REVIEW

About PhD defense procedure in the Faculty of Mathematics and Informatics at Sofia University “St. Kliment Ohridski”

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Thesis title: jADL, μσADL – Case Study of New Generation ADLs for Architecting Advanced Software Architectures

1. General characteristic of the PhD thesis

The thesis is written in English and the main text has a volume of 103 pages, which includes an Introduction, 4 chapters, conclusion and bibliography. There also exist appendices with a total volume of 26 pages.

The goal of the thesis is to create a software architecture description language that provides the means to formally describe dynamic and mobile software architectures with relatively simple syntax.

Main focus of the thesis is on formal description of software architectures, via Architecture Description Languages (ADLs). This is a relatively new area of software engineering that has evolved since the early 1990s. However, there are some obstacles for application of such languages to everyday practice in software development. These are, for example, their relatively complex syntax, as well as the lack of sufficient tools to support them. Also, a large number of research groups working on this topic are located outside the EU, further enhancing the relevance of the work for the region.

In this sense, I believe that the purpose and field of the thesis are relevant and have the potential for high scientific value. This impression is reinforced by the positive opinion sent to the members of the PhD application committee about the relevance of the work, by Prof. Eduardo Miranda, who is a leading researcher in the field.

In addition, the doctoral student's excellent writing style should be noted.

2. Assessment of the scientific contributions

Main contribution of the thesis is the creation of an Architectural Description Language (ADL), called jADL. In order to justify the need for the creation of this language, in the second chapter of his thesis, the doctoral student made a comprehensive review of existing ADLs. Result of the analysis is the conclusion that most of them specialize in description of a specific aspect of software systems analysis. The most important task of the PhD student is to enable the description of the dynamic behavior of the software architecture, which is inherent for large part of contemporary systems.

Chapter 3 of the thesis, outlines the main elements of the language, created of the PhD students. A detailed description of the syntax is available in the appendix to the thesis. Additionally, Chapter 3 presents some, examples of language usage.

The subject of Chapter 4 is an extension of the language called μσADL, which is aimed to descriptions of service-oriented architectures and microservices in particular. Very promising aspect of the thesis is the application of μσADL to describe BPMN (Business process modeling notation) processes and the proposed procedure for transformation from BPMN to μσADL.

The most popular architectural approach to software development currently is related to service-oriented architecture, and microservices. Its essence is to find a match between a business process model and existing services (and in particular microservices) that can implement the business process. Usage of microservices also facilitates the development of the so-called dynamic software systems that have the ability to change their architecture at runtime. Thus examples made in the thesis for transition from BPMN to jADL present a significant contribution to the development of dynamic software architectures.

Chapter 5 of the thesis describes a software tool developed by the PhD student that supports the use of jADL. Tool's GUI is based on Xtext, a framework for domain specific languages, which is based on one of the popular Eclipse software development platform. In this way, a step is also taken to address the problem of the lack of appropriate instruments to support the use of ADLs. As mentioned above, this is one of the main obstacles to their active application.

In summary, the doctoral student's contributions are as follows:

- A comprehensive review and analysis on the development of architecture description languages (by the time of the thesis).
- Development of a new ADL called jADL that solves some of the problems that hinder the massive use of ADLs.
- Validation of jADL has been made, and a description of several fundamental architectural styles is proposed.
- An extension of jADL is proposed to describe microservices which is currently one of the most popular architectural styles in modern software development.
- Software tool has been designed and developed to support the operation and application of jADL.
- Procedure for converting BPMN (Business process modeling notation) models to μσADL models is proposed.

Based on what is written so far, I believe that the contributions of the PhD student are very significant and contribute to the development of the domain of software architectures.

3. Assessment of the thesis publications

The PhD student has submitted 7 publications. He is the only author of 1 of them, and the remaining six are co-authored by his supervisor. The following two publications are indexed in the SCOPUS database:

- T. Papapostolu, D. Birov, Towards a Methodology for Designing Micro-service Architectures Using μσADL, In Lecture Notes in Business Information Processing book series (LNBIP, vol. 319), Springer-Verlag, 2018, pp. 421-431.
- A. Papapostolu, D. Birov, Structured Component and Connector Communication, Proceedings of International Conference “Balkan Conference in Informatics ‘17”.

First of these publication also has SJR = 0.243. No citations of the SCOPUS indexed doctoral student's publications were noted.

The presented 7 publications cover most of the work as presented in the text of the PhD thesis. There exist one more publication (which is also indexed in SCOPUS), concerning the extension (μσADL) of the EAA developed. It is currently under print and is not listed within the thesis.

The publications confirm the the doctoral students work has good dissemination and also fully cover the requirements to receive a PhD degree.

4. Assesment of the thesis synopsis

The thesis synopsis is written both in English and Bulgarian language. The length of the Bulgarian version is 57 pages and the English version is 53 pages. Both versions are identical.

The abstract fulfils all the requirements and covers in sufficient degree the content of the thesis.

5. Personal impressions

I know Anastasios Papapostolu since September 2017 when we together participated in an international seminar in the field of software engineering education. After that we also had common activities as a part of the educational process at the Faculty of Mathematics and Informatics at Sofia University “St. Kliment Ohridski" (conducting exams and preparing courses).

My impression is that Anastasios is a very precise and diligent young man who has the potential to develop himself both as a scientist and teacher.

6. Critical remarks and questions

I had the opportunity to read the thesis before its final submission and then I made a bunch of remarks and recommendations to the doctoral student, mainly related to the rationale and layout of the contributions, as well as to the validation of the jADL language. He complied most bulk of them and corrected his thesis in a timely manner.

One of the few thesis drawbacks is that most of the examples given for the use of jADL fall into the category of so-called academic cases, i.e. they are mainly illustrative. Thus, main recommendation about the PhD student's future work, is to focus his efforts in application of the language he has developed into real software development projects.

I have the following questions to the PhD student:

- Main requirements that influence software architecture are the quality requirements. Does jADL provide means to formally describe quality requirements and if not, can you discuss how the language could be extended in order to address this issue?
- You give an example by translating the jADL-described architectures to the GO and Java programming languages. Why did you choose these two languages and is it possible to modify the jADL tool to use other programming languages?

7. Conclusion

I consider the thesis to fulfil all the requirements for PhD degree of the Bulgarian law and corresponding state and university regulations. Thus, I strongly recommend that Anastasios Papapostolu should be given a PhD degree in field of 4.6. Informatics and Computer Science.

Sofia Signed:

18 October 2019