CRITICISM OF DEPLOYING
WIRELESS APPLICATION PROTOCOL (WAP) GATEWAY SERVER
WITH WIRELESS TELEPHONY APPLICATION (WTA)

by

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Faculty of Engineering

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by
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ABSTRACT

The aim of this project is the criticism of deploying and upgrading the WAP Gateway Server for the service providers. WAP Gateway Server translates request and response data with coding system between WAP protocol and WWW protocol.

In order to do this, information are collected from the companies, which produce WAP Gateway Server and their functionalities, and are compared. The coming of WAP1.2 that adds support of WTA create the interests for service providers to improve their services to the customer. The review of WAP1.2 and WTA are given then the analysis on the need of Thai service providers to upgrade their WTA software is pointed out. The analysis bases on the information gathered from the service providers by asking them about the services that they need to give to customer.

The analysis on the Servers is based on the functionality of four major brands. The WAP services of the foreign providers are given for comparison with the Thai providers. The analysis for the tariff is given base on the characteristic of the services.

In conclusion, this study provides the new information regarding WAP, which allows mobile phone users to access information and services from the Internet.

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ACKNOWLEDGEMENTS

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LIST OF ABBREVIATIONS

ADE -   Application Development Environment

APIs -   Application Programming Interfaces

CPU -   Central Processing Unit

CSD -   Circuit Switch Data

DTMF -   Dual Tone Multi-Frequency

GPRS -   General Packet Radio Service

GSM -   Global System for Mobile communications

HSCSD -   High-speed Circuit Switched Data

HTML -   Hyper Text Markup Language

HTTP -   Hyper Text Transfer Protocol

IP -   Internet Protocol

ISDN -   Integrated Services Digital Network

LDAP -   Lightweight Directory Access Protocol

MPTY -   Multiparty communication

MSISDN -   Mobile Station International ISDN number

OTA -   Over The Air

PSTN -   Public Switched Telephone Network

RADIUS -   Remote Authentication Dial-In User Service

RE -   Runtime Environment

SMS -   Short Message Service

SNMP -   Simple Network Management Protocol

SSL -   Secure Socket Layer

TCP/IP -   Transmission Control Protocol/ Internet Protocol

UAProf -   User Agent profile

UMTS -   Universal Mobile Telecommunication System

URL -   Uniform Resource Locator

WAP -   Wireless Application Protocol

WBMP -   Wireless Bitmap

WIM -   WAP Identification Module

WML -   Wireless Markup Language

WTA -   Wireless Telephony Applications

WTLS -   Wireless Transport Layer Security

WWW -   World Wide Web

I. INTRODUCTION

In global world, a mobile handset has both audio and display. It has limited ability to have Internet service in addition to its original telephony service. However, due to limited capability of display, processing and memory of a mobile handset and limited bandwidth of wireless access, the world-wide-web (WWW) was found not suitable for wireless mobile system. As a result the Wireless Application Protocol (WAP) has emerged.

WAP provides an open universal standard for bringing Internet content and advanced value added services to mobile phones and wireless device. WAP allows for communication between a mobile handset and the Internet by the use of WAP Gateway Server. The Gateway Server translates request and response data with coding system between the WAP protocol and WWW protocol (HTTP and TCP/IP).

Mobile user can communicate with the integration of Internet and telephony services by using WAP. Although telephony and Internet came under the same device, the two class of service remains isolated. One step further to the development a class of application is being emerged where both telephony and Internet are involved. In fixed network there are several proprietary solutions available to provide such service because the standard WWW does not support such applications. The WAP, however, includes Wireless Telephony Application (WTA) to support this class of service.

One of the major advantages WAP has over the traditional Internet comes in the WTA framework. With this framework developer are able to enrich services by adding telephony services. This WTA is accomplished by introducing an in-client interface to the mobile network, handling of network events, a repository that allows real-time handling of services, and a mechanism-supporting server initiated services. WTA allows incoming and outgoing call to be handled within WML and WMLScript permitting trust parties to deploy combined voice mail and Internet service in the easily programmable way, in conjunction with network WTA Server.

For example, a user could call a number found in a yellow page, search and virtually interface to voice mail system. Such a kind of WTA services are unified messaging, phonebook service, address book service, voice mail, call logging, call management (incoming call selection, multiparty, call waiting, forwarding rules), call offering, call transfer, call holding, call control feature and paging service. These services will be explained in the next chapter.

1.1 Problem Statement

At the time of establishing, wireless mobile system could not be able to access the Internet service. Nowadays, with the emerging of WAP the mobile phones can be used Internet as the combination with telephony service. In order to supply the WAP services to the users, WAP Gateway Server is an indispensable tool. The WAP Gateway Server is the two-way software, which allows the user to access the WAP services on the Internet via the WAP device. By using it, the service providers have to extend the services for the benefit of both the users and the service providers. The following questions are to be answered in the later chapter.

1. Which brand of Gateway Server is matched with WTA function that the needs of service provider?

2. Which of these brands are used and which services will be extended by the service providers in Thailand?

3. How the tariff of WTA services should be collected in the near future?

4. Will WAP be enabled the corporation of the future third generation (3G) wireless network?

1.2 Objectives

The objectives of this project are

1. To explore new class of services encompassing both telephony and Internet: a survey will conduct through chapter 2 to make a list of such services. One of them will be explained using WAP including WTA capability.

2. To investigate the type of services used in the other countries and their costs: the service providers, outside Thailand supply WAP services in accordance with the users preference and some different cost depends on the service plan.

3. To describe the products and functionality for WAP implementation: the necessary products are surveyed from the companies for the WAP implementation and their functionality, will be compared.

4. To analyze the data between two service providers in Thailand: collecting the data from the companies, in Thailand, which implement WAP and then the data will be analyzed.

5. To estimate the tariff of WTA services for Thailand: the estimation of the tariff of WTA service will be expressed in this study, Thailand.

1.3 Emergence of WAP

In December 1997, WAP was formally opened. WAP forum members represent over 95% of the global handset market, carriers with more than 100 million subscribers, leading infrastructure providers, software developers and other organizations providing solutions to the wireless industry. The purpose of WAP is to enable easy fast delivery of relevant information and services to mobile users. *(searching from the Internet)*

In April 1998, WAP 1.0 was released for industrial trial after that WAP 1.1 released in June 1999 for commercial products in 2000. It specifies Wireless Transport Layer Security (WLTS), User Agent Profiles, and Wireless Telephony Application (WTA) in trial. WTA specifications provide for access to telephony functionality such as call control, phonebook access, and messaging from within WML and WMLScript Applets. WTA APIs include functionality for integrating voice and data, such as the ability to

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initiate phone call from phone lists or from e-mail. WAP 1.2 released in November 1999, provides a mature specification of WTA and specifications for push capability as well. *(searching from the Internet)*

Nokia, Ericsson and Openwave of WAP Server version 1.1 certified from Open Group, WAP forum, on 01 March 2001. Motorola has same virtue on 01 June 2001. *(searching from the Internet)*

The information about Gateway Server has been received through e-mail from Nokia and Ericsson. *(personal connection with e-mail)*

For Motorola and Openwave Gateway Server, the information about them is obtained by searching the Internet. *(searching from the Internet)*

Collecting the data from the two service providers (AIS and DTAC) in Thailand according to the questionnaire form. *(personal connection with e-mail)*

Gathering WAP services from the related web site of these service providers (Telstra, Sonofon, One2one, Orange, BT Cellnet and Vodafone) and asking some questions to them outside Thailand. *(personal connection with e-mail as well as searching from the Internet)*
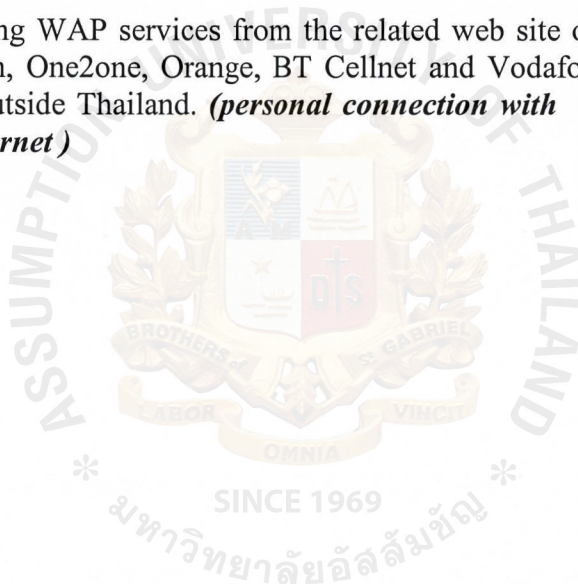
II. EMERGENCE OF NEW CLASS OF SERVICES

The combination of mobile telecommunications and Internet services is extremely attractive for two main reasons. Firstly, both the Internet and the mobile communication markets are growing very rapidly; secondly, they address the same types of users, those aware of modern technology and willing to use it, and business users with a need that justifies the costs of using the services intensively. For this reason, the World Wide Web is being adopted by an increasing number of mobile operators as the main interface towards their users. The following WAP services as listed below will be explained and other services avail in each web site is also express as the tabular forms. In addition, the review of service providers who supply the WAP services to the users outside Thailand are asked some questions via e-mail, and then searching are made from the Internet. These can also be expressed in this chapter.

2.1 Explanation of the Use of WAP Services

Services	Explanation	Other services avail in each web site	References
1. Unified Messaging Service	A message that was sent to the user as an e-mail can be retrieved by the user, for example while driving, as a voice message, using text-to-speech conversion	Information service, E-mail service Call offering, fax mail	www.tdap.com/tdap/wireless/wireless(CMG_person)html
		m-banking, m-commerce	www.idc.com/data/europe/Content/EUO41200PR.htm
		Banking, Finance, Shopping, Gambling, Ticketing, Weather, Incoming call selection, Multiparty, Call Waiting, Forwarding rule, Voice mail, advanced phone book management.	www.vksoftech.com/freshvpn/wap/wapatvk.htm
2. Fax mail service	The messages are stored in a service center from which they can be retrieved by the subscriber via a personal security code to the desired fax number	Information service, E-mail service Call offering, unified messaging	www.tdap.com/tdap/wireless/wireless(CMG_person)html
		Information, ticketing, banking, unified messaging, e-mail service	www.motorola.com/GSS/CSG/Help/PR?pr980319_gsmobile.html
		m-commerce, banking, information service	www.swisscom.com/gd/information/press_releases/1999/added_service-en.html
		Banking, SMS based service, finance, weather, information service	www.the-arc-group.com/ebrief/2000/wap2000/WAP_conference_summery.htm

3.	Phonebook Service	The phonebook WTA function library handles requests for operations towards the phonebook application. The requested operations can be used for storage and retrieval of phonebook entire.	Banking, Finance, Shopping, Gambling, Ticketing, Weather, Incoming call selection, Multiparty, Call Waiting, Forwarding rule, Voice mail, Unified messaging service.	www.vksoftech.com/freshvpn/wap/wapatvk.htm
			Call holding, transferring calls, answering or forwarding calls, arranging conference calls, checking voice mail, call control features, call logging, paging and address book.	www.4k-associates.com/IEEE-L7-WAP-BIG.html
4.	Address book Service	No need to memorize every address in your mind just press a single button that you have already made in your phone.	Call holding, transferring calls, answering or forwarding calls, arranging conference calls, checking voice mail, call control features, call logging, paging, and phonebook services.	www.4k-associates.com/IEEE-L7-WAP-BIG.html
5.	Voice mail	This service is actually an answering machine within the network, which is controlled by the subscriber. Calls can be forwarded to the subscriber's voice-mail box, and the subscriber checks for messages via a personal security code.	Call holding, transferring calls, answering or forwarding calls, arranging conference calls, call control features, call logging, paging, address book and phonebook services.	www.4k-associates.com/IEEE-L7-WAP-BIG.html
			Banking, Finance, Shopping, Gambling, Ticketing, Weather, Incoming call selection, Multiparty, Call Waiting, Forwarding rule, phonebook service, Unified messaging service.	www.vksoftech.com/freshvpn/wap/wapatvk.htm
6.	Call waiting service	The mobile subscriber to be notified of an incoming call a conversation. The subscriber can either answer, reject, or ignore the incoming call.	Banking, Finance, Shopping, Gambling, Ticketing, Weather, Incoming call selection, Multiparty, Phone book, Forwarding rule, Voice mail, Unified messaging service.	www.vksoftech.com/freshvpn/wap/wapatvk.htm

7. Incoming call selection service	Allow the user to choose how an incoming call should be handled. Options could be: answer, reject, forward to assistant, forward to voicemail	Banking, Finance, Shopping, Gambling, Ticketing, Weather, call waiting, Multiparty, Phone book, Forwarding rule, Voice mail, Unified messaging service.	www.vksoftech.com/freshvpn/wap/wapatvk.htm
8. Multiparty call service	Provide a comprehensive user interface to multiparty call handling	Banking, Finance, Shopping, Gambling, Ticketing, Weather, Call waiting, incoming call selection, Phone book, Forwarding rule, Voice mail, Unified messaging.	www.vksoftech.com/freshvpn/wap/wapatvk.htm
9. Call offering service	The name of the calling party for an incoming call is presented to the user, who then has the option to accept the call, forward it (perhaps to voice mail) or to respond with a text message.	Information service, E-mail service and unified messaging	www.tdap.com/tdap/wireless/wireless(CMG_person)html
10. Call forwarding service	The subscriber the ability to forward incoming calls to another number if the called mobile unit is not reachable, if it is busy, if there is no reply, or if call forwarding is allowed unconditionally.	Call holding, transferring calls, arranging conference calls, checking voice mail, call control features, call logging, paging, address book service and phonebook services.	www.4k-associates.com/IEEE-L7-WAP-BIG.html
11. Call transfer	Call transfer allows a caller to transfer any call to a third party.	Call holding, call forwarding, arranging conference calls, checking voice mail, call control features, call logging, paging, address book service and phonebook services.	www.4k-associates.com/IEEE-L7-WAP-BIG.html

12. Call holding	Call holding allows when the subscriber wants to initiate a second call, perhaps in response to a short message received during the call.	Transferring calls, arranging conference calls, call forwarding, checking voice mail, call control features, call logging, paging, address book service and phonebook services.	www.4k-associates.com/IEEE-L7-WAP-BIG.html
13. Call control feature	During a call, by the use of WTA functions, where applicable, to control the operation of available call control features such as accept call and release call.	Call holding, transferring calls, arranging conference calls, checking voice mail, answering or call forwarding service, call logging, paging, address book service and phonebook services.	www.4k-associates.com/IEEE-L7-WAP-BIG.html
14. Call logging service	WTA services can access the device's history. Three option can access independently: outgoing call dialed history, not answered incoming call missed, answered incoming call received	Call holding, transferring calls, arranging conference calls, checking voice mail, answering or call forwarding service call control features, paging, address book service and phonebook services.	www.4k-associates.com/IEEE-L7-WAP-BIG.html
15. Paging service	Paging service systems give operators the opportunity to stand out in an increasingly competitive sector by differentiating their services.	Call holding, transferring calls, arranging conference calls, checking voice mail, call control features, call logging, answering or call forwarding service, address book service and phonebook services.	www.4k-associates.com/IEEE-L7-WAP-BIG.html

16. SMS service	If the subscriber's mobile unit is powered off or has left the coverage area the message is stored and offered back to the subscriber when the mobile is powered on or has reentered the coverage area of the network. This function ensures that the message will be received.	Banking, Finance, Shopping, Gambling, Ticketing, Weather, Call waiting, incoming call selection, Phone book, Forwarding rule, Voice mail, Unified messaging service.	www.vksoftech.com/freshvpn/wap/wapatvk.htm
		Banking, information service, e-mail service, m-commerce service	www.swisscom.com/gd/information/press_releases/1999/added_service-en.html
17. Attractive interface to DTMF service	Increase usage of existing DTMF services by providing a better user interface.	Banking, Finance, Shopping, Gambling, Ticketing, Weather, Call waiting, incoming call selection, Phone book, Forwarding rule, Voice mail, Unified messaging service.	www.vksoftech.com/freshvpn/wap/wapatvk.htm
18. Information service (some web site write same service but different name)	Consumers could be able to receive simple, but in many cases vital, pieces of information such as news, sports, traffic information, white and yellow pages, as well as public transportation schedules on a mobile device.	m-commerce, banking, fax mail service	www.swisscom.com/gd/information/press_releases/1999/added_service-en.html
		Banking, SMS based service, finance, weather, fax mail service	www.the-arc-group.com/ebrief/2000/wap2000/WAP_conference_summery.htm
		Ticketing, finance	http://www.manx.net/wap/index.htm
		Banking, ticketing, m-commerce	www.cs.ait.ac.th/~a99426/wapspecial.html

19. Banking service	Customer being able to access both public domain and proprietary information necessary for their banking needs Eg. account balances and payment activities	m-commerce, unified messaging	www.idc.com/data/europe/Content/EUO41200PR.htm
		Information service, m-commerce	www.swisscom.com/gd/information/press_releases/1999/added_service-en.html
		Gaming, information service, SMS base service, finance, weather	www.the-arc-group.com/ebrief/2000/wap2000/WAP_conference_summery.htm
		Information service, ticketing, m-commerce	www.cs.ait.ac.th
20. e-mail service	These services notify the user of the arrival of new e-mail and the user can configure how often, or for which e-mails, a notification will be sent.	Information, ticketing, banking, unified messaging, fax mail service	www.motorola.com/GSS/CSG/Help/PR?pr980319_gsmobile.html
		Banking, information service, e-mail service, SMS service	www.tdap.com/tdap/wireless/wireless(CMG_person)html
		Information service, call offering service and unified messaging	www.swisscom.com/gd/information/press_releases/1999/added_service-en.html
21. Finance	Stock quote, buy and sell stocks, interest rates, exchanges rate,...	Banking, SMS based service, information service, gaming, weather	www.the-arc-group.com/ebrief/2000/wap2000/WAP_conference_summery.htm
		Banking, Phone book service, Shopping, Gambling, Ticketing, Weather, Incoming call selection, Multiparty, Call Waiting, Forwarding rule, Voice mail, Unified messaging service.	www.vksoftech.com/freshvpn/wap/wapatvk.htm
		ticketing, Information service	http://www.manx.net/wap/index.htm

22. M-commerce	Salespeople entering orders into their company computer system by accessing their Internet securely, right from their phone.	Banking, information service, e-mail service, SMS service	www.swisscom.com/gd/information/press_releases/1999/added_service-en.html
		Personal management	www.mg.co.za/mg/pc/2000/03/02 mar-wap-iobox.htm
		Banking, Phone book service, finance, Gambling, Ticketing, Weather, Incoming call selection, Multiparty, Call Waiting, Forwarding rule, Voice mail, Unified messaging service.	www.vksoftech.com/freshvpn/wap/wapatvk.htm
		Banking, ticketing, information service	www.cs.ait.ac.th/~a99426/wapspecial.html
		Banking, phone book, e-mail access	www.infocommworld.com/99sep/cover02.htm
23. Gaming or gambling service	Playing the game by using WAP mobile phone	Banking, SMS based service, information service, finance, weather	www.the-arc-group.com/ebrief/2000/wap2000/WAP_conference_summery.htm
		Banking, Phone book service, finance, m-commerce, Ticketing, Weather, Incoming call selection, Multiparty, Call Waiting, Forwarding rule, Voice mail, Unified messaging service.	www.vksoftech.com/freshvpn/wap/wapatvk.htm

24. Ticketing	A business traveler, who realizes that an important meeting will extend over its planned duration, could use WAP-enabled device to change his/her flight to the next available connection.	Banking, Phone book service, finance, m-commerce, gaming, Weather, Incoming call selection, Multiparty, Call Waiting, Forwarding rule, Voice mail, Unified messaging service.	www.vksoftech.com/freshvpn/wap/wapatvk.htm
		e-mail access, information, finance	http://www.manx.net/wap/index.htm
		Banking, m-commerce, information service	www.cs.ait.ac.th/~a99426/wapspecial.html
25. Weather	Weather forecasts, weather on other locations	Banking, SMS based service, information service, finance, gaming	www.the-arc-group.com/ebrief/2000/wap2000/WAP_conference_summery.htm
		Banking, Phone book service, finance, m-commerce, Ticketing, gambling, Incoming call selection, Multiparty, Call Waiting, Forwarding rule, Voice mail, Unified messaging service.	www.vksoftech.com/freshvpn/wap/wapatvk.htm
26. Personal management (calendar)	You can manage your diary at a daily, weekly and monthly level using the personal calendar feature	m-commerce	www.mg.co.za/mg/pc/2000/03/02mar-wap-iobox.htm

Table 2.1   Explanation of the Use of WAP Services

2.2   Outside Thailand Service Providers Launch WAP Services and Tariffs

Service provider	Company profile	Gateway Server brand name	Version	WAP Internet services	Remark	WAP service tariffs
1.Telstra	Oldest and largest telecommunications corporation in Australia	N/A	WAP1.1	e-mail, sport, news, weather, share/ banking, chat, game and fun, search, flight, on line travel, shopping, what's on (video guide, restaurant, car parking), lifestyle.	Telstra still does not used WTA services.	Call connection fee 22 cents. Peak : 16.5 cents per 30 seconds Off peak : 8.25 cents per 30 seconds. (off peak 7pm and before 7am Monday to Friday and all weekend).
2. Sonofon	Second largest telecommunications company in Denmark	Nokia corporate WAP Server	WAP1.1	News, sport, stock, on line travel, banking	N/A	N/A
3. One2one	One2one was launched on 7th September 1993. It is the UK network of T-mobile International a leading worldwide provider of mobile telecommunications services.	N/A	N/A	Financial news, sports results, travel, e-mail, horoscope, shopping, banking, enquire (cinema, TV)	N/A	10p per minute for all type of cost plan.

Service provider	Company profile	Gateway Server brand name	Version	WAP Internet services	Remark	WAP service tariffs
4. Orange	One of the world's leading communication company in Europe	Don't have any particular favored brand	WAP 1.1 but they currently engaged in a project to upgrade the gateways to 1.2.1	News, finance (transfer funds, check payment, see balance updates), entertainment, e-mail, location based services (restaurant, cinema), weather, sport, games, travel, horoscope	They have no WTA services at the moment and are unaware of anything planned for the future.	All prices include VAT <u>Talk plan</u> Week day : 5p per minute Weekends : 2p per minute <u>Orange everytime</u> Week day : 10p per minute Weekends : 2p per minute <u>Just talk</u> Week day : 10p per minute Weekends : 5p per minute
5.BT Cellnet	Cellnet launched in January 1985. One of the world leading service provider and 11 million people are now using it.	N/A	N/A	e-mail, information (latest sport, scores, new) enquire (flight time, cinema time), entertainment (games, competitions and reviews), m-commerce	N/A	10p per minute for all type of cost plan including VAT.
6. Vodafone	In the year 2000, Vodafone become the largest in Europe by market capitalization and the largest telecommunication company of its kind grabally.	N/A	N/A	On line travel, entertainment, e-mail, new, online trading, sports, weather, Yellow page, movie listing, games, music, calendar, shopping, horoscope	WTA services are used as a trial.	12p per minute for all type of cost plan including VAT.

Table 2.2 Outside Thailand Service Providers Launch WAP Services and Tariffs

III. WAP GATEWAY SERVER ANALYSIS

To implement WAP, Server or Gateway is the necessary tool. The gateway server is the most proven and reliable solution for communication service providers to deploy the full breath of the Internet to wireless handset. This device has function to make communication between mobile network and Internet is possible. It translates WAP requests to the WWW requests thereby allowing the WAP client to submit request to the web server.

In this case, it has two different types of purpose between Gateway and Server. A Gateway is a piece of software that has several functions in the "chain" between the WAP device and the Web Server, whereas a WAP Server is simply a combined web Server and WAP Gateway. The purpose of combining these two are for security. WAP Server is not only in control of the content, but also the Gateway where the encryption/ decryption process takes place. These two differences are-

- Access to information via a WAP gateway. WML and WMLScript files located on ordinary WWW servers on the Internet. This is illustrated in figure shown below and mainly targeted at GSM operators. Besides providing access to the Internet, it is expected that operators will enter agreements with a number of content providers on the delivery of content to their WAP site or WAP portal. It is also expected that operators will provide a hotel solution where small companies may provide WAP services.

| Client | WAP Gateway | The Internet |
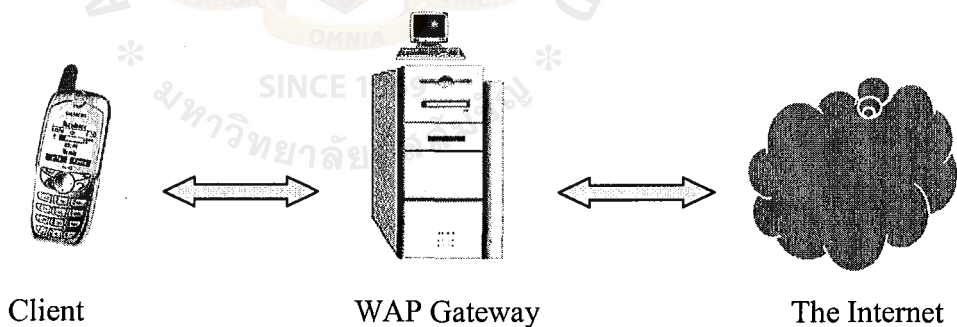
Figure 3.1   Solution where a GSM Operator Establishes a WAP Gateway

- The possibility to access corporate data directly with a WAP server, i.e. a company-specific solution model. This is illustrated in figure shown below. If an organisation installs its own WAP server, it has control over who will have access to the server, which enhances security. WML and WMLScripts are located at the WAP server and not a WWW server.

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Client   WAP Server   Data
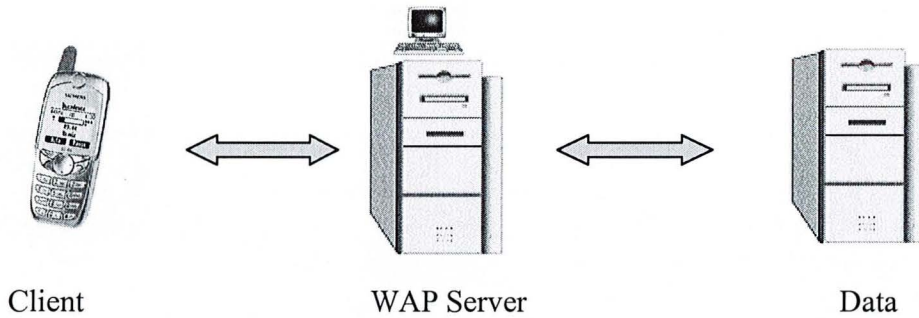
Figure 3.2   Direct Connections from Client to Own WAP Server

Either the WAP gateway or the WAP server is accessed by calling from a WAP terminal.

Before analyzing the Server and Gateway, in order to survey the server vendors, the following questions should be considered.

1. Which brands obtain certification from WAP Forum?
2. Which type of software and hardware are being used?
3. What functionality do they have?

The brands name of Nokia, Ericsson, Motorola and Openwave are officially certified by Open Group, the WAP Forum trademark. All these vendors acquire the license for the trademark from the WAP Forum. They use different types of hardware and software with different functionalities. The different types of product are compared and functionalities as well.

3.1 Companies Gateway Server Products

Company	Nokia Activ Server 2.0		Ericsson		Motorola
Server	Professional	Enterprise	Application	Runtime	
Hardware	For Windows NT® • Pentium processor, min 266MHz • 128MB RAM, 256 MB RAM recommended, • min.100MB of free hard disk space For HP-UX • 512MB RAM, • min.200 MB of free hard disk space For Sun Solaris™ • 512 MB RAM, • min.200 MB of free hard disk space	For window NT® • P III processor, min.600 MHz recommended (standalone/ clustered) • 256 MB RAM, 512 MB recommend (standalone); 128 MB RAM, 256MB recommended (clustered) • Min. 200 MB of free hard disk space For HP-UX • Min. 2x440 MHz CPU (standalone); 440MHz CPU, 2x440 MHz recommended(clustered) • Min. 1 GB RAM, 2GB recommended (standalone); 512MB, 1GB recommended (clustered) • Min. 200 MB of free hard disk space For Sun Solaris™ • Min. 2x450MHz CPU (standalone); 450MHz CPU, 2x450 MHz recommended (clustered) • Min. 1 GB RAM, 2GB recommended (standalone); 512 MB RAM, 1 GB recommended (clustered) • Min. 200 MB of free hard disk space	• Sun Ultra 10 • Enterprise Server 220/250 or NT hardware	• Sun Enterprise Server 220/250 or NT hardware (2-4 CPUs)	Window NT • Pentium III 500 MHz • 512 KB cache • 384 MB RAM • 20 GB internal mass storage • Ethernet network interface • CD-ROM drive

Table 3.1   Hardware Requirement for WAP Server Implementation

Company	Nokia Activ Server 2.0		Ericsson		Motorola
Server	Professional	Enterprise	Application	Runtime	
Software	For Windows NT® • Window NT ® service pack 5 • Java™ Runtime environment 1.3.0 • Java HotSpot™ Server VM 2.0 For HP-UX • HP-UX B.11.00, 64-bit environment • Java™ Runtime environment 1.2.2 • Java HotSpot™ 1.0.1 For Sun Solaris™ • Solaris™ 7 • Java™ Runtime Environment 1.3.0 (related HotSpot in he JRE package)	For window NT® • Microsoft Windows NT 4.0 with service Pack 5 • Java™ 2 Runtime Environment1.3.0 • Java HotSpot™ Server VM 2.0 For HP-UX • HP-UX B.11.00 • Java™ Runtime Environment 1.3.0 (related HotSpot™ in the JRE package) For Sun Solaris™ • Sun Solaris 8 • Java™ 2 Runtime Environment 1.3.0 (related HotSpot™ in the JRE package)	Windows NT Sun Solaris	WAP application Server requires WAP Gateway/ Proxy in order to connect to the mobile network	Microsoft Windows NT Server 4.0 Enterprise Edition • Microsoft Service Pack 6 • Microsoft Internet Explore v5.0 • Microsoft Internet Information Server (IIS) and Microsoft MTS version 2.1(used for Authentication Server) • Oracle 8 Client Software Windows Load-Balancing Services (WLBS)

Table 3.2   Software Requirement for WAP Server Implementation

Gateway	Nokia	Ericsson	Motorola
Hardware	• Hp L2000 Server • HP K380 Server (upgrades only) • Sun Netra t 1405 Server	• Intel-based commercially available servers • Mirrored disks • Specific CCITT Number 7 hardware • O&M workstation	Remark: The Developer's Version of the Motorola WAP Server is comprised of the core modules of the Motorola WAP Gateway and provides all of the functionality needed to provide Internet access to wireless devices using the WAP protocol. Adjunct applications such as security, authentication, and subscriber management are not included in the Developer's System. Developer's version of Motorola WAP server price: $ 995
Software	• HP-UX 11.00 Operating System for HP • Sun Solaris 8 Operating system for Sun Solaris	• Microsoft Windows NT™ • BMC Patrol (used for fault management) • Sybase Adaptive Server™ Enterprise (use for storing data in the WAP Gateway/ Proxy)	

Table 3.3   Hardware and Software Requirement for WAP Gateway Implementation

3.1.1 List of WAP Server and Gateway Functionality in Respective Companies

Since Nokia Server can be used as Gateway, all the Nokia Gateway functionalities are in Nokia Server. In the same way, because of Application Development Environment (ADE) and Runtime Environment (RE) are parts of Ericsson Application Server, all functionalities of ADE and RE are in the Application Server.

Server Functions	Nokia	Ericsson (Application server)		Motorola
	Profession/ enterprise [1]	ADE	RE	
1. WAP standard	✓	A part of WAP application server		✓
2. WTLS	✓	✓		✓
3. WTA application			✓	✓
4. Authentication	✓	✓	✓	✓
5. Charging	✓	✓		✓
6. Graphic web based user interface				✓
7. Access control	✓			✓
8. SNMP	✓		✓	✓
9. SMS	✓	✓	✓	✓
10. HTML to WML	✓		✓	✓
11. Personal pages			✓	
12. Extendible system	✓		✓	
13. WAP mail client	✓		✓	
14. OTA WAP terminal configuration	✓	✓	✓	
15. User registration	✓		✓	
16. Logging	✓	✓		
17. HTTP debugger		✓		
18. WBMP plug-in		✓		
19. URL builder	✓	✓		
20. Cookies	✓			✓
21. Open APIs	✓	✓	✓	
22. Bookmarks	✓	✓		✓
23. Administration	✓			✓
24. UAProf parser		✓		
25. System management application		✓	✓	
26. WAP push				✓

Table 3.4   Comparison of Servers Functionality

Remark: [1]Nokia Server Enterprise Edition has all the functionality of the Professional Edition plus an array of addition features:
- Scalability and high availability through a distributed product architecture with load-balancing capabilities
- Automatic adaptation of WAP content to the characteristics of different end-user devices
- Single login functionality for server assisted sign-on service
- Additional authentication mechanisms including Windows NT domain, RADIUS and LDAP integration
- General Package Radio Service (GPRS) support

Gateway Functions	Nokia	Ericsson	Openwave
1. WAP standard support	✓	✓	✓
2. WAP push	✓		✓
3. Cookies	✓		✓
4. Flexible billing & performance monitoring	✓	✓	✓
5. Both security & secure Internet connection	✓	✓	✓
6. Fault management		✓	
7. Gaming, download of ring tone & image and interactive positioning	✓	✓	
8. Multimedia message service (MMS)		✓	
9. SNMP	✓		✓
10. Graphic web based user interface	✓		
11. Privacy management			✓
12. GPRS	✓		✓
13. Application-specified billing			✓
14. Keywords for wireless navigation			✓
15. Class of interface			✓
16. Event tracking support			✓
17. International language support			✓
18. Support for fast upgrade			✓
19. System administration			✓
20. Geographic Redundancy			✓

Table 3.5   Comparison of Gateway Functionality

3.1.2 Comparison of the Server Functionality

By looking at the above-mentioned table 3.4, Server brands by the name of Nokia, Ericsson and Motorola of their functionalities are compared as follows:

- Nokia, Ericsson and Motorola have already supported WAP standard. WTLS function class II is for the secure mobile device to WAP gateway communication. The function of charging effectively manages the charge of the users from APIs or WAP Gateway interface. SNMP will be sent to a remotely connected system, in case of failure. For authentication function, WAP gateway forwards user ID and MSISDN for authentication wherever it is available. These Servers possess above all functions. The conversion of HTML to WML function is also possessed. In addition, SMS and bookmarks functions are included in these three Servers.

- For having WTA application in Ericsson and Motorola, some of the telephony services can be used. For example, incoming call selection and call waiting. But Nokia had not that function.

- Cookies function effectively manages the customer specific information for content providers. In access control function, Subscribers can be restricted access to WAP gateway and its services based on subscriber identifiers such as MSISDN, MISI, or IP address. In system administration, the mobile gateway provides system

administration and system monitoring. Nokia and Motorola have these four functions, but Ericsson has not.

- APIs allow application developed in almost any language and environment to take advantage of WAP push functionality. By the use of OTA WAP terminal configuration, for example, new users to effortlessly start using their WAP terminal without having to enter complicated configuration information. URL builder function that allows the parsing of URLs as well as composition of new ones. E-mail account can be accessed via a WML interface by the user. The registration component allows registering themselves with the Server through a WML interface. The log function can create log application event for programmer. Nokia and Ericsson have the above functions. For Motorola due to lack of APIs and OTA function, it is not complete.

- UAProf parser component provides a simple way for applications to retrieve the properties of the terminal device used. The user has the opportunity to create WAP home page. System management application function is a Web-based administrative tool for the application server. All these function are included in Ericsson only. HTTP debugger and WBMP plug-in function are included in ADE.

- WAP push and graphic web based user interface functions are in Motorola Server.

3.1.3 Comparison of Gateway Functionality

The above-mentioned in table 3.5, Gateway brands by the name of Nokia, Ericsson and Openwave of their functionalities are compared as follows:

- WAP standard of Nokia, Ericsson and Openwave gateways have flexible billing and performance monitoring and both security (WTLS) and secure Internet connection (SSL).

- Graphic user interface, SNMP, cookies, GPRS and WAP push functions are included in Nokia and Openwave. WAP push is not specified for the HTTP protocol, used by the WAP Gateway Server to communicate with content hosts. To support pushes, the Server has to provide an application interface to allow Server based applications to generate a push to a mobile client. The support of pushes on the client side depends on the capabilities of the handsets to handle pushed content.

- Nokia and Ericsson have gaming function. Only Ericsson has multimedia message service and fault management functions. Fault management supports alarm collection, alarm administration and alarm reporting.

- The others functions, privacy management, application specific billing, keywords for wireless navigation, class of interface, event tracking support, International language support, support for upgrade, system administration and geographic redundancy function, are supported in Openwave Gateway.

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3.1.4 WAP Server/Gateway - Key Features

WAP standard
Wireless protocol stack, encoders and decoders for textual to binary conversion of WML 1.1/1.2 and WMLScript 1.1/1.2 content, secure and non-secure, connectionless and connection oriented sessions.

WTLS
Wireless Transport Layer Security (WTLS) for secure mobile device to gateway communications.

WTA server
WAP and voice value added services are combined on the basis of the WTA server. For example, searching, selecting, dialing and other services are enabled.

Authentication
The authentication module is used to authenticate users. The default authentication mode is basic authentication. WAP gateway forwards user ID and MSISDN for authentication where it is available. Users can also be authenticated by means of URL based authentication.

Charging
WAP gateway interface or API is possible to collect a variety of information and configuration Call Detail Records (CDRs) according to their need. The charging of mobile users can be managed effectively.

Access control
Access control of subscribers and services is possible. Subscribers can be restricted access to WAP gateway and its services based on subscriber identifiers such as MSISDN, MISI, or IP address. Services can be managed through lists of URLs, which define which services can be accessed and which are restricted.

SNMP
Simple Network Management Protocol (SNMP) trap will be sent to a remotely connected system, in the case of a failure in the WAP application server.

HTML to WML
HTML to WML is a based application that converts HTML documents to WML documents. The component is used when WAP users download an Internet Web site that is HTML based. The HTML page is first converted at the server and then sent to the user as a WML page.

Personal pages
Provides users with the opportunity to create their own WAP home page. It is easily administered by the user, and may include WML links, HTML links, texts and images.

Extendible system
The WAP application Server is easily extendible, enabling additional services and content providers to be included when the opportunity arises.

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WAP mail client
This component provides the user with access to their regular email account via a WML interface. The user can read, send, reply, forward and delete an email from a WAP terminal.

OTA WAP terminal configuration
It allows, for example, new users to effortlessly start using their WAP terminal without having to enter complicated configuration information. This is accomplished with an API that sends bookmarks and configuration data to GSM WAP terminals via SMS.

User registration
The registration component allows users to register themselves with the application server through a WML interface. Other user administration is performed by the system administrator using the system management application.

Logging
Log enables a programmer to log application events. The application can even create its own log file.

HTTP debugger
It provides the developer with a debugging facility that accommodates application development and verification.

WBMP plug in
It is a plug in for photoshop and paint shop that allows both the reading and creation of WBMP files. WBMP is a bitmap format developed for the mobile environment and support by the WAP forum.

URL builder
It also allows the parsing of URLs as well as the composition of new ones. This is useful when searching for specific information or modifying URLs in accordance to specific application events.

Cookies
Cookies support via cookies proxy functionality. Cookies are a way for content providers to effectively manage customer specific information. By storing and handling cookies, the WAP gateway can help minimize network traffic. Statistical information of subscriber specific cookies is available via the user interface.

APIs
A set of Application Programming Interfaces (APIs) across all major platforms allow applications developed in almost any language and environment to take advantage of WAP push functionality. Supported languages and environment currently include C, Java, Perl and ASP on most popular operating systems. Command line executables are also available to provide a simple test facility.

Bookmarks
Special character or code inserted at a particular point in a document that allows the user to move straight back to that point at a later date.

Administration

All provisioning, graphical user interface, password-protected access, local and remote usage, log and alarms, security, and user data import from the LDAP server is provided. (Openwave gateway is available all provisioning except graphical user interface)

UAProf parser

This component provides a simple way for applications to retrieve the properties of the terminal device used. This allows the adjustment of applications to the client's abilities.

System management application

It is web-based administrative tool for the application server. New services and applications introduced to the WAP server are made available to users after the applications have been registered. Any administrative or configuration module needed for an application can be integrated into the system management application.

WAP push

With the Push functionality in WAP gateway applications to push timely can be provided, relevant messages to mobile users, who then just decide whether or not they will activate the WAP session for downloading the content. WAP push opens up an array of new service possibilities.

Security

WAP security enables encryption and authentication for traffic between WAP enabled device and WAP gateway through support of WTLS. WAP gateway also provides a secure Internet connection through Secure Socket layer (SSL), which is important when transferring personal, corporate, or financial data over the Internet.

Fault management

Alarm collection, alarm administration and alarm reporting are supported locally at the WAP gateway.

Multimedia Messaging Service (MMS)

This service provides the framework to implement a feature-rich messaging solution. MMS provides features and functionality that permits delivery of varied types of content.

Privacy management

Operator remain in control of the release of subscriber information based on the application accessed, ensuring subscriber privacy, while providing specialized information to prefer the content providers.

GPRS support

Full support of General Packet Radio Service (GPRS) networks enables service providers to support subscribers accessing multiple bearers, as determined by coverage.

Application specified billing

The web server sends application-specific data as part of the HTTP reply and embeds this data into an m-commerce transaction record, allowing communication service provider to potentially share revenue from application-specific charges.

Keywords for navigation

It modules allow subscribers to type a Keyword or its first few letters quickly and easily navigate to wireless Web sites.

Class of interface

Service providers can distinguish access over different networks, such as CSD and GPRS, for billing and content tailoring purposes. Class of interface also accommodates a defined list of allowed URLs, enabling a service provider to easily and precisely guide which wireless applications and services subscribers can access.

Event tracking

With event tracking, service providers can closely monitor subscriber behavior and event information, supporting a variety of billing models.

International language support

Multi-byte character sets, in compliance with the Unicode standard, and character transcoding are supported to properly map application content to the character set in the handset.

Support for fast upgrade

An upgrade mechanism that substantially minimizes production network downtime is supported, enabling the service provider to upgrade their production gateways which minimal downtime.

Geographic redundancy

Geographic redundancy enables the communication service providers to store subscriber information in multiple, geographically separate locations, so that if one site suffers from a natural disaster the others will still be operational and able to support subscribers.

3.2 Case Analysis Based on the Brands

3.2.1 Nokia

Nokia WAP server can be used as a gateway to Internet web server over HTTP. Alternatively, stand alone applications or connectors to various kinds of back end system can be implemented as JAVA™ Servlets on top of the Nokia server API. In addition, it supports the Java Runtime Environment (JRE 1.3) for specific Java based functions or application. Nokia WAP server is designed for corporate usage in Professional Edition whereas the Enterprise Edition uses the server for large-scale business.

The Enterprise Edition has all functionality of the Professional Edition plus an array of additional feature to make it an ideal solution for demanding. It is also GPRS compatible and many more features possibilities. The distributed and modular architecture allows for easily adding capacity to mach the growing WAP traffic. This Edition is especially designed to work on cluster installations. The user can add more CPUs or server instances with minimum effort and disruption to the service. It has self-

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monitoring and recovery capabilities for fault tolerance. Within the cluster, the servers are constantly monitored and if one subsystem of the cluster goes down, traffic will be invisibly rerouted to other subsystems. This ensures a maintained service level to all users. Despite the distributed architecture, the administrator can manage the cluster as a single system via an easy-to-use graphical user interface, a command line interface or a WAP manager. The additional feature has been mentioned as a remark on page 29.

The Nokia software can be purchased per concurrent user. It depends on the application and usage. The license price is based on the number of concurrent user and several licenses can be installed to one server. Concurrent users are defined as requests from one terminal address via one port during a one-minute period.

Nokia software <u>Professional Edition</u> is available for Windows NT, Sun Solaris and HP-UX.

One concurrent user license wallet:	700 USD
Additional 5 concurrent users license wallet:	3490 USD
Additional 10 concurrent user license wallet:	5590 USD

Nokia software <u>Professional Developer Edition</u> license is available for Windows NT, Sun Solaris and HP-UX.

5 concurrent users:	990 USD

<u>Estimating the Amount of Required Concurrent User Licenses</u>

Eg. A bank is implementing a WAP service for a population of 140,000 users who are expected to visit the service once a week for 3 minutes at a time. There are about 10 busy hours each day.

Estimated need $= \dfrac{20,000(\text{user per day}) \times 3 \text{ usage in minute}}{600 \text{ (the 10 busy hours in minute)}}$

$= \quad$ 100 concurrent user licenses

<u>Nokia security</u> is an option to the Nokia Server, the maximum number of concurrent user is limited to the number of concurrent users on the Nokia server.

Number of Concurrent user	Professional Edition		Professional Developer Edition	
	56-bit	128-bit	56-bit	128-bit
1	280 USD	470 USD		
5	1400 USD	2320 USD	600 USD	890 USD
10	2230 USD	3710 USD		

3.2.2 Ericsson

Ericsson's WAP application server enables the creation of applications that adjust themselves according to terminal used. WAP server can utilize the advanced information and services available via the WAP service APIs. WAP application server also includes high level APIs in order to enable the speedy development of application. Application Development Environment (ADE) and Runtime Environment (RE) are the part of WAP application server. ADE and RE can be used by the service provider and operator. But the former is designed for developing their own WAP application whereas the latter can easily deploy and manage applications for use in WAP environment. RE detects the specific terminal type and constructs an appropriate WML page presentation.

Ericsson has focused on developing integrated telephony and data. For example, the ability to initiate a phone calls from a Web site or from e-mail. Ericsson has prototyped this capability, and the company has helped drive the basic technology standard for integrated telephony and data, called Wireless Telephony Applications (WTA) through the WAP Forum.

3.2.3 Motorola

Motorola has started vending Server on 1 June 2001 and therefore they are trying to be complete their functionality for server. There exists WAP Gateway in Motorola Server. It system configures to insure the flexibility to meet the developers or the specific business needs. Motorola believes its WAP Gateway offers added value capabilities in scalability (including nonproprietary access control and authentication control services), billing services interface (provides application and network based events to a customer's billing system), security (certification management tools based on WTLS), and management software (SNMP based management services for the WAP gateway server including resources, throughput, and available capacity of the server).

3.2.4 Openwave (Phone.com)

Openwave is purely a wireless software provider for phones. With WAP1.1 certification and WAP1.2.1 support, Openwave gateway provides communication service providers (CSPs) with solutions needed today and a path to next generation networks and services. WAP1.2.1 have all the feature of WAP1.1 as well as a number of optional features, including WAP push and User Agent profile. Alcatel and Siemens implement software WAP1.1 from Openwave.

The main idea of this chapter -

After analyzing the Servers and Gateways, the result can be made. At present, Nokia, Ericsson and Openwave, the three companies of WAP products get leading row in the market. These companies focus as follows:

- Nokia focuses enhancement of functionality that construct provisioning of Internet services and support bearers.

- Ericsson intends to launch WTA services as extended functionality.

- For Motorola, due to the lack of OTA WAP terminal configuration and APIs, it is not complete.

- Openwave gateway supports 2G, 2.5G and 3G networks to deliver solution today and prepare network operators for the future. It also supports WAP push as well as GPRS. Most of the hardware vendors (eg. Alcatel, Siemens,…) buy the Gateway from the Openwave for WAP implementation.

IV. CASE STUDY BASED ON THE SERVICE PROVIDERS

4.1 Case Study in Thailand

This case study based on the implementation of WAP Gateway Server, surveyed in Thailand. The survey asks service providers about the brand and type of services available in their companies.

The two companies, AIS and DTAC, have recently created the WAP services for advanced wireless mobile system in Thailand. The problem is whether these two companies have upgraded new version and whether WTA will be used in the near future.

The purpose of this study is, to discover what kind of the WAP services will be deployed in Thailand. Specifically, this study identifies the rank of the services in which service providers want to serve to their customer.

By studying this, service providers can be aware of which services prefer to the user. On the side of the user, they can point out which services are mostly used. In addition, it is known that which brands are used by the service providers and why they use them.

In order to make the right decision, the data must be collected as questionnaire from service providers in Thailand. The questionnaire was made by personal interview via the uses of e-mail to the service providers. Before collecting the data, the problems are defined for this case study as follows:

1. Which version do you have?
2. When would you upgrade your WAP gateway server?
3. Which brand is the most appropriate one for your company?
4. Why do you choose that brand?
5. Could you rank the services that you would like to serve your company?

4.1.1 Case Study 1 (AIS)

According to the questionnaire, AIS fills up the form and answer it as follows:

1. WAP1.1
2. Within one year
3. Nokia and Ericsson
4. More functionality, more reliability, cheap price and easy to implement
5. (1) e-mail
    (2) m-commerce
    (3) gaming

Analyzing Result from AIS

By looking at AIS's answer, it is clear that

- Though AIS says their Servers will be upgraded, yet the current WAP software are supposed to be sufficient. The services AIS needs can all be implemented by using WAP1.1. Therefore, they do not need to upgrade the system.

- WTA service is, to integrate telephony services into WAP. According to AIS's answer, they do not wish to launch WTA services for the users.

- If AIS uses Internet services only then WAP1.1 is quite sufficient for some. But according to AIS, it is known that, by announcing they will upgrade within one-year means AIS wishes to extend WAP push function: proactive delivery of information from a WAP Gateway to a WAP terminal, because it can be used only when WAP 1.1 has been already upgraded, and m-commerce can be safely used, since more security has attained after upgrading.

- These facts are all complete in Nokia Server. That's why, it is sufficient to implement in AIS with Nokia Server. For Ericsson Server, it will be more useful, if WTA services are used.

- The facts that these two servers are better than others in functionality have been already mentioned in chapter 3. In addition, these two servers have more reliability, cheap price and are easy to implement compared to others have been disclosed by AIS.

- On the side of the user, it is seen that, most of the people like to check e-mail from the mobile phone.

4.1.2   Case Study 2 (DTAC)

According to the questionnaire, DTAC fill up the form and answer it as follows:

1. WAP1.1
2. Within one year
3. Nokia
4. More functionality, more reliability
5. (1) E-mail
   (2) Unified messaging
   (3) Banking
   (4) Finance
   (5) Call control feature
   (6) Call management
   (7) Reservation
   (8) Calendar

(9) M-commerce

(10) Ticketing

Analyzing Result from DTAC

By studying DTAC's answer, it is seen that

- In that case, unified messaging, call control feature and call management are from WTA services.

- Since DTAC has ranked WTA services in the high priority, it is obvious that they are willing to launch WTA services. To achieve the services the need to upgrade to WAP1.2.

- Owing to WAP Server will be upgraded in DTAC, it will be more convenient to use dually with Ericsson Server, because there are WTA application in Ericsson Server.

- While questioning Nokia with e-mail, they answered that they did not implement WTA services for the time being. Though Nokia Server will be upgraded in DTAC, yet WAP push function can be used.

- Nokia Server has strongly focused on security, which is mainly useful in m-commerce, e-mail and banking services.

- The facts that Nokia Server has more functionality and more reliability have been mentioned in AIS, in addition it is found in DTAC's answer that they recommend these.

- On the side of the users since DTAC will start launching with E-mail services, just like AIS, it is clear that Thai people wish to use E-mail at any time, at any place independently.

4.2   Analysis of WAP Tariff in Thailand and Future trend of WAP

4.2.1   Analysis of WAP Tariff in Thailand

Since WAP is a new wireless mobile system it is popular in Thailand. WAP services are more useful for educated people and businessmen, because WAP services are quick and easy to get the Internet access without using laptop or palmtop. In Thailand, if WAP services are accessed, users will have to pay the additional costs. Therefore WAP phone should be sold with reduced price, so the more users can access WAP services the more beneficial for both service providers and users.

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The customers usually pay the actual amount of Airtime Calling for WAP services. However, there are additional charges for other services, such as, m-shopping, news and horoscope in Thailand. The mobile users may have to register to the service provider for these services and it must be paid monthly charge. In Europe, users can subscribe the WAP Internet services (news, weather, horoscope, and so on) by the use of login and password. All the services that can be accessed with certain fixed cost per minute, i.e. no additional charges for these services in Europe. But in Thailand, the services are accessed according to the type of services.

Most of the service providers launched Internet services rather than WTA services in Europe by surveying through Internet. WTA services are useful in using mobile phone, while it is using Internet such as incoming call selection; for example, activated by an incoming call, the application displays the name or number of the caller and presents the user with the options answer, reject, forward, or voice mail. This WTA service is now available in US. While we are using the Internet, we cannot dial on our mobile for the time being.

With the growth in usage of mobile devices, there is an increased awareness of the needs specific to the mobile user. Moreover, from the economical point of view, service provider needs to promote WAP services for customer awareness by the use of sale promotion and advertising. Sale promotion consists of a diverse collection of incentives tools, mostly short term, designed to stimulate quicker or greater purchase of particular services by customers. It can contain bundling the time or bundling the services. At the same time, advertising is needed for the customers' awareness the WAP services. Advertisers are a cost effective way to disseminate messages, whether to build the services for WAP. Advertising may more effective in Thailand because most of the Thai people have the interest in the new wireless mobile system; WAP services precisely WTA services as well. In this way, more users can access WTA services right away. Therefore, service providers can achieve proper revenue from the users.

The tariff of WTA services should be the same as some other mobile telephony services. For example, if you receive an incoming phone while you are using Internet browser or any other wireless web site, the call will be handled the same way your phone handles calls while it is turned off. This should be charged 3 Baht per minute for WTA service. It is clearly seen that it becomes normal telephone calling. But it can be known that the name or number of the caller appears on the display, while we are using the Internet. In Thailand, if WTA services will be supplied to the users, service provider may need to set up the WTA service tariff. The tariff of WTA services are estimated and expressed as follows:

WTA services	Optional type of services	The tariff of service	Explanation
1. Unified messaging	1. voice mail	per minute charge eg.3 Baht per minute	While the user using the internet, the message has been sent to the user then that message can be retrieved as e-mail, fax mail or voice mail.
	2. fax mail	per minute charge eg.3 Baht per minute	
	3. e-mail (receive)	per minute charge eg.2 Baht per minute	
2. Incoming call selection	1. answer	No service charge (the internet is now turned off.)	While one is using the Internet, the incoming call actives and the name or the number of the caller appears. Then option of answer, reject, forward or voice mail can be carried out.
	2. reject	No service charge	
	3. forward	Call charge should be the same as the mobile tariff from your mobile registration area to the area where the desired forwarding number is located.	
	4. voice mail	per minute charge eg.3 Baht per minute	
3. Call waiting and call holding	1. answer/ reject	The service is charged to the party initiating the call according to the mobile tariff.	Activated by an incoming call detected during an ongoing call, the application displays the name or number of the caller and presents the user with the option answer/reject, answer/hold, reject, forward, voice mail.
	2. answer/ hold		
	3. reject	Above mention	
	4. forward	Above mention	
	5. voice mail	Above mention	
4. Phonebook or address book		No service charge	The required phone number or e-mail address can be stored and retrieved in these services
5. Initiating call		This service should be charged as actual amount of airtime calling because it is not necessary to give the extra charge of its service and it has been already charged for Internet at that time	If the user wants to find the desire phone number from yellow page, the user can dial it while browsing wireless web site. Yellow page: The one which can find the desired business phone number or address and online directory can find out for you.

Table 4.1   estimating the tariff of WTA services

4.3.2 Future Trend of WAP

WAP is not limited to the transmission of purely character-based information, neither today nor in the future. Sooner, users will also be able to display color images and animated graphics and use all their usual home or work Internet services and applications, anytime, anywhere.

But the new transfer protocol WAP cannot be replaced by faster transmission technology like GPRS, HSCSD or UMTS. Nevertheless, WAP is steadily becoming an essential part of the future third generation wireless network.

In spite of this, the hopes being placed in the new mobile WAP technology are both high and varied. Combined with various standards and technologies, WAP will doubtless become the basis for mobile front-ends which can be used as "remote controls for the world" to access the entire Internet at the push of a button.

Compared to the HTTP and HTML standards, the WAP protocol and the corresponding WML are better adjusted to the special requirements of the mobile front-ends for which they were developed. As an efficient transfer protocol, WAP saves large amounts of bandwidth. For a single query, WAP exchanges far fewer data packets than HTTP/TCP-IP. Moreover, WAP signals are binary coded, allowing major capacity savings. WAP therefore offers not only faster transmission, but also more efficient use of wireless interface capacity. Recently, technologies such as WAP and GPRS have emerged that will enable customers to use mobile digital devices to quickly and easily utilize mobility-based services or shop on the Web.

The resulting surplus allows the WAP service provider to manage more connections and subscribers, leading to increased turnover or reduced costs, which can then be passed on to customers. Which in turn has a positive impact on the use of commercial WAP-based services.

In the future, WAP Identification Module (WIM) will also provide the options of authentication and digital signatures. This feature opens up a whole new dimension concerning payment for goods and services anytime and anywhere. This could mean the end of queues for parking tickets or at the car wash. Customers will simply call a number, select a washing program, and pay at the push of a button: simple, safe and convenient. Therefore WAP enables the corporation to be part of the wireless future.

WTA is an important element of WAP, because it combines telephone services and Internet surfing. While the user searches for hotel reservation or any other searching from the yellow page, the user may need to dial the phone call from the Internet. In the future, the user can dial the desire number while browsing wireless web site. In that case, WTA service is needed and it is an essential for WAP world. WTA can be seamlessly combined with other data services. Therefore, WAP exists with the existence of the WTA in the future.

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V. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

WAP enables mobile users with wireless devices to easily access and interact with information and services instantly. Using a WAP phone it is possible to access a variety of services such as e-mail, travel information, news and weather updates, or sites, which allow user to buy products and services online. WAP sites are a simplified version of traditional Internet sites and there are huge range of WAP sites available, many containing the same information found on traditional Internet sites. In addition WTA combines telephony services and Internet surfing such as unified messaging, call waiting, call holding, incoming call selection and so on. If WTA services will be launched to the users, the services should be charged with the same rate as some other mobile telephony services for same period.

Generally, Europe and Australia use the WAP Internet services. WTA services are used as a trial. The portal offers all the services from their web sites (news, sport results, weather, movie listing and so on) and the service provider belongs to the web site in Europe. For example, BT Cellnet is service provider and Genie is the portal. The two companies are engaged each other. Therefore, if the mobile users, who subscribe the web site, can access all the services without limit and the charges will be certain fixed costs per minute. AIS in Thailand, service provider provides mobile user both WAP access and WAP content combing together and the costs of these services (m-shopping, horoscope and news services) are paid with monthly charge.

The mobile phone is going to be the universal personal interface to information. With WAP Gateway Server, the user can tailor company-specific applications, adding tremendous value to the user everyday operation. The Gateway Server brand names of Nokia, Ericsson, Motorola and Openwave are deploying various WAP functionalities for service providers and operators.

Nokia Gateway Server has two editions, professional edition and enterprise edition. These two editions Server are available for window NT, HP-UX and Sun Solaris. Professional edition is designed for corporate usage. It has OTA provisioning of WAP settings, easy installation and administration, WAP toolkit and, secure and robust platform for enabling the mobile office features. Enterprise edition is designed for large- scale business. It has all functionalities of professional enterprise. Besides, scalability and high availability, automatic adaptation of WAP content, single login functionality and additional authentication mechanisms. These Gateway Servers has complete functionality for WAP1.1. It has focused on security as option extending secure encryption to the carrier's application Server or to a company's Internet. In addition, Nokia has push function. It provides the user of a mobile telephone with information without this person actually having concretely requested them. These can be subscribed e-mail services or also current information. Moreover, Nokia Server supports GPRS compatible bearer service. It means that Nokia WAP Server will be constantly stable in 2.5G.

Ericsson Gateway Server, like Nokia, also has many functionalities. It has two types of Server, application development environment (ADE) and runtime environment (RE). These two environments are part of Ericsson Application Server and are available for window NT and Sun Solaris. ADE is designed for own WAP application whereas RE can easily deploy and manage application. Ericsson has focused on developing integrated telephony and data called WTA.

Motorola Gateway Server is only available for window NT. It has WTA application Server and WAP push function but the lack of OTA WAP terminal configuration, APIs and less functions, it needs to complete the function on its Server.

Openwave Gateway is mostly used by the hardware providers (Alcatel, Siemens, and so on) for implementing WAP. It has also many functionality. It supports 2G, 2.5G and 3G network. Openwave WAP1.2.1 supports all the feature of WAP1.1 as well as a number of optional features, including WAP push and User Agent profile (UAProf).

By comparing the functionalities of Gateway Server and by asking questionnaire to service providers in Thailand and analyzing, it is found that Nokia has more functionality and more reliability.

WAP1.1 also includes the first version of WTA, the telephony functionality within WAP. However, it is stated that WTA in this version is mainly for testing purpose. WTA services and WAP push functions are key features in WAP1.2. WAP push functions are in Nokia and WTA application functions are in Ericsson. If WAP1.1 is upgraded and these services are running together, Nokia and Ericsson should be used dually.

In Thailand, WAP1.1.has been recently created and already launched some services to the end users. AIS and DTAC, the services providers are trying to extend new services and for this consequence they will upgrade the version in Thailand. They commonly use Nokia Server. In addition, AIS has Ericsson as well. But they will serve some different services to the end users. AIS intends to use Internet services and therefore they do not need to upgrade the system whereas DTAC intends to use Internet services as well as WTA services. To achieve the services in DTAC, they need to upgrade to WAP1.2. As for AIS, Nokia Server is sufficient enough. But as for DTAC, Ericsson should be used together with Nokia.

Both AIS and DTAC are going to launch WAP new services for the users in Thailand so that they can be able to use WAP services vastly in the near future.

Finally, WAP is the essentially part of wireless mobile system in global world. Continue the work of WAP by permitting applications and services to operate over all existing and foreseeable air interface technologies and their bearers; includes high speed technologies known as GPRS and third generation (3G) cellular.

5.2 Recommendations

This study recommends further studies to do how WAP can be sustainable in 3G and which software and hardware should be added in Gateway Server and then, which services are beneficial in real life after upgrading the Gateway Server. The study can go in the direction of how WAP can stand alone to stay in the future or how can it be communicated with the other technologies.

In addition, what kind of functionality of Gateway Server needs to add on the vendors' side. So that it can be able to stand in the third generation (3G).

APPENDIX

QUESTIONNAIRE

1. Which version do you have?
   - ❏ WAP1.1
   - ❏ WAP1.2
   - ❏ WAP1.2 above

2. When would you upgrade your WAP gateway server?
   - ❏ Within one year
   - ❏ Next two year
   - ❏ Next three year
   - ❏ Later

3. Which brand is the most appropriate one for your company?
   - ❏ Nokia
   - ❏ Ericsson
   - ❏ Motorola
   - ❏ Phone.com
   - ❏ No special preferring

4. Why you choose that brand?
   1. More functionality
   2. More reliability
   3. Cheap
   4. Easy to implement
   5. 1 & 2 only
   6. 1 & 3 only
   7. 1 & 4 only
   8. 2 & 3 only
   9. 2 & 4 only
   10. 3 & 4 only
   11. 1,2 & 3
   12. 1,2 & 4
   13. 1,3 & 4
   14. 2,3 & 4
   15. All
   16. Others

5. Could you rank the services that you would like to serve your company?
   - ----- **E-mail**
   - ----- **Ticketing** (eg. A business traveler who realize that an important meeting will extend over its planned duration, could use WAP enabled device to change his flight to next available connection)
   - ----- **Reservation** (eg. Call hotels directly to make your booking or send a reservation request online, and check hotel prices and available online)
   - ----- **Weather** (eg. Weather forecasts, weather on other location)
   - ----- **M-commerce** (eg. Salespeople entering orders into their company computer system by accessing their Internet securely, right from their phone)

- ----- **Calendar** (eg. You can manage your diary at a daily, weekly and monthly level using the personal calendar feature of WAP phone for business)
- ----- **Gaming**
- ----- **Banking** (eg. Account balances or payment activities)
- ----- **Finance** (stock quote, buy and sell stocks, interest rates, exchanges rate, ...)
- ----- **Unified messaging** (eg. While you are driving, as a voice message, using text to speech conversion)
- ----- **Call offering** (eg. The name of the calling party for an incoming call is presented to the user, who then has the option to accept the call, forward it or to respond with a text message)
- ----- **Phonebook**
- ----- **Address book**
- ----- **Call logging** (eg. Device's history: outgoing call dialed history, not answered incoming call missed, answered incoming call received)
- ----- **Paging**
- ----- **Call control features** (eg. Setup call, accept call, release call and send DTMF Tone)
- ----- **Call management** (eg. Incoming call selection, multiparty, call waiting, forwarding rules)
- ----- **Other**

BIBLIOGRAPHY

- www.wapforum.org

- www.nokia.com/corporate/wap/pdf/datasheet_NokiaActivServer.pdf

- www.ericsson.com/developerzone

- www.motorola.com/MIMS/ISG/wap/require.htm

- www.openwave.com/docs/products/resources/mobile_access_gateway_5.pdf

- www.ais900.com

- www.mobilelife.co.th

- www.dtac.co.th

- www.telstra.com

- www.genie.co.uk

- www.orange.co.uk

- www.btcellnet.co.uk

- www.one2one.com

- www.vodafone.com

- www.ukphoneshop.com

- www.lastminute.com

- www.tdap.com/tdap/wireless/wireless(CMG_person)html

- www.idc.com/data/europe/Content/EUO41200PR.htm

- www.vksoftech.com/freshvpn/wap/wapatvk.htm

- www.the-arc-group.com/ebrief/2000/wap2000/WAP_conference_summery.htm

- www.4k-associates.com/IEEE-L7-WAP-BIG.html

- www.swisscom.com/gd/information/press_releases/1999/added_service-en.html

- www.mg.co.za/mg/pc/2000/03/02mar-wap-iobox.htm

- www.cs.ait.ac.th/~a99426/wapspecial.html

- mdev.temple.edu/garner/datapro/62236-1.htm

- wap.bluedomino.com/faq/chapter6.html

- www.allnetdevices.com/faq

- www.bellatlantic.com/foryourhome/MD/Products/additional.html

- Cooper R.D. & Schindler, S.P. (1998). Business Research Methods (6th Ed.). Irwin, New York

- Philip Kotler (1999). Marketing Management (The Millennium Ed.). Prentice Hall International, Inc.

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