companies behind the global handset market, and the huge development potential of WAP, its future indeed looks bright. Despite the stiff completion posed by other emerging technologies such as the i-mode, WAP still has the advantage of being an open and independent standard. It is therefore hoped that the WAP technology will continually evolve to provide mobile Internet access at a more affordable rate, increasing the number of users that can connect to the Internet.

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