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# MOBILE BANKING — INTERDISCIPLINARY SOLUTION

**Dimitar Birov, Vladislav Zhelyazkov**

The current article presents an interdisciplinary approach and a mobile banking solution, which is a symbiotic combination of advanced modern software disciplines. We consider the technology and logical model of the implemented solution as an example for a successful experiment in the wireless technologies sphere. A similar approach can be generalized and applied to *e*-commerce and *m*-commerce.

**1. Introduction.** During the last 2-3 years, wireless communication has stimulated interest in both the science and business circles. Attractiveness is due to the lack of a common technology in the creation of effective solutions to supply mobile services.

The current article presents an interdisciplinary approach and a mobile banking solution, which is a symbiotic combination of advanced modern software disciplines. We consider the technology and logical model of the implemented solution as an example for a successful experiment in the wireless technologies sphere. A similar approach can be generalized and applied to *e*-commerce and *m*-commerce.

WAP (Wireless Application Protocol) [3,4], which was developed by a group of leading companies in the communications industry as the standard for wireless communication, serves as a basis for the presented technology model.

Figure 1 presents the technology model created in accordance with the model of WAP-based mobile applications. The main parts of the model are: a mobile client – mobile

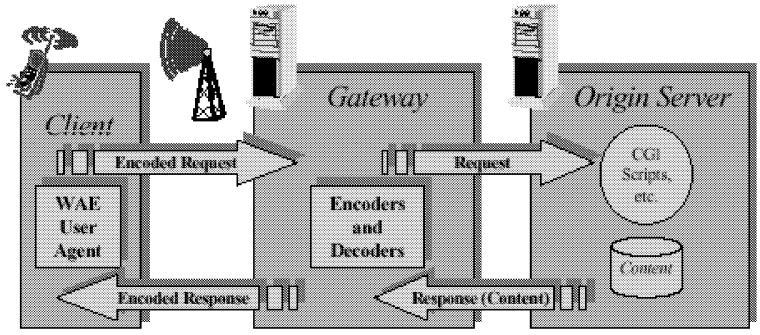


Fig.1. Model of WAP-based application

device with wireless communication capability and built-in software micro-browser, in particular a mobile phone; a server which performs information services; and a WAP gateway, whose function is to translate and relay the client requests to the server as well as relay back the server responses.

The functional characteristics of the WAP gateway determine its architectural components - a protocol gateway, whose purpose is to translate the requests from the WAP protocol stack (WSP, WTP, WTLS WDP) to the WWW protocol stack (HTTP, HTTPS TCP/IP) and back and a content encoder/decoder, which is needed in order to minimize the transfer over the wireless network by means of encoding and decoding data for transfer from and to the client. For realization purposes, a Nokia WAP Server [7] was experimented with.

The server performing the information services is a HTTP server that provides content for rendering and visualisation on the mobile device.

**2. Application model.** The suggested mobile banking solution is a WAP-based distributed system, designed according to a three-tier business model [1] – a software technology which has been popular lately among business application developers – and developed on MS Distributed iNternet Architecture (DNA) application platform [5]. Figure 2 presents the model of the DNA application.

According to the three-tier model, the application is designed as mutually independent and communicating tiers. The first tier defines the presentation services, the second one determines the business services, and the third one is dedicated to data services.

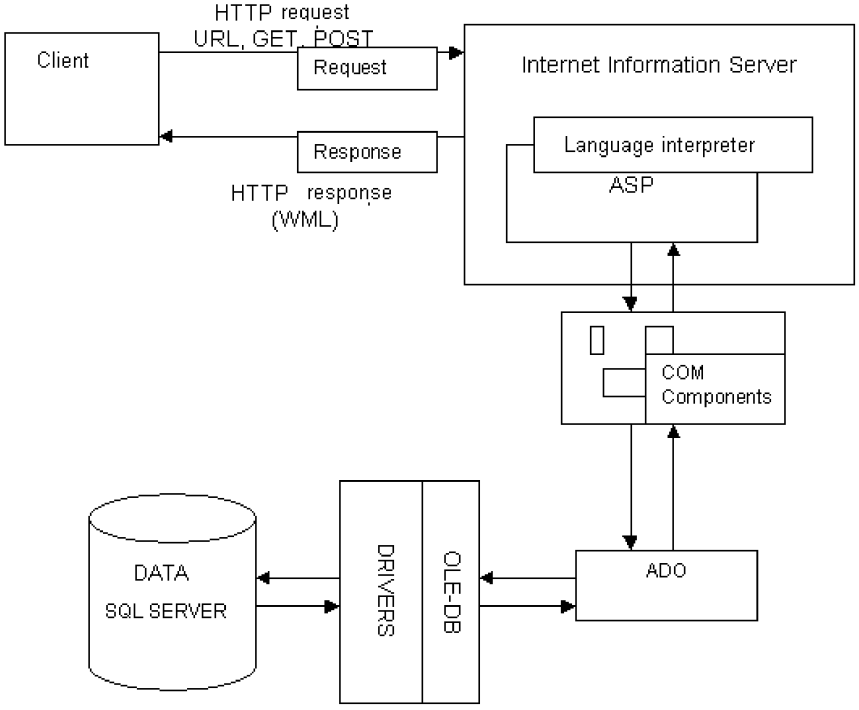


Fig. 2. Technology model of DNA application

**2.1. Presentation services.** The characteristics of the model with thin client and communication environment without permanent connection determines the main direction of the development – creation of a server-side dynamic application, which completely manages business logic, generates the relevant content and defines user interaction.

A Microsoft Internet Information Server [6] with ASP (Active Server Pages) extension is used as an HTTP server. The interaction with the client is represented by the ASP components and consists of Active Server pages, additional ASP files, image files. The programming language used is VBScript.

**2.2. Business services.** The ASP capability for interaction with external components is intensively used. The external components are implemented on Microsoft's object-oriented technology for interaction between software modules Component Object Model (COM) [5]. These components serve as object libraries representing application business logic. Data access is realized through ActiveX Data Objects (ADO).

The integration of COM components with ASP impacts the communication with the user. The consecutive actions of the user determine the navigation through the different pages. Passing of parameters to specific pages is executed using fields and standard POST method or in some cases the parameters are part of the URL of request to the HTTP server.

The WML content, generated by the ASP application, is subject to the limitations of visualization on the display of a device with the size and functionality of a mobile phone. A representation mode that utilizes several cards is used for the visualization of common-type information.

**2.3. Data services.** The data management and storage tier consists of the system database and the existing bank financial accounting system.

The structure of the system database is based on the specifics imposed by the mobile banking application. Upon its creation, a logical ER-model and a corresponding physical structure are defined.

**3. Implementation.** When developing the solution, an iterative approach for analysis, design and implementation was followed which in turn was regulated by the technology model.

The analysis determines in principle the user model of the system. It is based on the services which are offered to the bank customers. There are two types of services, depending on their purpose: information services – actual balance, account statements, liabilities on public services, currency rates, state of transfer or payment; active services – transfer of funds between own accounts, transfer of funds to partner accounts, and bill payments.

The method used during the design phase allowed the creation of a system architecture, which is not directly dependent on particular bank information, accounting and payment system. In the proposed implementation, the interface to the financial and accounting system is implemented via a MS SQL Server of the institution.

UML use cases, use case diagrams, and sequence diagrams have been used as means of specification of the user model and generation of the object model of classes that carry through the business logic. Rational Rose 2000 has been used as a planning tool.

The analysis of the messages between the classes in the sequence diagrams clearly defines the main methods of these classes. The common characteristics that stand out

identify the design patterns which are the basis for creating an effective hierarchical object model.

The class attributes and methods are determined by pre-defined rules for every use case. It is easy to determine the logical separation of the classes in packages. Every package groups classes that have a common logical purpose. The full class specification is accomplished by a round-trip engineering process. According to the technology model the packages from this middle tier are implemented as COM components – ActiveX DLLs, and Microsoft Visual C++ 6.0 and Microsoft Visual Basic 6.0 have been used as development tools.

The interdisciplinary approach chosen by the authors guarantees a good and secure solution to one of the fundamental problems that invariably accompanies the mobile applications, namely the lack of ability to store information about the connection state – the so-called stateless model. With the introduction of additional session management for the active client, the system ensures the rejection of any unauthorized service request, initiated without prior login.

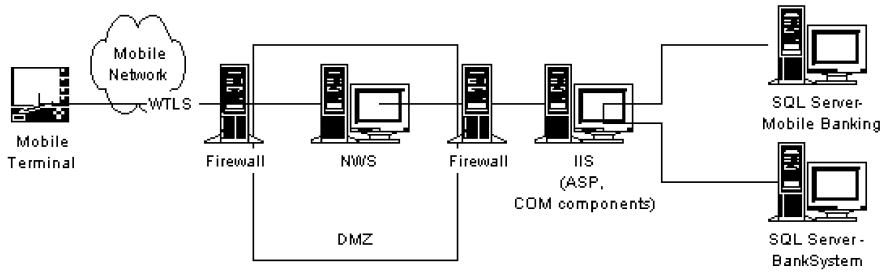


Fig. 3. Physical model

Figure 3 illustrates the physical model of the proposed solution. The model includes the applied security strategy that prevents from any attempts for unauthorized access.

**4. Conclusion.** The suggested interdisciplinary solution allows for achieving independence of the user interface from the particular banking financial and information system. The conducted tests with banking systems that have different management logic and data storage methods allow to conclude that the integration can be achieved within a very limited timeframe.

The reusability of developed COM components makes them suitable for usage in systems with similar functionality, for example in phone/fax banking solutions.

The achieved independence of the technology model from the logical model allows for the realization of different technology solutions based on other application environments and platforms, for example Java (JSP, Servlets, EJB), Oracle.

The functionality of the system can be increased easily. There is a possibility of offering additional services, with the integrated bank system being the only limiting factor.

The localization of the solution is realized by using UNICODE as standard for WML.

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Dimitar Birov
Vladislav Zhelyazkov
Faculty of Mathematics and Informatics
Sofia University
5 James Bourchier
1164 Sofia, Bulgaria
e-mail: birov@fmi.uni-sofia.bg
jim@terascale-euro.com
vlad@iterner-bg.net

## МОБИЛНО БАНКИРАНЕ – ИНТЕРДИСЦИПЛИНАРНО РЕШЕНИЕ

**Димитър Биров, Владислав Желязков**

Настоящата статия представя интердисциплинарен подход и решение за мобилно банкиране, което е симбиотично съчетание на авангардни съвременни софтуерни дисциплини. Разгледани са технологичния и логическия модел на реализираното решение като пример за един успешен експеримент в областта на безжичните технологии. Подобен подход може да бъде обобщен и приложен в областта на електронната и мобилната търговия.