STATEMENT REPORT

on PhD dissertation thesis „JADL, juaADL - Case Study of New Generation ADLs for Architecting Advanced Software Architectures“

submitted by Anastasios Georgios Papapostolu - full-time doctoral student
at the Department of Computational Systems at the Faculty of Science
at Sofia University “St. Kl. Ohridski "

for obtaining a doctorate degree and educational degree,
field of higher education: 4. Natural sciences, mathematics, and informatics,
professional field: 4.6 Informatics and computer science,
doctoral program "Computer sciences"

prepared by: Prof. Boyan Bontchev, PhD, Department of Software Technology,
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By means of order No. RD38-560/26.09.2019 issued by the Rector of Sofia University "St. Kliment Ohridski”, I have been appointed a member of a scientific jury with regard of the defense of the PhD dissertation on "JADL, juaADL - Case Study of New Generation ADLs for Architecture Advanced Software Architectures" for the acquisition of educational and scientific degree "Doctor" in area of higher education: 4. Natural sciences, mathematics and informatics, professional field: 4.6 Informatics and computer science, doctoral program "Computer sciences", by Anastasios Georgios Papapostolu. In accordance with Record No. 1 of the meeting of the scientific jury on the dissertation defense of September 30, 2019, I submit this statement on the presented dissertation. For preparing this statement, I was guided by the Act for the Development of the Academic Personnel of Republic of Bulgaria (ADAPRB) with its latest amendments announced in State Gazette No.17 of February 26, 2019, as well as by the Rules on the Terms and Requirements for Acquisition of Academic Degrees and Occupation of Academic Positions at the Faculty of Mathematics and Informatics at Sofia University “St. Kl. Ohridski " effective since June 26, 2017.

The doctoral student Anastasios Papapostolu has completed all his planned teaching activities, has successfully passed the exams defined in the individual curriculum, and has submitted a fully completed dissertation in the form and volume corresponding to the specific requirements of the department where he has started his PhD study, as well as copies of scientific papers and their abstracts in Bulgarian and English. The dissertation is written in English and contains 126 pages, structured into a title page, contents, lists of both figures and excerpts from the code, introduction, presentation of languages for descriptions of jADL and μσADL architectures, descriptions of tools and validation, conclusions, three appendices, a bibliography and a declaration of originality. The purpose of this work is "to create a new architecture description language, called jADL, that provides means to describe formally dynamic and mobile software architectures with relatively simple syntax".

Concerning the rapid development of software architectures over the last decades in the context of mobile software applications, the Internet of Things (IoT), smart agents, and software services, I find the topic very relevant and significant. Research objectives include: (1) creating a language for describing next-generation architectures and for defining modern and dynamic architectures called jADL; (2) validating the language by describing well-known and widely used architectural models and more sophisticated modern architectures; and (3) developing a tool to facilitate language use.

The doctoral student has successfully completed the tasks outlined at the beginning of the dissertation. The created language jADL provides the necessary means and language constructions to maintain dynamic reconfigurations of software systems, as well as to maintain contemporary architectural styles. An extension of the jADL language, called μσADL, has been introduced to describe oriented to micro-services software architectures. jADL provides the necessary language constructs to adequately express the behavior of different types of components. Additionally, the language has easy-to-understand and use syntax. Software tools have also been created to facilitate the use of the language – an editor created for architectural descriptions in jADL, along with a translator for the π-ADL language.

The main contributions of the dissertation can be summarized as follows:

- I would point out, as a scientific contribution, the creation of a new architecture description language called jADL, and its extension to describe software architectures oriented to micro-services;
- I would point out the following as scientific and applied contributions:
    - A comparative analysis is made in the field of Architecture Description Languages (ADLs) and their use, with conclusions drawn about the advantages and disadvantages of most existing ADLs;
    - A process for converting BPMN models into jADL models is proposed;
- I would define the following as applied contributions of the dissertation:
    - Creating software tools to facilitate the use of jADL;
    - Description of some widely used architectural models by means of the created language.

The doctoral student has provided copies of seven scientific publications related to the topic – all in English. One of the publications is in a Bulgarian scholar journal (*J. of Information Technologies and Control*) and the other six papers are published in scientific conferences in Bulgaria (four issues) and abroad (two issues). The publications in foreign conference proceedings are in *Lecture Notes in Business Information Processing* and in the proceedings of the *Balkan Conference in Informatics*, which are prestigious and well indexed. All publications were made during the PhD study of the candidate – from 2016 to 2018. One of the publications was made by the applicant alone, and six were co-authored with the research supervisor of the doctoral student, whereupon the doctoral student always appears as the first co-author. Given all this, I have no doubt about the significant creative contribution of the candidate. Additionally, the paper describing the μσADL language published in the 2019 edition of the prestigious *International Conference on Human Interaction and Emerging Technologies*.

The reviewer was not able to find in Google Scholar any citations by other authors of the mentioned above publications of the doctoral student.

As a critical note, I would like to point out the lack of comparison between the developed language jADL and its extension μσADL (to describe software architectures oriented to micro-services) with other languages for the description of architectures in terms of quantity and quality characterizations. As a recommendation, I would suggest that such a comparison be made in the context of the description of the static, dynamic and mobile software architectures for which the jADL language itself was designed.

The abstract is 57 pages in size and correctly reflects the contributions of the dissertation. It is presented in both Bulgarian and English. As a critical note to the Bulgarian version of the abstract, I would point out some places with inaccurate translations from English to Bulgarian, for example on page 50 translating the term *granularity* as *detail*.

I have no personal impressions of the dissertation. However, during the review of the defense materials, a positive opinion was received from Prof. Eduardo Miranda of Carnegie Mellon University regarding the achievements of Ph.D. Anastasios Papapostolu, based on his scientific publications. In it, he emphasizes the importance and originality of the dissertation as follows: „*Microservices is a development and architectural approach in which a software application is developed by breaking down the required features into small, independently developed and individually deployable lightweight components and communication protocols. The approach is emerging as the predominant paradigm in the implementation of internet scale systems. The increased modularity and the decentralized development resulting from following the microservices approach, as expected, comes at a cost: the orchestration and communication of the many services necessary to realize even the simplest application. Hence the relevance of their work.*

The originality, arises from their proposal for a new Architectural Design Language (ADL) called jADL to describe and connect the services under development and an extension of it, μσADL, which allows the architecture of the application to be derived from a business workflow expressed in the Business Process Modelling notation."

Considering all the above, I give a **POSITIVE** assessment of the dissertation, scientific works and the abstract. I suggest to the honorable scientific jury to promote the acquisition of the Doctor's degree by the candidate Anastasios Georgios Papapostolu in the field of higher education: 4. Natural sciences, mathematics, and informatics, professional field: 4.6 Informatics and computer science, doctoral program "Computer sciences".

18/10/2019 Signature: ……

Sofia /Prof. B. Bontchev/