

REVIEW

of doctoral thesis for the acquisition of educational and scientific degree "DOCTOR" in higher education: 4. "Natural sciences, mathematics and informatics", professional field: 4.6 "Informatics and computer sciences", doctoral program "Computer sciences"

Author of the thesis: Anastasios Georgios Papapostolu

Topic: jADL, μσADL - A Case Study of New Generation ADLs for Advanced Software Architectures Architecture

Supervisor: Assoc. Prof. Dr. Dimitar Birov

Reviewer: Assoc. Prof. Dr. Desislava Ivanova, Technical University of Sofia

This review was written and submitted on the basis of order No. ΡΔ 38-560 / 26.09.2019. of the Rector of Sofia University "St. Kliment Ohridski, as well as the decision of the scientific jury on the procedure (Protocol 1 of 30.09.2019). The review was prepared in accordance with the Law on the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for its implementation and the Regulations on the conditions and procedure for acquiring academic degrees and occupying academic positions of Sofia University "St. Kliment Ohridski" and the Faculty of Mathematics and Informatics.

1. General information.

The dissertation consists of 136 pages, of which 96 pages are the main text, 22 pages are annexes and 18 pages are content, a list of figures and a bibliography. The main text is structured in six chapters. The dissertation contains 33 figures. The references used are from 87 sources, with 42% of it being published in the last 5 years, which shows an excellent knowledge of the current state of the area. The references are appropriately cited in the text of dissertation.

2. Analysis of the applied scientific achievements in the dissertation.

The first chapter presents the object and the subject of the scientific research, defines the purpose, tasks and perspectives of the doctoral thesis. Some

basic definitions are given. A description of the selected research tools is presented. **The second chapter** deals with the analysis of the current state of the art. Various formal and informal languages for describing architectures have been reviewed and presented. **In chapter 3**, the architecture description language "jADL" is presented. The syntax and semantics of the language are analyzed. Sample architectural descriptions are presented, with an emphasis on the constructs that language offers for dynamic reconfiguration. **Chapter 4** introduces and analyzes the extension of the language "jADL", called "μσADL", which focuses on the description of microservices. **Chapter 5** introduces the tool designed to support the proposed language "jADL". The tool is based on the "Xtext" framework for development of domain-specific language. **The last chapter** summarizes the results and contributions. Examples of implementation, applicability and evaluation of the achieved results are presented. At the end of the dissertation the prospects for future development are presented.

3. Contributions to the dissertation and relevance to science and practice.

Anastasios Papapostolu has excellent knowledge and practical experience in the field of the software architectures. The analysis of the cited references, related to the dissertation topic, presentation and interpretation of the research problem, approbation in the publications index in Scopus - all this shows a very thorough knowledge of the topic and awareness of its relevance and perspective, which I appreciate.

Contributions to the dissertation are in the field of Software Architectures. The contributions can be classified as scientific and applied as follows:

Scientifically applied contributions:

1. A review and analysis of the existing literature has been made and the main problems with architecture description languages (ADLs) and their use have been identified. Based on the analysis, the advantages and disadvantages of a subset of existing ADLs have been discussed.
2. New architecture description language called "jADL" has been created to:
 - a. Can support dynamic software architectures and provides the means to handle dynamic reconfigurations of a given architecture.

- b. Provides an easy to adopt and use syntax for practitioners. The high degree of formality constitutes one of the major problems surrounding the usage of such languages and *jADL* provides an easy and familiar to developers' syntax.
 - c. Can support the description of modern architectural styles, such as the microservices architectural style.
3. A tool to support the proposed new language *jADL* has been designed and developed. The editor created for the architectural descriptions in *jADL* is shown, alongside the translator implemented for π -*ADL*.
 4. An analysis of widely used architectural models of popular self-adapting load balancer and message bus architectural styles has been described.

Applied contributions:

5. A case study for the evaluation of the language created and proposed.
6. A process for the conversion of *BPMN* to *jADL* models is proposed. This can help towards the promotion of the use of *ADLs*, since *BPMN* are widely used in practice.

7. Publications on the topic of the dissertation.

Anastasios Papapostolu has seven publications on dissertation thesis (one of them is published in journal "Information Technologies and Control", one is published in Lecture Notes in Business Information Processing book series, Springer-Verlag and other papers are presented at international conferences). Three of the publications are Scopus-indexed publications and have an impact rating.

Six of the publications are co-authored with the supervisor, and in all publications submitted for review, Anastasios Papapostolu is the first author. There were 3 citations in Scopus of publications submitted for review.

The publications are presented in the prestigious international scientific forums. The presence of citations of world scientists showed the importance of the research results.

It is noteworthy that all publications present parts of dissertation research. This fact and the approbation are an indicator of the presence of excellent knowledge and lasting interest of doctoral student on the studied subject.

8. Reliability of the obtained results.

Seven publications, the papers presented on the topic of the dissertation, the doctoral student's direct participation in the research process and the description of the experiments are the reliability proof of the obtained results in PhD thesis.

9. Doctoral student's personal participation.

Considering the dissertation thesis submitted for review, as well as the annexed publications of Anastasios Papapostolu, I believe that in the development of the dissertation research and the receipt of relevant scientific and applied contributions, his personal contribution is real.

10. Evaluation of the abstract.

The abstract reflects objectively and completely the main content of the PhD thesis. It includes the entire list of used references in the dissertation thesis, which has been carefully crafted.

11. Critical notes and recommendations.

1. The thesis is well structured. It is noteworthy that each chapter of the dissertation thesis contains introduction and conclusions. *Recommendation: It would be good if each chapter starts with a formulated purpose and ends with contributions.*
2. There are a lot of abbreviations in the thesis, which are used repeatedly in the text. All of them are perfectly introduced in the dissertation text. Regarding the abstract written in Bulgarian language, it notes some syntactic omissions that do not reduce the value of the dissertation submitted in terms of the candidate's achieved results.
3. I would recommend classifying the contributions into scientific-applied and applied (item 3 of the review) as follows:
 - a. Scientific-applied contributions: 1, 2, 3, 4.
 - b. Applied contributions: 5 and 6.

12. Conclusion.

The presented dissertation frilly corresponds to the set of criteria and indicators for the acquisition of educational and scientific degree "Doctor", according

to the Law for the Development of Academic Staff in the Republic of Bulgaria, Rules for its implementation and Rules for the conditions and procedure for acquiring academic degrees and occupying academic positions at Sofia University and Faculty of Mathematics and Informatics.

I strongly recommend the scientific jury to award educational and scientific degree "Doctor" of Anastasios Georgios Papapostolu in professional field 4.6 "Informatics and Computer Sciences", Doctoral Program in Computer Sciences.

Date: 17.10.2019 r.
Sofia

Signature:
/Desislava Ivanova/