Mobile Based Attendance System in Distributed LAN Server

Ratnesh Prasad Srivastava[1], Hardwari Lal Mandoria[2], and Rajesh Nautiyal

[1] Department of Information Technology College of Technology, GBPUAT Pantnagar. 263145, India
write2ratnesh@gmail.com
[2] UniversityĎepartment of Information Technology College of Technology, GBPUAT Pantnagar. 263145, India
drmandoria@gmail.com

Abstract. With recent advancement in mobile communication, there has been a rise in the number of applications for mobile and its users are also continuously growing throughout the universe. Most of the applications developed, are for en-tertainment and internet. Apart from this many of the utilities have been devel-oped to make handing of mobile devices easy. Numbers of people using mobiles and wireless devices are growing rapidly, but still mobile application market isn't growing at the expected rate. Number of people having mobile are far more than people having computer or laptop. And if we provide application for mobile that will assist people in their day-to-day routine and official work, it can become a po-tential area of development. Considering the ubiquity wireless devices and their ability to be used anywhere and at any time, This paper presents a platform for the intercommunication between applications and load balancing access of dis-tributed LAN servers with implementation issues of application development.

Keywords: Kannel, WAP, WAP Gateway, WAP Services.

1 Introduction

Information is one of the key factors to facilitate the economic growth of a country. Information is a base for performing different activities in sev-eral disciplines. For instance, information regarding the demand of a par-ticular good is essential for a producer to decide when and where to sell the product. As a result of which the producer would be able to maximize profit.

And leads towards a better economic growth of a countryInternet is one way of retrieving information from different areas through the web. Most of the technology developed for the Internet has been designed for desktop and larger computers supporting medium to high bandwidth connectivity on reliable data networks. In recent times, technologies that enable handheld wireless devices to retrieve information have been developed. However, these handheld wireless

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devices present a more constrained computing environment compared to desktop computers. In addition, providing Internet and WWW (World Wide Web) services on a wireless data network presents many challenges.

And at any time is an interest of everybody, because getting accurate information from anywhere on time is an important element for making a better decision.

Retrieving information through wireless terminal on mobile creates new business opportunities for corporations by providing additional channel for the existing services. The possibility of this additional service is that it can reach cus-tomers 24 hours a day wherever they are. Since mobile services are based on open protocol, it provides the same technology to all vendors regardless of the network system. This common standard offers a better market scale that encourages manufacturers, application developers and content providers to in-vest in developing products that are compatible with mobile. At the present time, accessing web content from anywhere and at any time using mobile devices is possible using WAP technology.

It is thus possible to reliably and efficiently communicate data over wireless WANs (Wide Area Net-works). Retrieval of information using local language is also another critical is-sue for facilitating different tasks for those who work in their local languages. Thanks to the Unicode and other standards, developing multilingual WAP services and getting WAP enabled mobile terminals that support multilingual character set is no more a problem.

This paper is organized as followed: section II introduce the review of related work , introduces the brief description of about the WAP services, section IV introduces the concept of WAP Gateway, section and languages in support for designing the project. Section III introduces conclusion and future work.

2 Review of Related Work

In this paper, we introduce WAP in general terms, and explain the role of the gateway in WAP, outlining their duties and features. It also explains why the Kannel project was started in the first place, and why it is open source.

2.1 WAP Technology

The wireless communication and the Internet are the rapidly growing industries that are gaining more and more customers every day. The WAP intention is to combine these two markets and met the new demands in the field. This and other reasons initiate some of the largest vendors to unite and create the WAP Forum, the standardizing organization of the WAP.

WAP specifies an application framework and network protocols for wireless devices such as mobile phones, pagers and PDA (Personal Digital Assistants).

WAP's specifications extend existing mobile networking technologies and some Internet technologies such as XML (extensible Markup Language) and scripting content formats.

The WAP platform is an open specification that addresses wireless net-work characteristics by adapting existing network technologies (and intro-ducing new ones where appropriate) to the special requirements of hand-held wireless devices . Therefore, WAP intends to standardize the way wire-less devices (mobile phones, PDA, and so forth) access Internet data and ser-vices. WAP's reuse of existing Internet protocols will ease the development of WAP services for Java and other Web developers.

Facilitating the delivery of Internet data to wireless devices will certainly lead to the introduction of new technologies. Wireless handheld devices preset a more constrained computing environment and platforms, compared to desktop computers which most of the Internet technology was devel- oped for. The handheld devices tend to have less powerful CPU's, less memory, very restricted power consumption, smaller and variant displays, phone keypads etc. Furthermore, the wireless networks present additional constraints as communication infrastructures. They have less bandwidth, more latency and less connection stability and unpredictable availability. WAP intends to overcome these difficulties by being interoperable, have scalable quality of service, efficient in the mobile network resources, reliable and se-cure.

WAP allows carriers to strengthen their service offerings by providing subscribers with the information they want and need while on the move. Infrastructure vendors will deliver the supporting network equipment. Application developers and content providers delivering the value added services are contributing to the WAP specification. Enabling information access from handheld devices requires a deep understanding of both technical and market issues that are unique to the wireless environment. The WAP specification was developed by the industry's best minds to address these is-sues.

Nowadays web pages are browsed on mobile terminals using the WAP. Because, WAP is a standardized way for delivering Internet data over wireless networks and capable of addressing the unique characteristics of mobile terminals and wireless networks[1].

2.2 WAP Architecture

The WAP standard defines two essential elements: an end-to-end applica-tion protocol and an application environment based on a browser. The application protocol is a communication protocol stack that is embedded in each WAP-enabled wireless device (also known as the user agent). The server side implements the other end of the protocol, which is capable of communicating with any WAP client. The server side is known as a WAP gate-way and routes requests from the client to an HTTP (Hyper Text Transfer Protocol) (or Web) server. The WAP gateway can be located either in an Operator premises (Figure 1) or in WAP application provider premises with the web server (Figure 2). Figure 3 illustrates an example structure of a WAP network. In the WAP net-work the client communicates with the WAP gateway in the wireless net-work. The WAP gateway translates WAP requests to WWW requests, so the WAP client is able

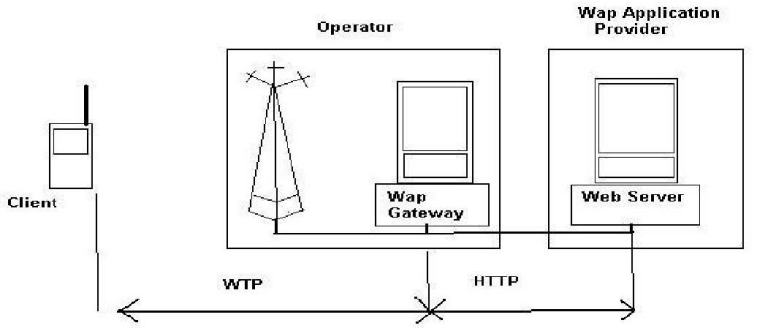

Fig. 1. Gateway equipment in the operator premises

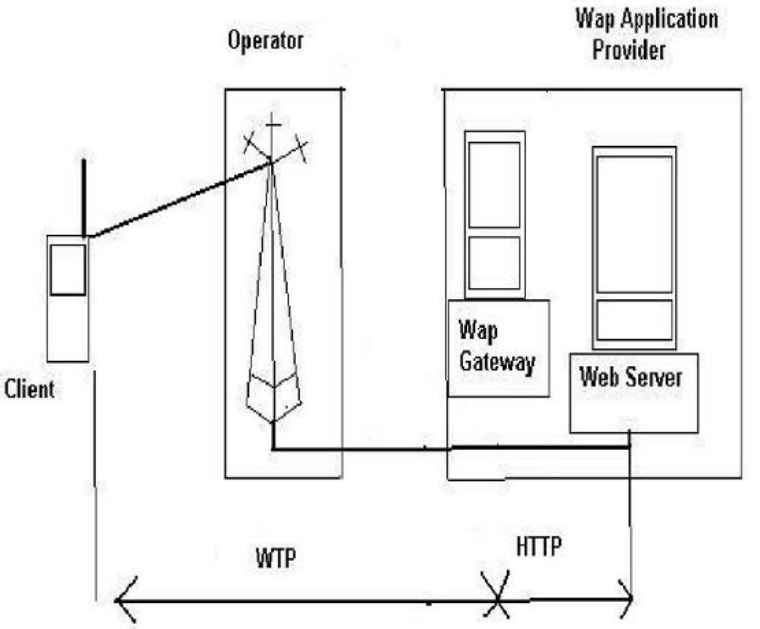

Fig. 2. WAP Gateway in the WAP application provider premises

to submit requests to the Web server. Also, the WAP gate-way translates Web responses into WAP responses or a format understood by the WAP client.

The wireless application environment provides WAP micro browser for interaction between WAP (web applications) and wireless devices. This browser relies on WAP Markup languages such as WML (Wireless Markup Language), WML Script and XHTML MP (Extensible Hypertext Markup Language Mobile Profile).

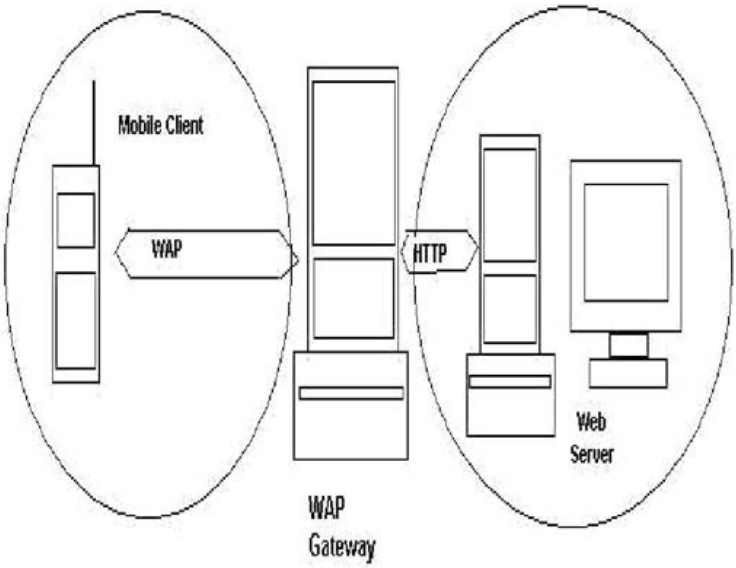

Fig. 3. The WAP network structure

2.3 WAP Programming Model

The WAP programming model is similar to the Web programming model with matching extensions, but it accommodates the characteristics of the wireless environment. The WAP programming model is based heavily on the Web programming model. But how does the WAP gateway work with HTML (Hyper Text Markup Language)? In some cases, the data services or content located on the Web server is HTML-based. Some WAP gateways could be made to convert HTML pages into a format that can bedisplayed on wireless devices. Be- cause HTML was not really designed for small screens, the WAP protocol de-fines its own markup language.

WML, WML Script, and XHTML MP are the languages that are specifically de-signed to develop WAP applications for Mobile devices. These languages ad-here to the XML standard and are designed to enable powerful applica-tions within the constraints of handheld devices . In most cases, the actual application or other content located on the Web server will be native WAP contents created with WML (XHTML MP) or generated dynamically usingWML Script, Java Servlets or JSP (Java Server Page), or other server side programming languages. WML is an XML-based markup language that was designed especially to present WAP content on a wireless terminal. WML can preserve the content of variables between different WML pages. The basic unit of WML is the card that specifies a single interaction between the user and the user agent.

Multiple cards are grouped together in decks, which is the top most element of a WML file. When the user agent receives a deck, it activates only the first

card in the deck. There are no functions to check the validity of user input or to generate messages and dialog boxes locally in using WML. Therefore, to overcome this limitation, WML Script was developed.

WML Script, which is based on ECMA Script (the standard for java script), is a language that can be used to provide programmed functionality to WAP applications. It was defined to enable the execution of scripts on WAP devices. The goal of using WML Script is to reduce the number of turn around between the client and the server. It is part of the WAP specification, and it can be used to add script support to the client. Its difference from ECMA Script is that it is compiled into byte code before it is sent to the client. The main reason for this is to cope up with the narrowband communication chan nels and to keep client memory requirements to a minimum. XHTML is a markup language used to create richer web content on an ever increasing range of platforms including mobile handsets. It is similar with HTML in its tag definition and syntax, but it adds modularity and enforces strict adherence to language rules. It brings a clear structure to web pages, which is especially important for the small screens and limited power of mobile devices. The XHTML MP is a mobile adaptation of XHTML by excluding those features not appropriate for devices with small screens. It is a strict subset of XHTML that includes additional elements and attributes that are useful in mobile browsers with additional presentation elements and support for internal style sheets.

Mobile browsing technology is evolving from WAP 1.x to WAP 2.0, by introducing different enhancements for mobile content development. Espe-cially WAP 2.0 provides support for protocols such as IP, TCP and HTTP. This

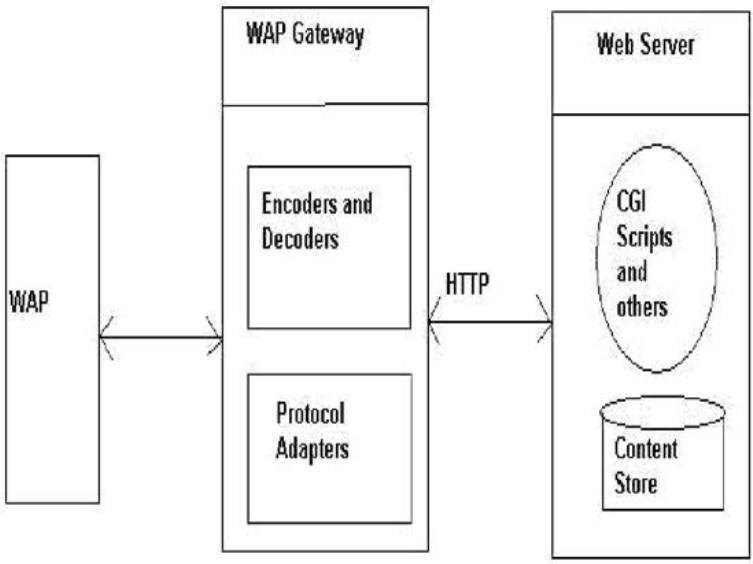

Fig. 4. The WAP programming model

provides interoperable optimizations suitable to the wireless environment and to the environment that permits wireless devices to utilize existing Internet technologies. WAP 2.0 also provides different application environ-ment, which enables delivery of information and interactive services to wireless devices.

WAP standard defines the future of wireless browsing technology based on the WML, XHTML MP and WAP CSS (WAP Cascading Style Sheet). Both WML and XHTML MP are a reformulation of the XML. XML is a language for marking up structures in text documents and supports the UTF-8 (8 bit Unicode Trans-formation Format) coding standard. The UTF-8 coding standard supports sev-eral languages character set including Ethiopic. So WML and XHTML MP can be used to create WAP pages that are encoded as UTF-8. Browsing from wireless terminals supporting UTF-8 encoding becomes possible.

2.4 WAP Communication Model

WAP contents usually reside on WWW servers on the Internet. The WAP gateway placed between the mobile network and the web servers. It receives WAP requests using the binary WAP communication protocols, and translates the requests to the text based WWW protocols and forwards to the content servers using the TCP/IP network protocol[7].

The WAP gateway also waits for the WWW text protocol reply from the content server, and receives using the TCP/IP protocol. It formats the message to binary WAP protocol, and then sends the reformatted response to the WAP client via WDP (WAP Datagram Protocol), which is almost equivalent to UDP (User Datagram Protocol) of the Internet. WDP makes no attempt to confirm delivery, resend lost packets, or correct errors in transmission like the UDP.

The WAP protocols are designed to operate over a variety of different bearer services, including short messages, circuit-switched data and packet data. Each bearer offers different levels of quality of service with respect to throughput, error rate and delays. The WAP protocols are designed to compen-sate for or tolerate these varying levels of service.The WDP specification lists the bearers that are supported and techniques used to allow WAP protocols to run over each bearer.

3 WAP Services

WAP provides two types of services, which are pull and push (Figure 5). In pull service, the user can request and fetch for the WAP site, for the informa-tion that he needs to browse. In the Push service, origin server or PI (Push Ini-tiator) initiates the connection and sends the push messages to the mobile de-vice. The push service can be, for example, messaging, stock price and traffic update alerts.

As shown in Figure 5, the client requests a server for a response in a pull ser-vice, and a server initiates a connection with a client for a push service.

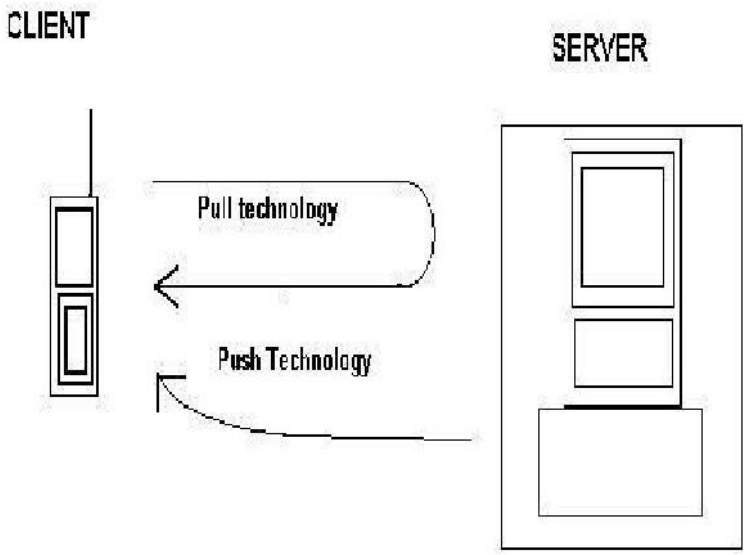

Fig. 5. The structure of a WAP pull and push service

3.1 Pull Service

WAP pull is a traditional WAP service. It works similar to the normal client/server model. In the normal client/server model, a client requests a service or information from a server, which then the server responds by transmitting

information to the client. This is known as "pull" technology. That is, the client pulls information from the server. The WWW is the best example of pull technology, where a user enters a URL (Uniform Resource Locator) (the request), which is sent to a server, and the server answers by sending a web page (the response) to the user. Similarly, inWAP pull, the user agent requests content from a WAP server. Then the WAP server reply through the WAP proxy to the user agent and the user agent can access the content[3].

When developing an application, which has connection with a database server, a pull service of WAP is essential. For example banking (transfer money between accounts), finance (buy and sell stocks, exchange rate), shopping (buy books, searching for record), and Ticketing (cinema tickets, concert tickets) are some of the applications, which can be developed using the pull technology of WAP.

3.2 Push Service

WAP push, available since WAP 1.2, allows WAP content to be pushed to the mobile handset with minimum user intervention. A WAP push is basically a spe-cially encoded message that includes a link to a WAP address. It can be deliv-ered over WAP or SMS (Simple Message Service) bearer. On receiving

WAP push messages, WAP enabled handsets can automatically give the user the op-tion to access the WAP content.

The push functionality is especially relevant to real-time applications that send notifications to users. Without the push functionality applications would require the devices to poll application servers for new information or status. In wireless environments such polling activities would constitute inefficient and wasteful use of resources of wireless networks. WAP's push functionality provides control over the lifetime of pushed messages, store and forward capabilities at the push proxy and control over bearer choice for deliv-ery.

The WAP push service directs the end user to a WAP address where particular content may be stored, which is ready for viewing or downloading to the handset that enhances usability[5]. Operators and content providers can utilize push data transfer to deliver content that is relevant to user groups, instead of relying on the traditional pull model. WAP push advances existing messaging models (SMS, Smart Messaging) by integrating them into the WAP application environment. In consumer segment, users can subscribe to content they are truly interested in or to receive push messages that add value (promotions and discounts). The push message can inform them to follow links to more details or to complete a transaction. In a corporate segment, the company can send important news and users can access vital, time-critical information easily.

A push operation in WAP is accomplished by allowing a PI to transmit push con-tent and delivery instructions to a PPG (Push Proxy Gateway), which then delivers the push content to the WAP client. The PI is typically an application that runs on an ordinary web server. It communicates with the PPG using the Push Access Protocol (PAP). The PPG uses the push Over-the-Air (OTA) protocol to deliver the push content to the client. The architecture of push can be thought of similarly to that of SMS, except that with push, the PPG is found in the middle rather than the SMSC. Push can be sent over SMS or GPRS.

4 WAP Gateways

WAP gateway acts as mediator between Cellular device and HTTP or HTTPS web server. WAP gateway routes requests from the client (Cellular Phones) to an HTTP (or Web) server. The WAP gateway can be located either in a telecom network or in a computer network.

4.1 Kannel

Kannel[2] is an open source WAP gateway. It attempts to provide this essential part of the WAP infrastructure freely to everyone so that the market potential for WAP services, both from wireless operators and specialized service provid-ers, will be realized as efficiently as possible. Kennel's quality has been recognized on March 7, 2001 when it was certified by WAP Forum as the first WAP 1.1 gateway in the world. Greater quality recognition are the quantity of companies using Kannel to successful connect to a variety of SMSC protocols in lots of countries.

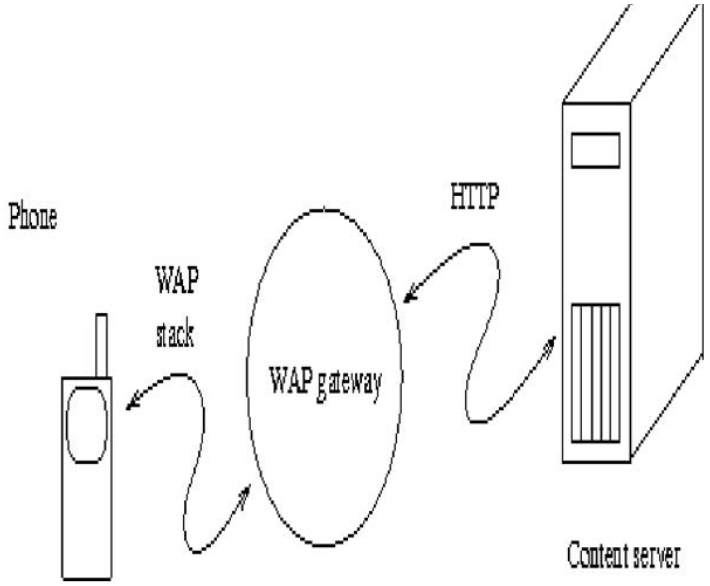

Fig. 6. Logical positions of WAP gateway (and PPG) between a phone and a content server

Kannel gateway architecture:

The gateway divides the processing load between the following two hosts:

I. The bearer box, which connects to the SMS (Short Message Service) centers and CSD (Circuit Switched Data) routers,providing a unified interface tothem for the wapbox. The bearer box does this by imple-menting the WDP (Wireless Datagram Protocol) layer of the WAP stack.

II. The wapbox, which hosts the upper layers of the WAP stack. Each ses-sion and its transactions are handled by the same wapbox.

Working of the system:

The bearer box receives UDP (User Datagram Protocol) packets from CSD rout-ers, inspects them to see whether they are WAP packets, and then routes themto the WAP box. This simple design allows the bearer box to do a mini-mum of processing per packet. The bearer box also sends the UDP packets that the otherboxes generate, which adds some more routing processing. The wapboxes implement the WTP (Wireless Transaction Protocol) and WSP (Wire-less SessionProtocol) layers. These take HTTP-like requests from the phones and make the actual HTTP requests to content servers, compress the respons-es, and sendthem back to the terminals. (Sessions are maintained to make as much use of the limited radio bandwidth as possible.)

4.2 Nokia Mobile Internet Toolkit

Nokia Mobile Internet Toolkit (NMIT) [5] consists of a set of editors that you can use to learn how to create various types of mobile Internet content. NMIT lets you display this content on multiple phone SDKs.Phone SDKs are installed separately. NMIT detects installed, supported phone SDKs at startup and lists these in its SDK Control Panel. You can display content you author on any sup-ported phone SDK by simply clicking a Show button within an editor. Many NMIT editors are used for creating XML-based content types defined by Docu-ment Type Definitions (DTDs). These editors employ content validation to check content against a DTD, and they provide features for easily selecting elements and attributions for insertion based on current cursor position. In addition, NMIT provides a DTD Manager through which you can import new DTDs for use by NMIT editors[4] . NMIT is a software simulation for mobile, integrated with WAP server. It is gen-erally used to test WAP sites. We also used it to test WAP content.Major features of NMIT include:

" Browsing Editors " Push Content Editors " Messaging Editors " Deployment Editors

4.3 WAP

WAP Proxy is a high performance WAP Gateway that is designed to meet the needs of WAP 2.0 and multimedia applications, especially MMS (Multimedia Messaging Service) and Java downloads. With WAP providing the underlying protocol support for multimedia object delivery to mobile clients[8]. The explosive growth of MMS services is placing heavy demands on conventional WAP gate-ways. WAP Proxy was designed to meet the needs of new MMS services, as well as legacy WAP applications. Now WAP Proxy provides full WAP gateway support for WAP v1.1, v1.2, v1.2.1, v1.3 and v2.0 WAP clients. WAP Proxy can support WAP 2.0 clients using either Wireless Profiled HTTP/TCP (W-HTTP and W-TCP), or the WSP protocol stack[6] .

WAP is proprietary software, designed to run on Windows platform. Since it's not free and a trial version of one month is available. We tested trial version to host WAP content.

5 Conclusion

Our designed system is able to solve the issues of integration related with open source WAP Gateways through service based interfaces. The orchestration of services is done by using Service oriented architecture approach. We tested that the content created by NMIT kit supports the various SDK's of mobile phones of different vendors by using XML based content configuration, which makes it portable across different vendor specific devices.

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