

OPINION

of a dissertation
for awarding an educational and scientific degree "Doctor" in

the field of higher education – 5. Technical Sciences
the professional field – 5.3 "Communication and Computer Technology"
doctoral program – "Communication Networks and Systems"

Author: Iskren Pavlinov Yankov

Subject: Innovativeness, methodology and design of a model for cyber defence and cybersecurity of communication networks and systems for government structures and institutions

Member of the scientific jury: Prof. Dr. Georgi Valentinov Hristov, PhD.,
University of Ruse "Angel Kanchev"

1. Topic and relevance of the dissertation

The doctoral candidate has presented a dissertation consisting of 119 pages, an abstract of 53 pages and 5 publications on the dissertation topic. The dissertation includes a list of references comprising sources in Bulgarian and English languages and 8 electronic resources. A total of 68 figures and 1 table have been used to illustrate the materials presented in the dissertation.

The Internet and the global network represent a particularly vulnerable environment due to their fundamental characteristics: the possibility of anonymity and the lack of territorial limitations. These features make it a medium for committing cybercrimes, cyber warfare and large-scale cyberattacks, which are carried out using advanced technical means and innovative methods. The operational techniques used in cybercrime, as well as software tools, are subject to continuous and dynamic evolution. These processes necessitate the development and implementation of adaptive systems for the prevention and protection against cyberattacks and hybrid threats.

To achieve effective protection of information resources, identification, elimination or mitigation of risks through integrated methodologies and technological solutions is essential. One of the most significant developments in this field in 2024 is the new NIS2 Directive, the trends in new approaches of ransomware groups, as well as numerous examples of new possibilities for the use of artificial intelligence—both by us, as users for the automation of various processes, and by hackers as well. All of this makes the dissertation topic extremely relevant, and given the importance of protecting the communication networks and systems of government structures and institutions, the present research aims to develop an innovative model for cyber defence and cybersecurity based on modern approaches and technologies.

The research has been conducted with the necessary depth and scope, and the obtained results are significant and meet the requirements for awarding the educational and scientific degree "Doctor." The public accessibility of the work is ensured and proven through the publication of reports in scientific conferences referenced by NACID (National Center for Information and Documentation).

2. Methodology of the research

The object of the research is focused on computer networks and systems and the risks of local damages despite the existing protective mechanisms in government institutions. Identifying risks for the information resources is a dynamic process based on continuous

monitoring of computer networks to detect potential threats for the information security. This process includes simulations of risk scenarios, which serve to evaluate the resilience of network systems, similar to stress tests used to determine the level of protection.

The research methods are primarily outlined in the individual chapters as analytical, simulation-based and practical, covering the dependencies of parameters characterizing the implementation of the individual models.

3. Contributions of the dissertation

The doctoral candidate has formulated a total of eight contributions, which are categorized and, in my opinion, should be considered as contributions of scientific-applied and applied nature.

The main scientific-applied contributions of the dissertation relate to:

- A review and analysis of the impact of various malware on the functionality of computer systems and networks;
- A concept for integrating local protective mechanisms into a unified global cybersecurity system;
- A model in which local and global protective systems operate synchronously during data transfer and protection;
- A methodology for effective interaction between local and cloud infrastructures using encrypted communication tunnels.

4. Publications and citations of the dissertation

The results of the dissertation have been approved in 5 scientific publications, and from the attached list, it is evident that all publications are the doctoral candidate's independent work. The publications have been presented in Bulgarian and international indexed journals. There is no evidence of plagiarism and no citations of the publications have been identified.

The publications present the key findings of the dissertation. The overall scientific work and the candidate's publications demonstrate in-depth knowledge and understanding of the dissertation's subject matter, as well as the author's ability to formulate and solve current scientific-applied problems. I believe that these publications contain the main original contributions claimed in the dissertation. This complies with the requirements of the Law on the Development of the Academic Staff and its Regulations regarding the publication of the most essential parts of the dissertation work.

5. Authorship of the obtained results

The dissertation and the submitted materials represent the independent work of the doctoral candidate, with the scientific ideas and approaches presented and defended at various forums clearly demonstrating his personal contribution. The candidate's skills in developing and solving scientific problems, writing in an academic style, expressing ideas clearly and accurately and logically justifying the choices made are unquestionably proven. The work demonstrates a high level of competence and commitment to scientific research, emphasizing the significance of the doctoral candidate in the respective field.

The public presentation of elements of the research and the discussion around them have been carried out through participation in scientific conferences. I believe that the main part of the conducted research and the analysis of the results represent the doctoral candidate's entirely personal contribution. Based on the systematically presented researches and conclusions in the dissertation and the published scientific articles, I have grounds to consider the achieved results as reliable and sufficient.

6. Opinions, recommendations and remarks on the dissertation work

The submitted materials are presented in the required volume and quality and are accompanied by various supporting documents – references, certificates, diplomas, etc. No significant shortcomings have been identified in the presented materials or in relation to scientometric requirements. Nevertheless, I have the following significant remarks and recommendations:

- The doctoral candidate works in a relatively dynamic field that is interesting from both a scientific and practical perspective. Therefore, additional efforts should be made to implement the results of the scientific activities into practice.
- The doctoral candidate could focus more on publishing scientific material in prestigious journals both in Bulgaria and abroad.

7. Conclusion

The topic of the dissertation is relevant and interesting. The work has sufficient volume and depth of research. The obtained results are significant enough for the awarding of the educational and scientific degree “Doctor”. The public accessibility of the work is adequate. The author has made 5 publications based on the dissertation. The doctoral candidate has conducted research, obtained, presented, and analysed the results of methodological researches. He has also drawn the appropriate conclusions, which gives me grounds to assess that the dissertation has the necessary scientific-applied and applied contributions.

The above-mentioned recommendations and remarks regarding the presented version of the dissertation do not undermine the results of the conducted research. The legal requirements concerning doctoral procedures have been fulfilled. The scientific community has been given the opportunity to become acquainted with the conducted research and the obtained results.

I believe that the presented dissertation meets the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria. The achieved results give me grounds to propose that the educational and scientific degree “Doctor” be awarded to Iskren Pavlinov Yankov in the field of higher education – 5. Technical Sciences, professional field – 5.3. Communication and Computer Technology, doctoral program – “Communication Networks and Systems”.

17.12.2024

Member of the scientific jury: /signature/
/Prof. Georgi Hristov, PhD/