# Towards Mobile University Campuses

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***Abstract***

*The introduction of the term mobile leaning (m-learning) reflects the tendency to provide more accessible and flexible education services using the newest achievements of mobile technologies. The paper presents research and experimental work in the field of m-learning, conducted in the University of Plovdiv. Possibilities to introduce m-learning for university students are presented and perspective tendencies for research in the fields are discussed.*

***Keywords****: Mobile Learning, e-Learning Environment, Mobile Campus, ASP.NET Mobile Designer.*

## 1. INTRODUCTION

It can be definitely assumed that mobile learning (m-learning) is a next stage or a new form of e-learning [5]. Basis for such statement is the observation that computer and communication technologies become more and more mobile, easily accessible and effective. The number of reasonably priced mobile devices like mobile phones, personal digital assistants, tablet personal computers, etc. grows, these devices use increasingly cheap methods for Internet access and have functionality similar to desktop systems.

Mobile learning suggests the use of mobile and portable devices applied in the field of information technologies, as well as the use of wireless network and communication technologies for teaching, learning and for support of the learning process. Research and experiments in the field of mobile learning aim at achieving greater accessibility and flexibility of educational services, that is at providing the possibility to offer and use them at any time and place [2, 6].

A number of leading educational institutions [10] conduct research and experiments and already offer mobile educational services (University of Regensburg, Germany; Technological University of Alberta, Canada, etc.). Research work is developed in two main fields: providing mobile learning/ teaching (pedagogical aspect of m-learning) and introduction of mobile administrative services related to education (administrative aspect of m-learning). Both fields support the creation of strategies to improve the quality of education. The first field aspires for the specification of the types of learning content and materials that can be effectively distributed using mobile devices and respectively – effectively used by the learners [1]. The second field aims at the development of as much mobile applications for services that support education as possible – from library search to registration for participation in courses [6].

The attempts to use mobile communication and devices for education in Bulgaria are few at the present moment and limited mainly to some universities – University of Rousse [3] and University of Plovdiv (internal report for the university project M-77/2004).

## 2. ABOUT BULGARIAN UNIVERSITY M-CAMPUSES

Although the tendencies of the Bulgarian education development in technological aspect reflect the European and world directions, they definitely have some own specifics. Survey of the distribution of mobile technical devices in Bulgaria and of their technological level shows that there is a great number and relatively uniformly distributed mobile technical devices. But these are mainly mobile phones with not very advanced technical features (memory, screen resolution, data transfer technologies, etc.).

Having in mind the results from the survey, we definitely think that at least for the present stage, m-learning shouldn't replace traditional learning but should supplement it

and improve its quality. The situation in the country is such that it's not realistic to think that significant progress in the process of learning/ teaching can be achieved with the introduction of a full list of mobile learning services and using mobile devices in learning. More reasonable is the development and introduction of tools related to the administrative aspect of m-learning. From content point of view additional tools and services are included here, facilitating the teaching, learning and administration, and they are mostly subsidiary for the students, teachers and the administrative staff. It's important that these services can give access to information that is current and of significant importance for the users (related to deadlines) and at the same time dynamic and changing (its content may change).

At least for the present moment, m-services in education are realized as supplementary e-services and therefore, in technological and structural aspect, have to respond to the following requirements:

- to be based on university electronic format data;
- to use and mostly to give well-structured and low volume information (can be imported within one session);
- to be initiated using dialogue that is not too complex and prolonged;
- not to put heavy requirements upon the parameters of the used mobile devices and the data transfer, etc.

The m-campuses designed according to the above analysis should provide mobile connection with the telephone network of the country and should allow automated access and data transfer to/from information resources of the corresponding university (mostly to integrated university database).

At the first stage of its creation, it's suitable for the m-campus to offer:

- services for candidate students:
  - ✓ queries for generally accessible information – concerning specialities, number and type of exams, documents and deadlines for application, exam dates, deadlines for standings, etc.
  - ✓ queries for confidential (with authorized access) information – information about the candidate student, grade, results from candidate students exams, standings, etc.;
  - ✓ subscription for various mobile and electronic services (SMS or email) and notification for events of interest to the candidate student together with receiving of regular information;
- services for students, related to their learning activity:
  - ✓ curricula queries, exam queries, queries for course project submission deadlines, application for state exams, etc.;
  - ✓ registration for eligible courses, application for participation in various research or exchange programs, etc.;
  - ✓ filing in of simple interactive tests;
  - ✓ exchange of messages and comments with fellow students or teachers;
  - ✓ subscription for various mobile and electronic information services;
- Services for teachers, supporting their activity:
  - ✓ queries for curriculum, exams, academic, faculty and department meetings;
  - ✓ subscription for various mobile and electronic information services, etc.;
- Other services for students and teachers:
  - ✓ applying for hostels, scholarships, etc.;

- ✓ access to information related to services offered by the university for students and teachers (electronic library, general educatory courses, etc.);
- ✓ access to information for social services provided by the university for students and teachers (holidays, excursions, performances, etc.);
- ✓ subscription for various mobile and electronic information services (university news, events, public holidays, etc.), etc..

## 3. PLOVDIV UNIVERSITY M-CAMPUS

M-learning research is conducted in the University of Plovdiv (PU) and there are concrete results in the two main subfields. The approach applied in the research and experiments related to introduction of m-learning in the University, is integrated – combining of various devices (mobile and stationary) using different data transfer techniques (wire and wireless). The research and experiments in the field of m-learning are based on the e-learning environment PeU 2.0 [8]. PeU 2.0 is a Web-based learning environment that gives the possibility for cooperative creation of learning materials, creation of e-learning courses and adaptive personalized learning.

In order to provide m-learning elements, software modules are developed and experimented, which provide access to the standard PeU 2.0 e-learning services using mobile devices and WAP interface for mobile phones and pocket PCs. The prototype of the m-learning system, based on PeU 2.0, and realizing mobile services modules, is called MobilePeU 1.0.

The main m-learning possibilities provided by Mobile PeU 1.0 are:

- authorized access;
- WAP text interface integrated with different media;
- WAP caledar and WAP news;
- WAP query for student's grades;
- WAP presentation of the PeU 2.0 possibilities;
- WAP query for the available programs and courses;
- WAP query for the students and teachers belonging to the user's group, etc.

MobilePeU1.0 can be viewed as a prototype of the Plovdiv University M-Campus – a mobile information system offering data in a wide range – for candidate students, for available rooms in hostels, etc. The M-Campus system[1] is developing as a mobile web application based on .NET technologies (ASP.NET Mobile Designer) for creation of Web-based program systems for mobile phones, personal digital assistants and pagers (Microsoft Visual Studio 2003 и MS SQL SERVER 2000).

The following two sections consider some of the created experimental software tools for m-services in learning.

### 3.1. M-service "Queries for candidate students"

M-Campus's subsystem "Queries for candidate students" offers m-services for the candidate students of the University of Plovdiv. Using it and his/her mobile phone, any candidate student can access the http address of the system's Web page (http://bell.pu.acad.bg/KSK2/Default.aspx) and check the dates of the candidate students exams and other actual information about them (for example if the exam results are published and what is his/her grade for a specific exam). Query about the result standings is process of development.

In order to receive the respective information, the candidate student identifies himself/herself by input of his/her input number (received at the producing of the candidate's documents). Besides the candidate student needs to have a mobile phone that supports

[1] The research is partially funded by the university project M-77.

the WAP-protocol and also to adhere to the requirements of the mobile operator for Internet services activation. The web application uses a database of PU candidate students.

The use of the service requires a three-step dialogue (Figure 1.). At *the first step* the candidate student inputs his/her input number and the exams with results are displayed. Now the candidate student can choose the exam for which he/she wants to see the results (*second step*). If there is no matching information, a proper message is displayed. At the third step the information for the chosen exam is displayed (three names, personal identification number, exam and respective grade). The created system allows making query about the exam results fast and comparatively easy from any place within the range of mobile phone operator.

Statistics about the visits to the mobile Web-site M-Campus shows that the service "Candidate student information" is used about 50 times per day (including from places outside Bulgaria) during the candidate student campaign in 2005.


**Figure 1. M-service "Queries for candidate students"**

### 3.2. M-service "Notification/ Information"

The purpose of the Notification/ Information system is to inform the students, by sending SMS to their mobiles, about upcoming events, changes in the curricula, exam results, etc. With its help the teachers can inform a certain group of students for events related to the learning process.

The service is implemented automatically for all registered users. During registration the users have to specify their email address, mobile phone number and subscription list containing information about the desired services. The service "notification" of a user is activated as a result from some of the following events:

- an email or SMS-to-email message from a teacher is received at the service account of the subsystem. The content of the message matches some of the preliminary specified message patterns, requiring service activation;
- data change related to some of the subscription types in the database of the system;
- changed files related to subscription;
- coming of a certain date, etc.

The notification system (**Fig. 2.)** is constantly alert for an activating event but automatic sending of short messages is implemented only for users with corresponding subscription type. The messages are generated on the basis of preliminary created patterns and are sent according to the requirements of the subscriber (as an SMS or email) again using the service account of the subsystem. In order to be free, the realization of the offered mobile service uses the services (supported by all mobile operators in Bulgaria) "email-to-SMS" (MAIL2SMS) and "SMS-to-email" (SMS2MAIL).

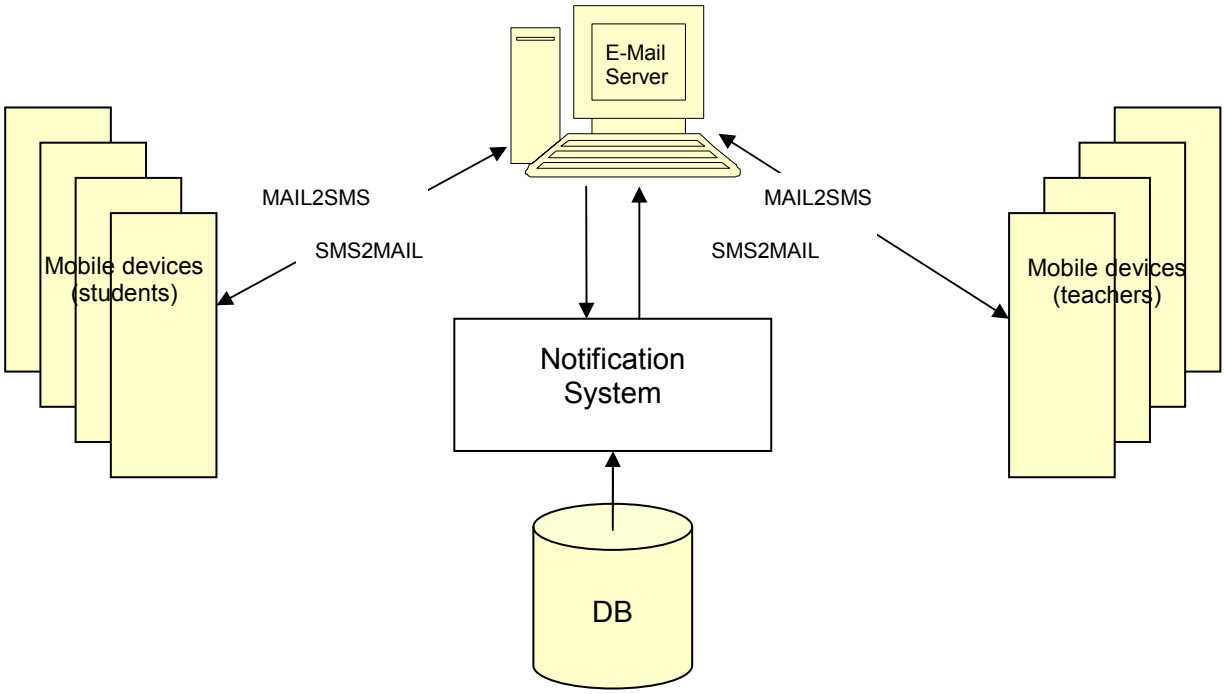


**Figure 2. Organizational scheme of "Notification/ Information" m-service**

## 4. CONCLUSION AND FUTURE WORKS

The presented concrete solutions in the e-learning environment (PeU 2.0) aim at accumulation of positive experience in the m-learning field. The analysis of the conducted experiments puts into consideration the question about design of e-learning system allowing a natural implementation of a mobile application – not as a subsidiary module but as an element (one of the many possible) of a virtual learning process presented as a sequence of events and learning activities. A similar system is designed as a next version of PeU system and combines possibilities of other famous open-source e-learning systems like Moodle [7] and LAMS [4]. The developed system can be characterized with one phrase – "a system for e-learning project management".

The m-applications in learning that are in process of development and experimenting are related to "generation" of games with cognitive nature. Analogous to the habitual for the user/ learner manner of ordering games from SMS-centre, requests for learning tasks with attractive elements are realized. Another interesting application that brings dynamics to m-learning is the evaluation approach – automatic generation of short messages for the *teacher* (when the learner finishes his/ her work on the test) and for the *learner* (when the grading process is finished). Another application in development is generation (suggestion) of test problems[1] from studied e-courses under the form of short messages.

A direction for subsequent research is the possibility to design and create generators of suitable learning tasks with game elements in the form of short messages (or mobile games which "return" results). Experiments from this type are conducted for the case of

[1] We have to note that not every type of problem is suitable for "mobile" representation.

lexical acquisition of an English-minimum study dictionary. The automated processing of short messages used in the learning process with linguistic technologies and tools is another interesting research direction.

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