

# M-Education Experience of Ukrainian University

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**Abstract** — this article describes m-education project, which is being introduced for the first time in Ukraine for students of the computer sciences faculty at National aviation university. The article presents features of m-education project organisation and realisation in the conditions of budgetary (state) university. Organizational and technical schemes of project realization are represented, difficulties are discussed and prospects are outlined.

**Keywords** — mobile technologies, mobile-education, Cisco Unified Wireless Network, wireless technologies.

## I. Introduction

The bachelor curricula of computer sciences faculty are filled with the disciplines, studying of which assumes an intensification of computers use within educational process and independent students work. The intensification has passed a way from computer centre, where faculty's computer resources were concentrated in one place up to territorially distributed computer educational classes connected by means of a local computer network. The next step of progress on this way has become usage of wireless communication Wi-Fi and mobile computers (notebooks), providing unique possibilities as to teachers so to students at training of disciplines.

The mobile technologies based on a wireless communication as a communication medium, are perspective and dynamically developing. Providing the user with territorial mobility, they allow him to concentrate attention at work performance. Most mobile "layer" of the population are students, therefore mobile technologies application should be especially productive for training in general, and vital for students, who are trained for bachelor degree in computer sciences and software engineering.

The project m-education has been developed for introduction of mobile technologies. In the second part of article organizational aspects of realisation of the project, in the third part - communication medium creation are discussed, and in the forth part - services are represented.

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## II. Organizational aspect of the project

Mobile technologies introduction project at university includes three stages.

The first stage is creation of a wireless network infrastructure for providing students access to the local network of university (department) and Internet.

The second stage is creation of service-oriented training environment for students.

The third stage - supply of students by mobile devices - laptops for performance of educational tasks.

For the first stage realization wireless infrastructure was developed by spreading local network by WI-FI infrastructure on the basis of wireless network access points and trunk channels (wireline technology - twisted pair, an optical fiber)

At the second stage - service was created - the focused, providing training process environment.

For the third part realization the laptops purchase program was developed, which was supported by Intel, Asus, Samsung presentations in Ukraine support.

All projects are being performed under Wireless Ukraine Association supervision.

## III. Wireless network

While designing of a wireless network of department the problem of complex solution creation, by inclusion of a network wireless segment in an existing wire network of university (fig.) was set. Integrated approach implies maintenance of management, monitoring and safety of WLAN. After carrying out of the existing solutions analysis, designing on the basis of technology Cisco Unified Wireless Network which represents the integrated solution covering all levels WLAN, beginning from level of client devices and access points, and finishing level of a network infrastructure, tools of network administration, integration tools of modern wireless services was accepted [1]. Cisco Unified Wireless Network supports wireless services of a voice transfer (VoIP), tracking moving of the subscriber, and also maintenance of wireless network safety (NAC, Cisco Self-Defending Network and guest access) [1], [5].

Project WLAN provides network management by realization of flexible distribution of rights and authorities. At access to any of network services the user of a network passes authorization. Depending on service, authorization occurs through the controller of the domain or through Radius server (fig).

For reliability increase of services operations in the network project function of monitoring and components and services of a network management on the basis of NAC a set

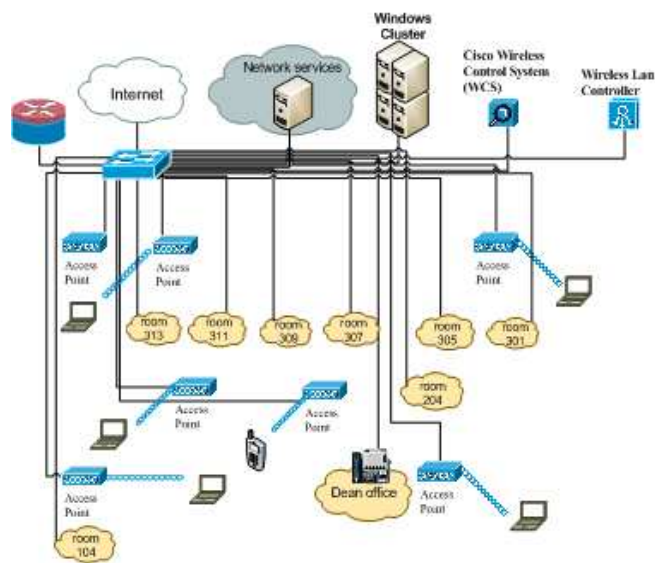


Figure. Physical network topology based on Cisco Unified Wireless Network.

of technologies, which is based on initiative offered by company Cisco Systems, was implemented [1].

Networks Cisco WLAN support NAC, using a network infrastructure for maintenance of safety policy of all wireless devices getting access to computing network resources. It allows limiting damage from various threats of safety. Besides wireless networks, as a result of their broadcasting nature, demand realization of additional mechanisms as for subscribers intensification (user authentication) for the purpose of prevention of not authorized access to network resources, and maintenance of confidentiality of data (data privacy) for the purpose of integrity and protection maintenance while transmission on a popular radio channel. The IEEE standard 802.11 used in a network provides two authentication mechanisms of wireless subscribers [2] - [4]: open authentication and shared key authentication. Besides twomechanisms - service set identifier of wireless LAN (SSID) and subscriber authentication by his MAC-address (MAC address authentication) are used. Enciphering WEP (Wired Equivalent Privacy) keys can be used as the mechanism of access restriction as the subscriber who does not possess a correct WEP-key cannot accept, or send data in a wireless network.

For controllability and safety maintenance the local network is structured and divided into virtual local networks (VLAN): computer classes, mobile users, department, dean's office. The given approach allows to territorially straddling group connections in the general group with uniform safety rules. Access of each group to network resources passes through router's lists of access management that allows raising level of a network safety and making access control to a resource before carrying out of users authorisation.

#### IV. Network services

There are following services are working in the network: software repository (server MSDNAA), a voice communication (VoIP), a Web-portal of teaching materials, service of terminal access to appendices (a server of appendices), access to the Internet.

For students maintenance with the licence software the faculty is signed on program MSDN Academic Alliance (MSDNAA) from Microsoft company. On internal server MSDNAA students can receive the necessary software for performance of laboratory tasks and self-instruction work. The software is delivered by ISO images. Besides the software from companies SUN Microsystems and IBM, also distributed within the bounds of curriculums, is accessible in a network.

VoIP allows to use voice communication services in a mode of real time in a wireless infrastructure that assumes presence on the client's side as the software so the device, for example Cisco Wireless IP Phone 7920 - phone with built in support Wi-Fi.

The portal is developed for granting to students of access to teaching materials. Students can receive the teaching materials developed by teachers of university (a lecture material, tasks to laboratory and course works) through it.

The Web-portal of teaching materials is information - training environment of remote formation, providing users of a network the integrated, personalised and protected interface for access to the information, applications and services. The Web-portal has the system of safety, which realises mechanisms of authorisation and authentication. The Web-portal is developed on the basis of following principles: integration, personification, scalability, «the thin client», hardware independence.

The service of terminal access gives to mobile computers access to the Windows applications started on a server. It allows students of university to work with difficult and big applications (for example, IBM Rational) not installing their software on notebooks. The server is accessible to students-members of Microsoft User Group and independent student's projects - Team Foundation Server 2005, allowing students to gain skills of collective development.

For obtaining an access to the Internet, networkers use virtual private networks (VPN) and PPTP protocol. The given approach allows to inject one more level of access to resources control and to provide if necessary enciphering of transferred data.

The cluster is accessible to process large scale arrays of the information and an acceleration of assemblage (compilation) of the difficult software to students, post-graduate students and employees of university. Cluster sites are built on the basis of Intel Core 2 Duo and the operating system of Windows Server 2003.

## V. Conclusions

Transition to application of mobile technologies in education allows solving two problems - to simplify a computing infrastructure at university and to raise quality of education.

For example, computer resources of computer sciences faculty at National aviation university before project introduction were consisted of 15 computer class-rooms occupying the space nearby 800m<sup>2</sup>, and containing about 200 computers. The quantity of serving staff was 20 employees. Maintenance of computer classrooms is connected with repair, upgrade, software support and demands expenses. Utilization of a wireless communication and mobile computers allows raising sharply efficiency of the presented infrastructure, practically by its elimination.

Other instance, considerable part of disciplines for bachelor training on computer sciences faculty is closely connected with computers usage. So in bachelor training on Computer Sciences is 41.86 % of disciplines, and in bachelor training on Software Engineering - 60.47 %. Thus, for example, only on the first year in bachelor training on computer sciences 8 % lessons demands usage of computers, and in bachelor training on Software Engineering - 24 %. Utilization of mobile technologies would allow intensifying of educational process.

## References

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