

REVIEW

**for the dissertation thesis of Kristina Lyudmilova Ignatova
on the topic "Modeling of cloud architectures for building a communication
and information environment for collaboration work and management"
for awarding the educational and scientific degree "Doctor"
in Professional Field 5.2 "Electrical Engineering, Electronics and Automation"**

1. Kristina Ignatova was born on June 1, 1991 in Sofia. She graduated with a bachelor's and master's degree from the University of Chemical Technology and Metallurgy (Sofia) (2017), majoring in Information Technology. She was enrolled as a self-preparation PhD student at the Institute of Defense on October 25, 2019. On March 29 2022, K. Ignatova conducted a successful pre-defense of her dissertation. With Ordinance No. 190 / 15.04.2022 the Director of the Institute of Defense determined the Scientific Jury for the official defense procedure, where I have been elected as a member.

2. Kristina Ignatova's thesis is in total volume of 160 pages and consists of an introduction, three chapters, a conclusion comprising the contributions of the dissertation, a list of author's publications on the topic of the thesis, a list of 131 bibliographic references and—something rarely seen in dissertation theses, but nevertheless useful—lists of the figures, tables and introduced abbreviations in the thesis.

3. The dissertation thesis is dedicated to a topical problem on the border of informatics and military affairs – modeling of cloud architectures for building a communication and information environment for collaboration work and management. Except for Ignatova's supervisor, Prof. Dr. Rosen Iliev, and Dr. Eng. Nevena Radoeva, a former PhD student of his, I am not aware of anyone else in Bulgaria to have worked in this field using the apparatus of generalized nets – a mathematical tool for modeling of parallel processes, extending Petri nets and other modifications and extensions. Having defined the concept 40 years ago, I have been following the publications related to it ever since.

Without commenting the contents in detail, I will outline which of the PhD student's contributions are the most important ones in my opinion, as well as will formulate some recommendations for future research.

Chapter One provides a detailed analysis of the basic concepts in the fields of cloud technologies, cloud computing, architectures, and it describes the main types of cloud objects and technologies. Special attention is paid to the application of cloud technologies in military affairs. Section 1.4, "Mathematical Toolkit for Describing Cloud Models for Collaboration," provides brief notes on theories of generalized nets and intuitionistic fuzzy sets. My recommendation for the PhD student's future research is to thoroughly explore the possibility for the generalized net apparatus to become the uniform tool for describing various types of cloud objects and technologies, something that has not been done with generalized nets so far, while they provide significantly wider opportunities for this purpose compared to the standard classes of Petri nets.

Chapter Two describes three generalized net models for cloud collaboration environment: the process of building a communication and information environment, the process of video communication within such an environment, and the process of building a cloud infrastructure. The models are described in detail and correctly. In practice, they are the first step towards implementing my above recommendation. Given the fact that the three models reflect various processes related to the cloud environment, in continuation of the above idea, in the future, a new generalized net model could be developed, containing the three available models as their actual subnets.

The third chapter contains a description of the results of the software implementation of the generalized net models from the second chapter, and discusses the possibility of their application in military affairs.

The results included in the dissertation clearly demonstrate that the candidate is already a well-established specialist in the field of informatics and computer science.

I acknowledge the contributions of Kristina Ignatova, as listed on page 138, as well as her ideas for future research.

The dissertation thesis has been prepared meticulously and meets all the requirements of the Academic Staff Development Act in the Republic of Bulgaria, and the Regulations for its implementation.

Prior to the pre-defense, I wrote a preliminary opinion on the dissertation thesis. All my critical remarks from there have been correctly reflected in the final version. Therefore, I have no new remarks on the thesis.

4. The synopsis of the thesis reflects the content of the dissertation and meets the requirements of the Academic Staff Development Act in the Republic of Bulgaria.

5. From the attached reference about Kristina Ignatova, it is seen that she has authored 7 publications related to her dissertation thesis. Three of these are in national conferences, three are in Bulgarian scientific journals and one is in a specialized volume published by Springer, where I was one of the editors, and in this capacity I can confirm that it was highly evaluated by the reviewers.

All papers by Kristina Ignatova are published in journals or proceedings, related to the topic of her dissertation.

The candidate has presented information about two citations of two papers coauthored by her.

6. Kristina Ignatova's scientific-metric indicators meet the requirements of the "Regulations on the terms and conditions for obtaining scientific degrees at the Institute of Defense."

7. I have known the PhD student since the time when she attended my PhD lecture courses in generalized nets and intuitionistic fuzzy sets, which I am reading on an annual basis at the Bulgarian Academy of Sciences. In my opinion, she works in a very purposeful and precise manner, therefore, my recommendation to her in the future is to start publishing in major national and – primarily – in international scientific journals.

All of the above justifies my **positive assessment** of the dissertation thesis presented and my recommendation to the respected members of the Scientific Jury, and to the respected members of the Scientific Council to vote positively for awarding **Kristina Lyudmilova Ignatova** with the educational and scientific degree **"Doctor"** in Professional Field **5.2 "Electrical Engineering, Electronics and Automation"**.

3 May 2022

Reviewer.....

(Acad. Krassimir Todorov Atanasov DSc DSc)