

## **OPINION**

from Prof. DSc Ivan Ganchev Garvanov - ULSIT

member of the Scientific Jury, appointed by Order of the Rector of SWU №

3163 / 20.12.2021

ON: Dissertation of **Iliyan Vladimirov Ivanov** on "ANALYSIS AND SIMULATION STUDY OF THE FEATURES OF LOCAL NETWORKS", presented for the acquisition of educational and scientific degree "Doctor" in the doctoral program " Computer Systems" complex 3. computer systems 5. complexes and m . "Communication and computer equipment and technologies", with supervisors: Assoc. Prof. Dr. Alexei Stefanov and Assoc. Ivan Trenchev.

### **1. General description**

At the first meeting of the Scientific Jury I was chosen to write an opinion and received the following documents: dissertation; abstract in Bulgarian and abstract in English; list of printed scientific publications on the topic of the dissertation; publications on the topic of the dissertation in full text; reference on the implementation of the minimum national requirements; other documents related to the defense of the dissertation.

### **2. Relevance, purpose and tasks**

The research and analysis of different types of computer networks, as well as the security of data transmission in them is an extremely current scientific task. It can be solved by developing mathematical models and conducting simulations. The models are also very suitable for studying hacker attacks and ways to counter them.

The aim of this dissertation is to study and analyze the transmission of data in different computer networks.

The tasks of the dissertation are:

To analyze the methods and approaches for analysis of computer networks and software systems.

To study the different types of protocols and to describe their differences.

To conduct software simulations using different protocols and to analyze the data transfer and some characteristics of the computer network such as data stability, bandwidth, etc.

To apply mathematical approaches for analysis and forecasting the stability of computer networks and information system in particular.

### **3. General characteristics of the dissertation**

The dissertation consists of 193 pages, structured in an introduction, three chapters, contributions, conclusion, list of dissertation publications, bibliography and appendix. It contains 51 figures, 2 tables and 337 literature sources.

Chapter ONE discusses the general characteristics of computer networks and the topology of different types of networks. The OSI model is briefly reviewed and characteristics at its levels are presented. Particular attention is paid to WiFi and protocols, as in the third chapter most computer simulations are made with WiFi.

In Chapter TWO an overview of the topic of the dissertation is made. The IEEE Standard 802.15.4 / - ZigBee is briefly described. The main types and characteristics of hacker attacks are presented. An analysis of the quality and quantity of the different types of damage they can do has been made.

Chapter THREE presents the results of the dissertation research, namely: Computer simulations for studying the characteristics of computer protocols with the software package - Matlab; Development of mathematical models for analysis of computer security and entropy of protocols and information system; Practical testing of computer security in data transmission and analysis of Cyber security of certain software systems.

#### **4. Contributions**

I would classify the doctoral student's contributions as:

An overview and analysis of the methods for the exchange of information in computer networks has been made. Existing hacker attacks are analyzed and counteraction methods are considered.

A hacker attack using the brute force method has been developed using an Arduino-type computer. The complexity of the attack is analyzed.

Mathematical models have been developed to analyze the stability of computer network security using mathematical approaches such as Markov processes and game theory.

The traffic of the computer network of the Internet provider is analyzed and the main attacks on the provider are systematized. Computer attacks on budget enterprises have also been analyzed.

#### **5. Abstract**

The presented two versions of the abstract in Bulgarian and English reliably reflect the content of the dissertation and meet the requirements of ZRASRB and PPZRASRB. From the attached declaration of originality of the presented results, as well as from the presented publications on the dissertation, it can be judged that the described results are the personal work of the doctoral student.

## **6. Assessment of compliance with the minimum national requirements**

The doctoral student **Ilian Vladimirov Ivanov** has tested parts of his dissertation in four scientific publications, two of which are in English and two in Bulgarian. Two of the publications are to be indexed in WoS . According to the minimum national requirements for obtaining the ONS "Doctor" in a professional field 5.3. "Communication and computer equipment and technologies" , defined in PPZRASRB requires at least 30 points on Group D. The presented publications on the dissertation fulfill the required minimum of 30 points for indicators on Group D.

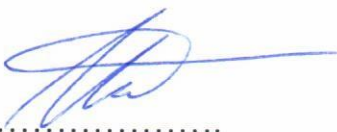
## **7. Notes and recommendations**

There are spelling and stylistic errors in the text. Some of the presented results in the dissertation are not reflected in the dissertation publications and my recommendation is to publish them.

## **8. Final complex assessment**

I believe that the presented dissertation meets the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria. The achieved results give me reason to confidently give a positive assessment and I recommend to the esteemed Scientific Jury to award the educational and scientific degree "Doctor" of **Ilian Vladimirov Ivanov** in a professional field - 5.3. "Communication and computer technology" .

04.02.2022

  
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/ Prof. I. Garvanov /