

ATTITUDE

on dissertation work for the acquisition of educational and scientific degree "doctor" in a professional field: 4.6 Informatics and Computer Science

Author of the thesis: **Tihomir Dimitrov Tenev**

Thesis title: **DEVELOPMENT OF HIERARCHICAL TAXONOMY THAT INCORPORATES PATTERNS FOR IMPROVING SECURITY IN INFORMATION SYSTEMS BASED ON MICROSERVICE ARCHITECTURE**

Member of the Scientific Jury: **Assoc. Prof. PhD Desislava Ivanova**

1. Relevance of the problem

The presented dissertation consists of eight three chapters, a conclusion, a declaration of originality of the results, a list of publications on the dissertation and a bibliography. The dissertation consists of 151 pages, 39 figures, 111 cited references and appendices. The dissertation is in the field of security of information systems based on microservice. This is a hot topic in the context of the intensive development of modern information systems and technologies and their active use of various target groups.

2. Degree of knowledge of the status of the problem and responsibility of the chosen research methodology and set goals and objectives

Chapter 1 discusses microservice architecture with a conceptual application. Chapter 2 reveals the threats in the Account and Identity area, gives a list of security patterns, and provides recommendations for each pattern. Chapter 3 reveals the threats in the Communication area, gives a list of security patterns, and provides recommendations for each pattern. Chapter 4 reveals the threats in the Storage area, gives a list of security patterns, and provides recommendations for each pattern. Chapter 5 reveals the threats in the Microservices environment, gives a list of security patterns, and provides recommendations for each pattern. Chapter 6 reveals the threats in the Microservices application distributed across platforms from different vendors, gives a list of security patterns, and provides recommendations for each pattern. Chapter 7 is devoted to the construction of a hierarchical taxonomy of security patterns for information systems based on microservice architecture, a methodology for describing a hierarchical taxonomy, the relationship definitions between different areas, creation of a graphical interface and analyzing the achieved results. Chapter 8 describes the implementation of modern microservice management tools that can be configured following the best practices of selected security patterns from the Hierarchical Taxonomy of Security Patterns. Solutions are offered according to the requirements set in each of the patterns. **Conclusion: Tihomir Dimitrov Tenev shows a good level of knowledge in the scientific field, as the goals and tasks set in the dissertation fully correspond to the chosen research methodology.**

3. Contributions

The contributions in the dissertation can be divided into scientific and applied:

Scientific and applied:

- ✓ Research and analysis of architectures based on microservices and threat analysis was performed toward the defined Microservice areas.
- ✓ A conceptual model using microservice architecture has been proposed, which helps in defining the vulnerable areas.
- ✓ A hierarchical model is presented, and a hierarchical taxonomy of security patterns is developed using object-oriented modeling.
- ✓ A graphical interface has been made to illustrate the links between vulnerable areas in microservice architecture and selected security patterns.
- ✓ The architecture of a platform implementing the proposed patterns is presented using modern microservice management technologies.

4. Dissertation publications

Tihomir Tenev has presented 5 publications related to the dissertation. All publications are presented at sufficiently reputable scientific forums. Three of the publications were presented at international conferences, one publication was presented at the 47th spring conference of the Union of Mathematicians in Bulgaria and one publication was presented at the doctoral conference "Young Researchers" at Sofia University "St. KLIMENT OHRIDSKI".

5. Opinion and recommendations

The dissertation is written at a good level. The abstract contains the based information. **Recommendations:** 1) It would be good if the lists of publications in the dissertation and contributions were prepared more precisely and accurately. **Question and opinion:** I would like to present and demonstrate the functionality of the graphical interface developed and proposed in dissertation? This is one of your main contributions in your dissertation.

Conclusion

The presented dissertation fully corresponds to the set of criteria and indicators for the acquisition of educational and scientific degree "Doctor", in accordance with the Law for the development of the academic staff in the Republic of Bulgaria, the Rules for its implementation and the Rules for the conditions and procedures for the acquisition of scientific degrees and academic positions at SU. **I recommend that the scientific jury award Tihomir Tenev the Doctorate degree in professional field 4.6 Informatics and Computer Science.**

Date: 29.06.2020

JURY MEMBER:

Assoc. Prof. PhD Desislava Ivanova