UDK [004.7-047.72]:656.2

FORMATION OF COMPETENCIES AMONG APPLICANTS OF FOREIGN ORIGIN IN BLENDED LEARNING «LOCAL NETWORKS» DISCIPLINE
ФОРМУВАННЯ КОМПЕТЕНТНОСТЕЙ У ЗДОБУВАЧІВ ІНОЗЕМНОГО ПОХОДЖЕННЯ ПРИ ЗМІШАНОМУ НАВЧАННІ З ДИСЦИПЛІНИ «ЛОКАЛЬНІ МЕРЕЖІ»

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Abstract. *The proposed «BlenLearnEnglLAN» methodology for the formation of competences among applicants of foreign origin bachelor's degree in the «Computer Engineering» specialty during blended learning in the «Local Networks» discipline: 1) study of basic concepts and fundamental principles of various network technologies during lectures held using the «Zoom» system; 2) compilation of the structure of the local network and assessment of its correctness, according to the compiled structure, creation of a simulation model of the local network in NetCracker Pro and conducting research on it during laboratory work carried out face-to-face; 3) research of network traffic parameters using neural network technology and obtained data on a simulation model during independent work using recommended sources; 4) development of theoretical material using the lecturer's presentations and testing in the «Lider» system, arguing the choice of network technology based on the obtained results of research on simulation models.*

Key words: *competence, local network, structure, assessment, technology, model, traffic, parameter, characteristic, blended learning.*

Introduction

Formulation of the problem. The current situation in the world, related to the spread of COVID-19, caused by the SARS-CoV-2 coronavirus, has led to the use of blended learning, in particular in the discipline «Local Networks» and the formation of relevant competencies in first-degree holders under such difficult conditions that confirms the relevance of the topic.

Analysis of the latest research. Assessment of competencies is the subject of research by such scientists as: Bykov V. Yu., Gurevich R. S., Gurzhiy A. M., Morse N. V., Ovcharuk O. V., Spirin O. M., Sysoeva S. O., Zhaldak M. I. and others. It is important to identify, analyze and summarize the experience of EU countries, important international organizations and initiatives (UNESCO, ECDL, MICROSOFT, INTEL, etc.), as well as comparability for modern Ukrainian education in international studies of the quality of education (PISA, TIMSS, PEARLS) [1]. The analysis of the latest research and publications [1-5] revealed the following: 1) the lack of uniform information and communication technologies for training in the «Local Networks» discipline; 2) the lack of a common methodology for designing local networks; 3) the existence of a wide range of local network simulation systems (but very expensive); 4) the peculiarities of generation Z and the peculiarities of education of applicants of foreign origin; 5) the need for blended learning under the conditions of the current situation in the world, and became the

basis for the development of our own methodology «BlenLearnEnglLAN».

The purpose of the article is to develop a methodology for the formation of competencies among applicants of foreign origin bachelor's degree of «Computer Engineering» specialty in the blended learning «Local Networks» discipline.

1. Formation of subject competencies during lectures

The proposed «BlenLearnEnglLAN» methodology provides an opportunity for a first degree of foreign origin during lectures held using the «Zoom» system to learn the basic concepts and fundamental principles of various technologies used in local area networks: Ethernet; Fast Ethernet; Gigabit Ethernet; Token Bus; Token Ring; FDDI; VLAV; WLAN. After the lectures, the applicant must study the theoretical material based on the teacher's presentations, located in the «Lider» distance learning system, and pass a self-test. So, for example, when studying the FDDI technology (Fig. 1), a first-degree applicant must know the classification of nodes: by purpose (workstation or hub); by attachment to the ring (Single Attachment, SA or Dual Attachment, DA); by the number of MAC nodes (one MAC node, SM or two MAC nodes, DM) and port assignment (A, B, M, S).
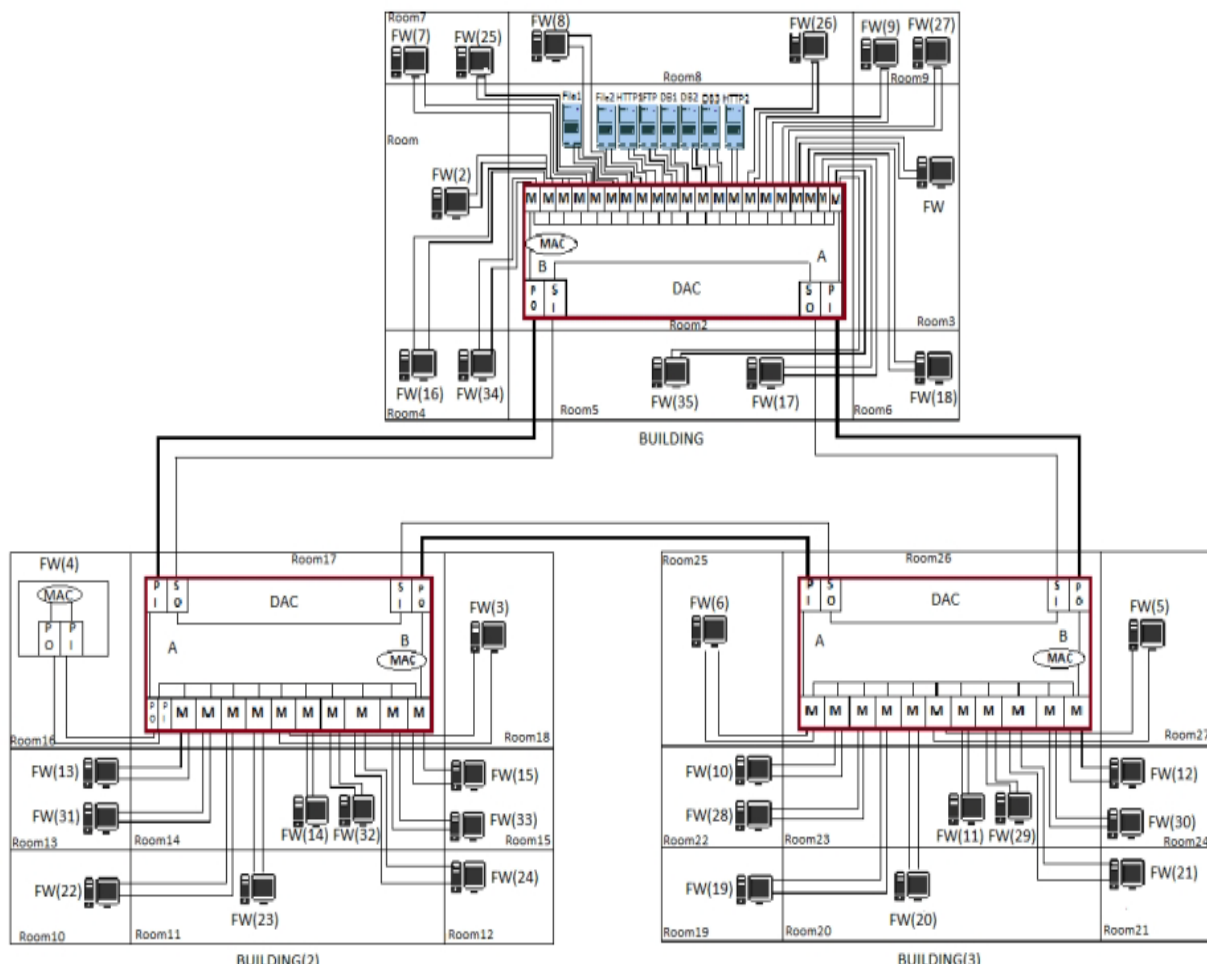

Figure 1 – Using different nodes and types of FDDI ports

2. Formation of subject competencies during laboratory work

The proposed «BlenLearnEnglLAN» methodology provides an opportunity for a first degree of foreign origin during laboratory work using the NetCracker Pro [6], which should be carried out face-to-face, and consists of the following stages:

designing the structure of the local network and evaluating its correctness (preparatory stage); creation in NetCracker Pro of a simulation model of a local network according to the assembled structure (the main stage); research on the created simulation model of network characteristics (research stage).

Videos have been compiled on the creation of simulation models of local networks, hyperlinks to which are embedded in the «Lider» system [3]. The «BlenLearnEnglLAN» methodology provides the applicant with the opportunity to conduct the necessary research on simulation models of various network technologies and their switching versions in order to justify the choice of: a variant of the physical implementation of a local network; communication equipment for the physical and logical structuring of the local network; network traffic structure and use of network technology. So, for example, the calculation between the two most distant workstations (under the condition that twisted pair is used in the buildings, and optical fiber is used between the buildings; Fig. 2), is: PDV=(15,3+11*0,113)+(33,5+200*0,1)*2+(165+11*0,113)=289,786 *bt* < 575 *bt*, where PDV (Path Delay Value) – signal double rotation time; PVV=10,5+8+8=26,5 *bt* < 49 *bt*, where PVV (Path Variability Value) – reduction of the inter frame interval, which indicates the correctness of the network configuration.

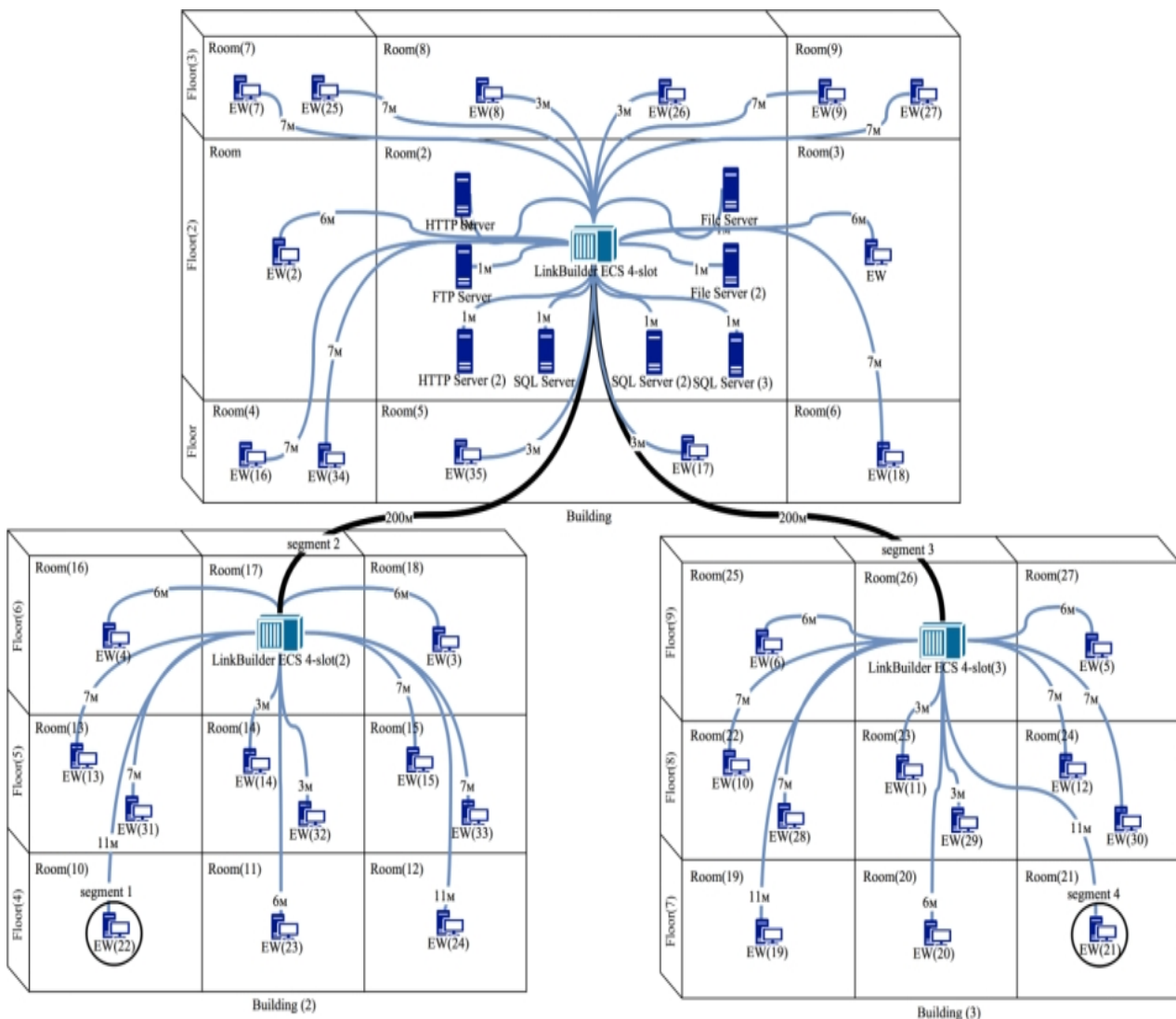**Figure 2** – **The proposed structure of the Ethernet local network**

According to the complex structure of the local network, the acquirer created an Ethernet network model in NetCracker Pro, on which the threshold number of workstations is defined. Next, the acquirer on the model determines the network performance threshold (in this case, 35 workstations) and conducts a study of the network response time and the workload of the communication equipment.

3. Formation of competences during independent work

The proposed «BlenLearnEnglLAN» methodology provides an opportunity for a foreign origin bachelor's degree graduate to acquire practical skills in forecasting network traffic parameters using neural network technology during self-study on the basis of recommended sources (data obtained from created simulation models is used to form samples).

4. Using a research approach in blended learning

Hrynevych L. M., Morse N. V. and Boyko M. A. emphasize that the research and cognitive method should become the most important component of the scientific program at all levels and in all branches of science [2]. The areas of acquisition of research competence of applicants should include: analytical review of scientific sources; organization of experiments with simulation models using different technologies (with the same parameters and under the same conditions of conducting experiments); analysis of obtained network characteristics on local network models using various technologies (presentation of results in the form of tables or graphs); formulation of conclusions.

The peculiarities of generation Z and the peculiarities of the education of students of foreign origin require the introduction of new methods in the conditions of mixed learning and the use of interactive learning methods. So, for example, according to the «Teaching-Learning» method [4], one student of foreign origin of the first degree, having created a model of a local network based on the chosen technology, explains to another student and then jointly conducts relevant studies of network characteristics on the model. At the end, the acquirers analyze the obtained results on models based on various network technologies.

Conclusions

1. The proposed «BlenLearnEnglLAN» methodology for the formation of competencies of applicants for foreign origin bachelor's degree «Computer Engineering» specialty in blended learning «Local Networks» discipline: use of «Zoom» system during lectures; face-to-face laboratory work using NetCracker Pro; performing independent work using neural network technology based on recommended sources; conducting module testing in the «Lider» system.

2. Based on the use of the proposed «BlenLearnEnglLAN» methodology of applicants for foreign origin bachelor's degree: firstly, acquires subject competencies in the «Local Networks» discipline; secondly, acquires practical skills in scientific activity in organizing and conducting research based on created simulation models of local networks using various technologies.

Literature:

• Биков В. Ю., Овчарук О. В. Оцінювання інформаційно-комунікаційної компетентності учнів та педагогів в умовах євроінтеграційних процесів в освіті:

посібник. Київ: Педагогічна думка, 2017. 160 с.

● Гриневич Л. М., Морзе Н. В., Бойко М. А. Наукова освіта як основа формування інноваційної компетентності в умовах цифрової трансформації суспільства. Інформаційні технології і засоби навчання. 2020. т. 77. № 3. 1-26.

● Пахомова В. М. Дистанційний курс в системі «Лідер» з дисципліни «Локальні мережі» для здобувачів ступеня «бакалавр» спеціальностей «Комп'ютерна інженерія» і «Кібербезпека». Сертифікат № ДК0287 від 20.07.2018. URL: lider.diit.edu.ua/course/view.php?id=344.

● Пахомова В. М., Маслак А. В., Остапець Я. Д. Формування компететностей у здобувачів ступеня «бакалавр» при дистанційному навчанні з дисципліни «Локальні мережі». Modern engineering and innovative technologies Germany, Karlsruhe: Sergeieva&Co, «ISE&E». 2021. № 16-06. pp. 66-70.

● Khadim B. Mobile learning and education in the digital age. 2018. URL: http://elearningindustry.com/mobile-learning-education-digital-age

● Pakhomova V. N., Miroshnychenko I. H. Local Networks. Methodical recommendations for laboratory works for foreign applicants of Bachelor's Degree of specialties «Computer Engineering». Dnipro: Edition Department of Ukrainian State University of Science and Technology. 2022. 60 с.

Анотація. Запропонована методика «BlenLearnEnglLAN» щодо формування компетентностей здобувачів іноземного походження ступеня «бакалавр» спеціальності «Комп'ютерна інженерія» при змішаному навчанні з дисципліни «Локальні мережі»: 1) вивчення основних понять та фундаментальних принципів різних мережевих технологій під час лекційних занять, що проводяться за допомогою системи «Zoot»; 2) складання структури локальної мережі та оцінка її коректності, відповідно до складеної структури створення в NetCracker Pro імітаційної моделі локальної мережі та проведення на неї досліджень під час лабораторних робіт, що проводяться очно; 3) дослідження параметрів мережевого трафіку з використанням нейромережної технології та отриманих даних на імітаційній моделі під час виконання самостійної роботи з використанням рекомендованих джерел; 4) опрацювання теоретичного матеріалу з використанням презентацій лектора та тестування в системі «Лідер», аргументування вибору мережевої технології на основі отриманих результатів досліджень на імітаційних моделях.

Ключові слова: компетентність, локальна мережа, структура, оцінка, технологія, модель, трафік, параметр, характеристика, змішане навчання.