

Development of a Mobile Airline Reservation System

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ABSTRACT

Currently, many people and companies are embracing the mobile air line reservation system. Reservation systems had been implemented in many parts of the world for decades, initially from manual to computerized reservation system. Mobile, airline, bus ticketing and automated reservation systems are effectively increasing in the market. As a result of the fierce competition in the airline sector, organizations within this sector are in the process of developing systems that will improve their services to customers. Consequently, an automated seat reservation system has continued to be an open area of research.

The objective of this paper is to develop a mobile airline seat reservation system that will assist the public in gaining an easier and faster way for seat reservation and providing them with more options to book a ticket for traveling on real time.

The system was developed using the Wireless Markup Language (WML) as front-end, MySQL 4.0 database management system as back-end and PHP (Hypertext Preprocessor) as the server-side scripting language.

The developed system will assist the airline customers and operators in providing cost-effective system that will make possible bookings and seat reservation on real-time using a mobile phone, irrespective of location of a user.

Keywords: WML, WAP, Mobile Internet, Airline Reservation, Mobile phone.

1.0 BACKGROUND INFORMATION

The internet has really changed the way transactions take place and has being able to remove the barrier of time and location. WAP provides a markup and a protocol that opens the possibility of the wireless environment and gives players

from all levels of the business industry the opportunity to access an untapped field that is still in its infancy. WAP (Wireless Application Protocol) is a protocol for accessing information and services from wireless devices. WAP is defined and coordinated by the WAP Forum, a consortium of industry players who have

interest in information and services to customers over the Internet through mobile devices, particularly mobile phones. The objective is to define a standard application framework that will be universal, and will allow seamless interoperability of all of the components required for mobile access to network applications. Figure 1 shows the basic

WAP architecture. It is made up of three components: the WAP browser, the WAP gateway and a server on the Internet. The mobile device connect to the Internet through the WAP gateway. This WAP gateway translates all the protocols used in WAP to the protocols used on the Internet.



Figure 1: WAP architecture Source:(Singel'ee et al 2005)

Most of the protocols in use today make a set of assumptions about the environment, such as the type of network that will be available (particularly from the point of view of bandwidth and reliability), the types of devices that will be accessing the services, and the types of services that will be available for access. These assumptions do not necessarily hold true in the wireless world such as use of mobile phone. There are a number of characteristics applicable to a mobile:

- **Form Factor** — a mobile device needs to be small enough to move around and ideally to be able to fit in the palm of the hand or in a shirt pocket.
- **CPU (Central Processing Unit)** - In a mobile device, the CPU is not as

powerful as a PC (Personal Computer), and is almost certainly of a different architecture.

- **Memory and storage** — The memory and storage unit of a mobile phone is a lot more constrained than on a PC, because handset manufacturers are cost-sensitive, and thus reluctant to add any additional components unless it is really necessary. Also some mobile devices do not have a persistent storage of their own.
- **Battery** — Mobile devices are battery powered, and the need to have the device available for long periods of time means that the processing CPU cannot make significant demands on the battery.

- **Display** — This is typically limited in size and resolution, and often cannot cope with color.
- **Input** — Mobile devices typically do not have keyboards and if they do they are limited in size. Therefore, input is more challenging than on a typical PC (Howell, 2000).

1.1 Wireless Networks versus Fixed Wireless Networks

A wireless network is considerably different from a fixed-wired network. Reliability profiles are considerably different, particularly where users move in and out of coverage areas, disappear into tunnels, and so on. Latency may also be an issue in wireless networks. An additional factor is that there are a number of mobile network standards in place across the world, and they do not interoperate seamlessly. Some countries even have incompatible standards in different regions.

The Wireless Application Protocol is designed to work with most wireless networks such as GSM (900, 1,800, and 1,900), Digital European Cordless Communication (DECT), Time Division Multiple Access (TDMA), Personal Communication Services (PCS), Code Division Multiple Access (CDMA), Circuit Switch Cellular Data (CSD), Cellular Digital Packet Data (CDPD) and

the General Packet Radio Service (GPRS) (Webopedia, 2006).

The WAP Specification complements existing wireless standards. For example, it does not specify how data should be transmitted over the air interface; instead, it is intended to sit on top of existing bearer channel standards so that any bearer standards can be used with the WAP protocols to implement complete product solutions. It is also independent of any particular device, instead, it specifies the bare minimum functionality a device must have, and it has been designed to accommodate any functionality above that minimum. The WAP programming model is similar to the World Wide Web (WWW) programming model.

1.3 Wireless Markup Language (WML)

WML is a generalized markup language that is optimized for limited capability devices and networks. WML documents are an XML document type. It has also borrowed from Hand-held Device Markup Language 2.0 (HDML 2.0) (Phone.com's proprietary markup language) and HTML. WML is a meta-language that provides a format for describing structured data (Musiano & Kennedy, 2000). WML is designed for specifying user interface behavior and

displaying content on wireless devices such as phones, pagers and personal digital assistant (PDAs). WML and PHP can be combined as a development tool for mobile client application while PHP perform the server-side scripting such as database queries. With server-side scripting, dynamic page content can be generated, forms data collected and cookies handled.

WML is based on a deck of cards metaphor, in which a document is analogous to a deck, and a card is approximately analogous to an individual screen or unit of display. The unit of transmission between the gateway and the mobile device is the deck, and the unit of user interaction is a card within the deck. Rather than focusing on the details of the rendering of User Interface (UI) elements, or of how the user should interact with the browser, WML focuses on the semantic meaning of the element. Separating the rendering from the meaning allows the actual rendering and implementation on the device to be adapted to the capabilities of the device.

WML elements support a number of features including text and images, the ability to interact with the user, navigation capabilities and variables. Layout and presentation hints can be included with text and images, but it is ultimately up to the browser how it renders the content.

Templates can be used to specify a set of characteristics that apply to all cards in the deck.

1.4 Benefits of WAP/WML

The following are some of the benefits of WAP/WML:

- **Operators:** For Wireless network operators, WAP promises to decrease churn, cut costs, and increase the subscriber base both by improving existing services, such as interfaces to voice-mail and prepaid systems, and facilitating an unlimited range of new value-added services and applications, such as account management and billing inquiries. New applications can be introduced quickly and easily without the need for additional infrastructure or modifications to the phone. This will allow operators to differentiate themselves from their competitors with new, customized information services. WAP is an interoperable framework, enabling the provision of end-to-end turnkey solutions that will create a lasting competitive advantage, build consumer loyalty, and increase revenues.
- **Content Providers:** Some mobile applications are written in WML, which is a subset of extensible markup language (XML). WAP enables

content and application developers to grasp the tag-based WML that pave the way for services to be written and deployed within an operator's network quickly and easily. As WAP is a global and interoperable open standard, content providers have immediate access to a wealth of potential customers who seek such applications to enhance the service offerings given to their own existing and potential subscriber base. Mobile consumers are becoming keen to receive increased functionality and value-added from their mobile devices, and WAP opens the door to the untapped market.

- **End Users:** End users of WAP benefit from easy, secure access to relevant Internet information and services such as unified messaging, banking and entertainment through their mobile devices. Intranet information such as corporate databases can also be accessed via WAP technology. Users are able to receive and request information in a controlled, fast and low-cost environment, a fact that renders WAP services more attractive to consumers who demand more value and functionality from their mobile terminals.

1.5 Mobile Commerce (M-Commerce)

M-commerce (mobile commerce) is the buying and selling of goods and services through wireless handheld devices such as cellular telephone and personal digital assistants (PDAs). M-commerce is a next-generation e-commerce and it enables users to access the Internet without needing to find a place to plug in. Advances in Internet and network technology and the rapidly growing number of mobile personal devices result in the fast growth of e-Commerce. The development and adoption of mobile technologies have made new services and related commerce more and more available. Some of the factors that contributed to this development are the tremendous development of the Internet and related technologies.

Electronic commerce is the electronic exchange (delivery or transaction) of information, goods, services, and payments over telecommunications networks. E-commerce activities include establishing and maintaining online relationships between an organization and its suppliers, dealers, customers, strategic partners, regulators, and other agents related to (or in support of) traditional delivery channels. Other activities include (Tarasewich *et al* 2002): product searches

and comparisons by consumers; product information presentation and promotion by manufacturers and retailers; post-purchase customer support; communication between seller and shippers or banks; and other activities that are not directly related to the transaction itself.

Mobile devices will become the basic business enabler for e-commerce (Marra A. 2000). The fundamental concept of commerce is to exchange goods and services in return for payment or in the case of a barter economy in return for other goods or services. This concept obviously only works in the interest of both parties if basic security requirements such as the reliability of a transaction can be guaranteed. In the non-mobile IT world, most of the involved challenges have already been addressed and at least conceptually solved. The different characteristics of non-mobile E-commerce and M-commerce and their unique usage patterns entail various additional security threats mainly caused by the fact of mobility itself (Edgar, 2001).

The rest of the paper is organized as follows. Section 2 discusses the objectives of the research. Systems design and implementations are contained in section 3. Section 4 enumerates the result

and discussions and section 5 contains the concluding remarks.

2.0 OBJECTIVES

The objective of this paper is to develop a mobile airline seat reservation system that will assist the public in gaining an easier and faster way for seat reservation and providing customers with more options to book an airline ticket on real time.

3.0 SYSTEMS DESIGN AND IMPLEMENTATION

The system was developed using the Wireless Markup Language (WML) as front-end, MySQL 4.0 database management system as back-end and PHP (Hypertext Preprocessor) as the server-side scripting language to enable communication between the front-end and back-end. Modular programming technique was applied during the program writing stage. The sequence diagram for requesting for flight information and the class diagram for the system are described in Figure 2 and Figure 3 respectively.

The testing of the system was done using the Openwave SDK V7 simulator which serves as a means to deploy the software on a Personal Computer in the absence of the WAP micro browser and gateway.

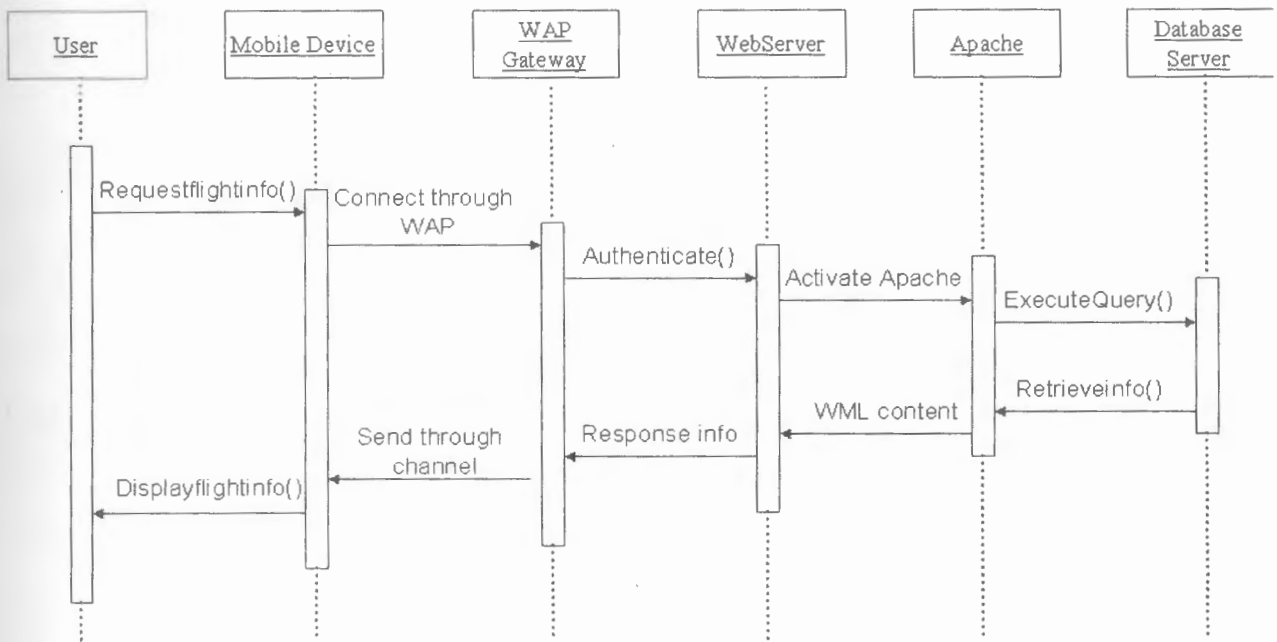


Figure 2: Sequence Diagram for requesting flight information

The System Functions

Described below are some of the functionalities of the application presented in card form.

Welcome Card

This card can be likened to the home-page in a web application. It is the first card the user interacts with. It also gives the user the option of either logging in, if the user is already an existing user, or registering, if the user is new to the system.

Access Authentication

This card requests for the details of the already existing user, that is, the user's username and password to enable the user access to the system and perform

operations. Figure 4 contains a welcome and authentication page of the system.

Registration Card

The registration card enables registration of new users. It consists of fields such as surname, other names, age, nationality, address, username and password. The username and password at this point has to be distinct and not already used.

Flight Enquiry Card

This card enables the user to input his/her take off point of location such as source airport and destination airport, so that it is checked up in the database if it exists. The enquiry card is contained in Figure 5.

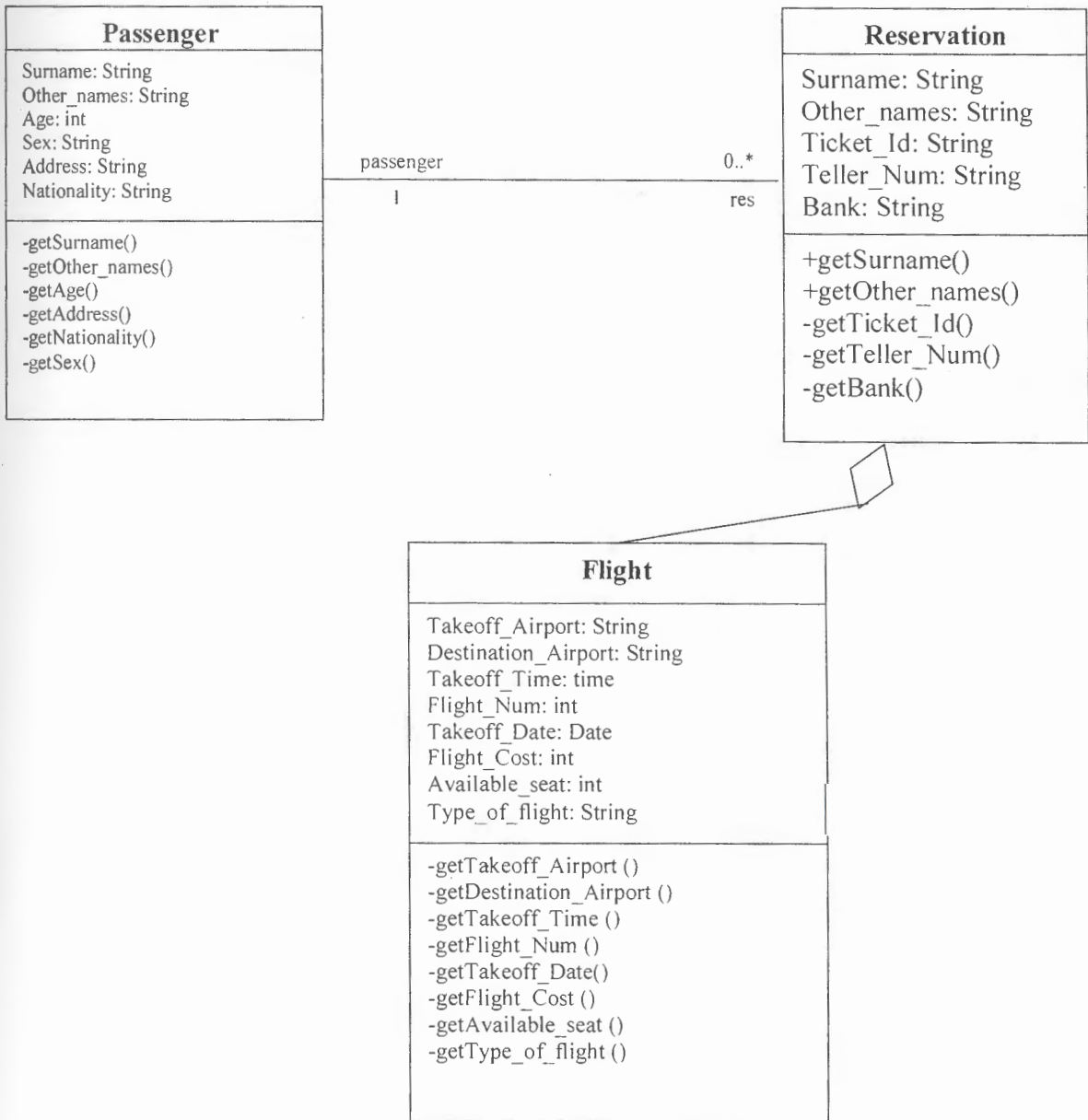


Figure 3: Class diagram of Mobile Airline system

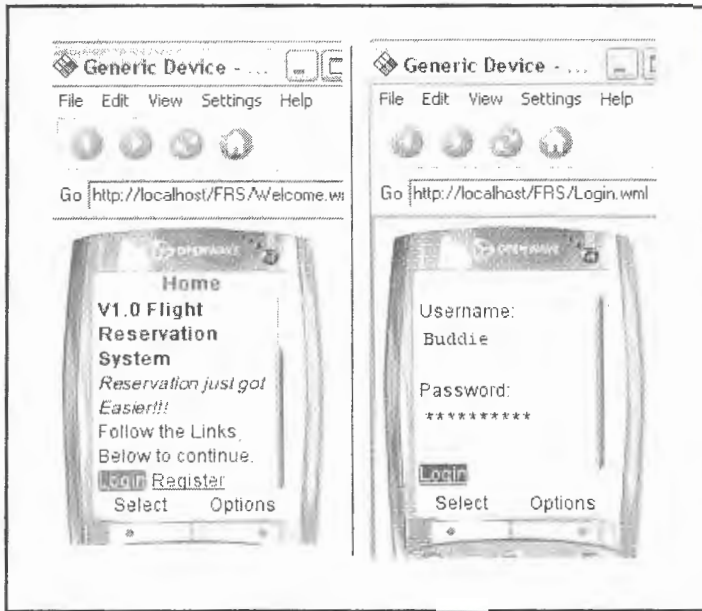


Figure 4: Welcome and authentication page



Figure 5: Flight Enquiry Card

Server-side Script

This card outputs the list of all flights going in the route selected by the user with details such as flight time, flight date, flight cost, and available seats. The user is

then presented with the option to make a reservation based on this list. The flight reservation information card is contained in Figure 6.

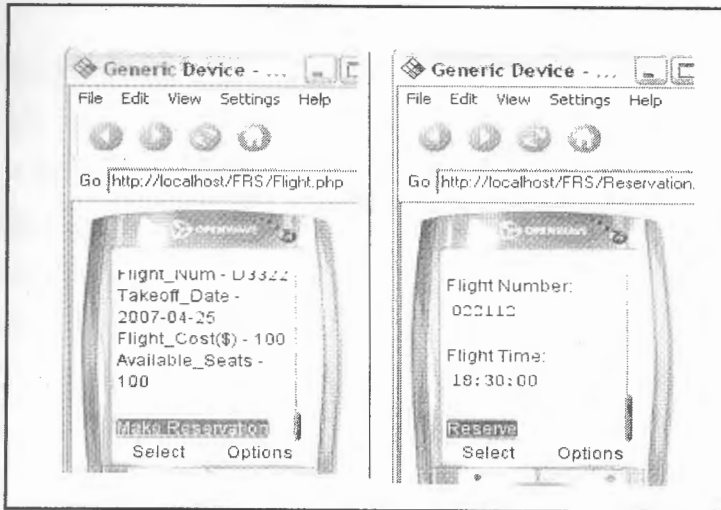


Figure 6: Flight reservation Information Card

Reservation Card

This card collects details of the user making a reservation. These details include Surname, other names, Flight number, teller number, and bank paid to.

4.0 RESULTS AND DISCUSSION

The system was designed such that any level of user can easily use it. To start and run the application, the user need to type the URL that refers to the index or home page. If the URL is properly typed, a connection to the server is established and the welcome screen is displayed. The user can easily navigate back or front without previous knowledge of the mode of operation of the application. The application is user friendly. The modular approach of programming which is a prominent feature of the modern system of programming was applied. Each module was designed as a deck of cards,

which can be activated at the different menu as the user navigates through the system just like going from one web page to the other, or from one site to the other. This modular approach made the program more interesting and it enhances easy modification and debugging.

The restrictions of mobile devices such as size of the display screen are major issue in user interface design for mobile phones. The screen display is made as brief as possible for proper paging. Scrolling is also possible to enable user move the displayed information up or down on the screen, one line at a time. Each screen carries sufficient instructions as to what operation is being performed at any time the user selects a function. Users can edit a wrongly typed text and can also modify any default value set by the application.

5.0 CONCLUSION

In this study, the authors have developed a mobile airline seat reservation system using the Wireless Markup Language (WML) as front-end, MySQL 4.0 database management system as back-end and PHP (Hypertext Preprocessor) as the scripting.

The prototype application has been tested locally (on a localhost computer) using a mobile device emulator. A WAP

gateway is required to fully deploy the application on a web server. The developed system will assist the airline customers and operators in providing cost-effective system that will make possible bookings and seat reservation on real-time, irrespective of location of a user using a mobile phone.

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