ISTANBUL UNIVERSITY –
JOURNAL OF ELECTRICAL & ELECTRONICS ENGINEERING

YEAR : 2005 (1249-1254)
VOLUME : 5
NUMBER : 1

MOBILE COMMERCE

M. Nusret SARISAKAL **M. Ali AYDIN**

Istanbul University, Engineering Faculty, Computer Engineering Department
34850, Avcilar, Istanbul, Turkey

E-mail: nsarisakal@istanbul.edu.tr E-mail: aydinali@istanbul.edu.tr

ABSTRACT

The opportunities offered by the Internet have made the concept of e-commerce very crucial as it makes the whole world a globular marketplace that serves 24 hours a day. The accessibility constraints of the Internet are becoming a less important obstacle as mobile communication devices become widespread. First of all it is clear that usage of mobile devices like cellular phones are getting popular day by day. Mobile Internet services supplied by these mobile devices eliminate the need of a stationary connection point and offer a more personal content with special services given. In this paper we argue on the concept of M-commerce and the facilities presented by it. An online reservation application is developed as an example.

Keywords: *E-commerce, M-commerce, WAP, WML*

1. INTRODUCTION

As the Internet becomes widespread, web-based applications get more complicated and today's trend makes it necessary to develop applications for e-commerce, B2B, B2C, and M-commerce that require advanced technological infrastructure instead of simple web pages which are out of trend. Today, database driven systems are used widely on most of the web sites. This, increased the cost of web-based projects (both time and financial) and new standards that decreased these costs became desirable. XML (Extensible Markup Language) is one of these standards. With the help of the flexibility offered by XML, data exchange between incompatible systems became an easy event. Nowadays, mobile communication service providers are seemed to be busier than before. WAP applications are the most important of all for mobile communication. Using mobile devices like cellular phones that support WAP technology, makes it possible to access the Internet, independent from the location of the mobile user without need for any additional device.

2. E -COMMERCE

With the increased online retail sales, the concept of e-commerce became more popular. Companies using communication and information technologies surpassed in the

Received Date : 07.02.2003
Accepted Date: 30.12.2004

international competition about the market shares [1]. E-commerce is a concept concerned with selling and buying various goods and services using computer technologies, electronic communication lines, and other related technologies (like smart-cards, electronic fund transfers, POS terminals, fax, etc…). It can also be stated that e-commerce is the process of shopping where the payment is made via the Internet. Usually when e-commerce is mentioned, it's thought to be the commerce, which takes place on the Internet or other networks as well [2].

Benefits gained by E-commerce

- E-commerce gives everyone equal accessibility.
- In the service providing companies, process costs are reduced dramatically as web pages are used instead of representatives.
- Most of the activities in the company are made with lower costs and the competition between producers increase. Also it can be stated that information flows are faster and can be used effectively.
- Customer demands can be responded in shorter periods as producing, testing, and determining customer demands are faster.
- Purchasers can be served at their homes.
- Different kinds of products can be offered.
- Production costs are reduced.

3. MOBILE COMMERCE

The rapid improvements in the wireless communication technologies and advantages available in the Internet presented mobile commerce as a new concept. The Internet, which makes the whole world a globular marketplace that serves 24 hours a day, overcame the accessibility constraints by the mobile communication devices. First of all it is clear that usage of mobile devices like cellular phones are getting popular day by day. Mobile Internet services supplied by these mobile devices eliminate the need of a stationary connection point and offer a more personal content with special services given. "M-commerce is the general process of selling goods and services and make the payment with the help of mobile phones and similar devices"[3]. M-commerce is a new age of e-commerce as it eliminates the need of a stationary connection point like PC or TV. It is likely that the potential waiting in the M-commerce is going to change the habits about desired products and services [4]. Common M-commerce applications are listed below:

- Mobile Instant Messaging (MIM)
- Multimedia Messaging Service (MMS)
- Mobil Financial Services (m-bank, m-stock exchange, m-money, m-invoice etc.)
- Mobil Security Services
- Mobil Shopping (m-reservation, m-auction, m-post card etc.)
- Mobil Advertising

Mobil Dynamic Information Management (m-subscriber, m-passport, m-games, m-music etc.)

4. MOBILE TECHNOLOGIES

A.WAP (Wireless Application Protocol)

WAP is a system that supplies Internet access to the GSM featured device users. The users can access services by wireless devices like cellular phones and pagers that support WAP technology.

B. GPRS (General Packet Radio Services)

GPRS based mobile communication devices reach greater speeds than that of WAP based ones. Furthermore GPRS platform is an appropriate media for WAP based services.

C. 3G (Third Generation)

Briefly, 3G is the rising technology for wireless networks that will take over in the near future. Unbelievable speeds will be reached in mobile communication when 3G networks enter our lives.

D. I-mode

DoCoMo (Do Communications Mobile), the research department of NTT founded for mobile communication issues, announced worlds first commercial Internet service called i-mode. i-mode gives its subscribers access for both private contractual sites and i-mode sites by using various kinds of mobile devices.

E. Bluetooth

Bluetooth is a communication standard which makes the data exchange possible between human-machine and machine-machine for wireless medium [4]

5. WAP-WIRELESS APPLICATION PROTOCOL

WAP is an open, global standard that gives the mobile users, access to information and services using wireless devices. WAP, without the need to attach any wire, works on many cellular phones and PDAs (Personal Digital Assistant) that support its technology. WAP's goal is to supply an interactive connection medium between services, information and users, which is safe and fast. WML language used for WAP technology, presents an optimum environment that eliminates the usage of keyboard and offers easy navigation with one hand for tiny screens. WML is an example of specially designed language for wireless applications and works on XML principles completely [5].

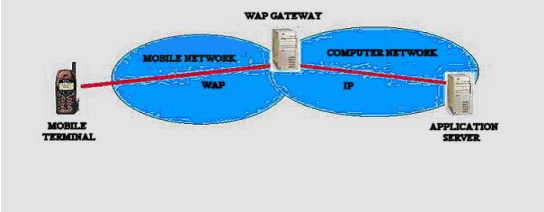

Figure 1. Working principle of WAP

Left side of Figure 1 illustrates GSM cellular phone networks (Mobile Network), and on right side computer network is illustrated. WAP gateway, which is placed between these networks, is software working on a computer. After attaching WAP gateway software installed computer to networks, the application placed on the web server and WAP pages located in the Internet will be available from cellular phones. A WAP page designed to be viewed from cellular phones, should be coded with WML as WML is designed for tiny screens for maximum usage.

5.1 WML (Wireless Markup Language)

WML (Wireless Markup Language) that was known as HDML (Handheld Devices Markup Language) before, is a language that presents the text parts of Web pages on cellular phones and PDAs. A WAP browser is required in order to view WML pages. These special browsers, akin to HTML based ones, hide some data from the user and include meta-tags that optimize pages for search engines. In other words, WML is a tag-based browser language, offering screen management, data input, Hyperlink and navigation. It is the inheritor technology after HDML and HTML that is derived from XML language, which is a W3C standard [6,7].

5.2 WAP Architecture

WAP has an architecture for data transferring that resembles OSI layers model (Figure 2). In this architecture the lower layer presents some functionalities to the layer above it. Consisted of only five layers, both applications and protocols reside in every layer of WAP model. These layers are Application, Session, Processing, Security and Transfer when counted downwards. Application developers are especially interested in viewing language WML and Script language WMLScript that are located in Application layer.

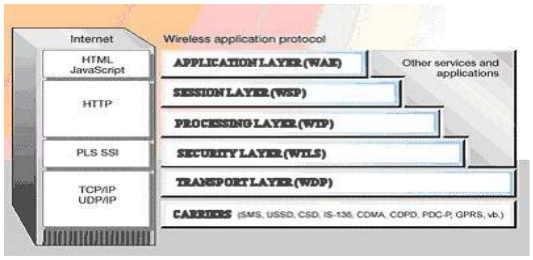

Figure 2. WAP Architecture [5].

Wireless Application Environment - WAE
WAE is a multifunctional application environment based on Web and Internet technologies. Its most important mission is to provide a platform independent communication environment for different devices.

Wireless Session Protocol - WSP
WSP presents services to the Application layer. It makes clients comfortable in WAP applications. This means that session between clients and WAP Gateway is established after connection. Simply a session is started, data exchange is made and the session is closed.

Wireless Transaction Protocol - WTP
In this layer WTP is used and actions are regulated. There is no need for packet control in the explained data transfer methods.

Wireless Transport Layer Security Protocol - WTLS
WTLS is the security layer in WAP architecture. This protocol works on TLS that is the continuation of SSL. WTLS supplies security for data, personality rights and intruder attacks.

Wireless Datagram Protocol - WDP
WDP plays role as a connection point between different carrier networks that presents WAP protocols and carriage services. These can also be defined as the connection point between WAP and physical networks.

In order to access a Web site from a mobile phone, URL must be written in the browser. Mobile phone browser encrypts the requested URL using Wireless Transport Layer Security (WTLS) and sends it to a WAP gateway server using Wireless Session Protocol (WSP). WSP differs from HTTP by transferring data in binary format rather than text-based format. WAP gateway server, interprets the request, converts this to the counterpart HTTP request and sends it to the Web server. Web server interprets this request and determines the sources required. If the URL points to a file, the server transfers that file to the client. If the URL points to an ASP page, the Web server processes ASP codes before sending the results to WAP gateway server. The file format returning from this step must be a WML document format. Then the Gateway server deletes the unnecessary tags, converts the WML document into binary format and sends it to mobile phone browser. The browser parses the WML and views the resulting page to the user. WAP architecture works on these principles [6,7,10].

6. M – COMMERCE APPLICATION

In order to design this reservation system, there were plenty of factors to be thought of, well-arranged basic processes and sub-processes should be stated systematically. In figure 3, application's conceptual working principle is illustrated. End users and so customers access to the application resident on the Web server through the Internet and make their reservation operations. Database is also stored on this Web server physically and it's attached to contractual foundations. We are going concentrate on the interface between end user and Web server. In our example a tourism agency is working for different airline companies and presenting reservation service for both domestic and international flights of these companies.

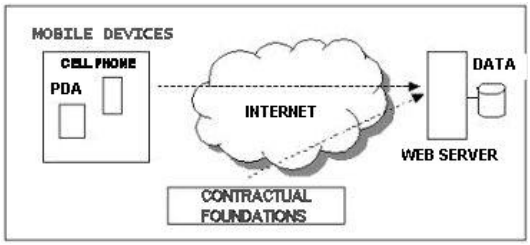

Figure 3. Conceptual infrastructure for WAP Application

The user will access to the WAP site of Tourism Company using mobile devices that he/she posses and makes a selection for desired operations from the listed links. In our application there are three basic operations available, which are explained below. Screenshots for the application can be found in Figure 4.

1. Giving a Reservation Instruction (Figure 4a)

a. Selection of the country to be traveled from the list.
b. Selection of the city to be traveled from the list.
c. Enter flight date.
d. Selection of the preferred airline company.
e. Suitable flights that see the desired criteria are listed and the user chooses appropriate one from the list.
f. The user makes selection about the customer class and ticket quantity.
g. Flight fee and seat number will be shown to the user.
h. Like identity information the user will enter name-surname and phone number.
i. Finally the reservation number will be shown to the user.

2. Querying Reservation Information (Figure 4b)

a. The user will enter the reservation number.
b. The user will enter the same phone number as he/she has entered when giving the reservation instruction in order to check identity.
c. Date, Departure-Arrival Place, Flight Number, Seat Number, and Flight Fee information will be shown to the user.

3. Canceling the Reservation (Figure 4c)

a. The user will enter the reservation number.
b. The user will enter the same phone number as he/she has entered when giving the reservation instruction in order to check identity.

The reservation will be cancelled and an exclamation will be shown that informs the user.

a) Giving a reservation instruction

b) Querying reservation information

c) Canceling the reservation

Figure 4. Screenshots of M-Commerce Application

7. CONCLUSIONS

As globalism is a rising trend in today's world the companies need to take advantage of e-commerce that combines the Internet and mobile technologies in order to market their products all over the world easily by accessing a huge customer society and these companies have increased their market share. On the other hand, the customers gain the opportunity to choose from alternative products and make the payment online without need to go to the store and paying no transport expense.

Developing technology of mobile communication made mobile tools secure for commerce and payments. Combining Internet and mobile technology brings a new concept called mobile commerce. In this paper we argued on the application platform for wireless access to

Internet called WAP and another concept called WML that is derived from an increasing trend today and seem to take over in the future called XML. XML and its derivatives can be said to be today's and future's data storing and transferring technologies. On the other hand, WAP offers wireless device users Internet services using WAP featured cellular phones or PDAs. The applications available in WAP technology includes:

- ✓ Internet based (POP/SMTP) e-mail usage,
- ✓ Information retrieval and database querying on the Internet,
- ✓ Scheduler or news (e.g., stock exchange services),
- ✓ E-commerce operations. These applications are called m-commerce today.

Despite the fact that WAP is a crucial technology, investments are not big enough in business and commerce world. From a wide application pool of WAP implementations we chose to develop a reservation system that is a mobile commerce in fact. The difference between the WAP applications that we have developed before [8,9,10] and this new one is that the new application is a m-commerce application. As a further work we are willing to develop an application for Insurance Company Agencies. Our new goal is to implement the online payment procedure in that new application in order to make it a full m-commerce application.

REFERENCES

[1] Sarısakal M. Nusret, "Veri Tabanlarının E Ticaret Uygulamalarında Kullanılması–MNS Sigorta Şirketi Otomasyonu", *I.U. Journal of Electrical & Electronics,* Vol. 1, No. 1, pp 41-48, 2001.

[2] Elektronik Ticaret Temel özellikleri ve Elektronik Ticarette XML kullanımı Hacettepe Üni. Müh. Fak. Bilg. Müh. Bölümü Gülcan Baser & Rukiye Sütbas Ankara, Nisan 2002

[3] What is m-commerce, http://www.3ginsight.com/what_is_mcom.htm

[4] Geleceğin Ticareti:Mobil Ticaret Ahmet BÜKE Uzman Enformasyon ve Dokümantasyon Müdürlüğü, İzmir Ticaret Odası, Haziran 2002.

[5] http://www.wapforum.org

[6] Regis J. (Bud) Bates Jr., *Wireless Broadband Handbook* – ISBN:0-07-137161-3

[7] Frank P. Coyle, *Wireless Web* - ISBN:0-201-72217-8

[8] Altan Z, Sarısakal M. Nusret, **"**OTOS: A Turkish Tool For Students Delivering The Faculty Information Using WAP Technology", NL'2002 *World Congress, Networked Learning In A Global Environment*, May 1-4, Technical University of Berlin, GERMANY Proceedings, pp. 117, 2002

[9] Sarısakal M. Nusret, Yarkan Serhan **"**WAP Destekli Öğrenci İşleri Bilgi Otomasyonu: SAA-W (Student Affairs Automation-WAP)", *BTK'2003 Bilgi Teknolojileri II. Kongresi* Pamukkale Üniversitesi, Denizli, *1-4* Mayıs 2003.

[10] Sarısakal M. Nusret, Aydın M. Ali, **"**E-Ticaretin Yeni Yüzü Mobil Ticaret", *Havacılık ve Uzay Teknolojileri Dergisi*, Vol. 1, No. 2, pp 83-90, 2003.