UNIVERSITÄT PADERBORN
Die Universität der Informationsgesellschaft

FAKULTÄT FÜR ELEKTROTECHNIK, INFORMATIK UND MATHEMATIK

FAKULTÄT EIM | UNIVERSITÄT PADERBORN | 33095 PADERBORN

Dr.-Ing. Steffen Becker
Juniorprofessor

Heinz Nixdorf Institute and
Department of Computer Science
Software Engineering Group

Zukunftsmeile 1
33102 Paderborn
Germany

Phone +49 5251 60-3320
Fax +49 5251 60-3530
Email steffen.becker@upb.de
Web http://ag-schaefer.upb.de

Office
Jutta Haupt
Phone +49 5251 60-3312
Email jutta@upb.de

To
Studijni oddeleni-doktorske studium
Ke Karlovu 3
121 16 Praha 2

Paderborn, den 10.08.14

Review of the PhD thesis submitted by
RNDr. Jaroslav Keznikl
Titled
"Dynamic Software Architectures for Resilient Distributed Systems"

Context The thesis under review addresses the important and up-to-date area of designing and verifying software architectures for resilient distributed systems (RDS) as they appear in domains like the one of cyber-physical systems. In this area systems are built from distributed components, which communicate over unreliable links in an often unplanned way to achieve a set of overall system goals. The behavior the system exhibits is a so-called emergent behavior as it only manifests itself at runtime based on the actual composition of (dynamic) system elements. Such systems only gained attention a few years ago and there is still a huge lack of modeling approaches and verification tools for these systems.

Contents The thesis by Mr. Keznikl addresses the challenges arising from the characterized system class. For this, the thesis consists of a motivating part, a related work discussion, a collection of articles co-authored by Mr. Keznikl and a summary including an outlook to future work.

Overall, the thesis is very well written and I enjoyed reading most parts of it. The goals of the thesis are motivated nicely and the addressed challenges were made clearly explicit. Therefore, it was easy to identify that the thesis contains new scientific results, which are important for the addressed area. This impression was strengthened to a large extend by the extensive related work survey in chapter 2 of the thesis. None of the approaches in the field I could think of being related were missing here. A selection of these approaches, which had close relation to the presented thesis have been discussed in detail. For each of them, the thesis either provides arguments why the approach is

not suited for the studied context or it justified and highlighted why some of the earlier ideas could be adapted and included in a new approach.

Chapter 3 gives a collection of papers co-authored by Mr. Keznikl. For each paper, he provides a summary of the paper and a statement about the parts of the paper that he contributed. Among the papers there are several papers published at high ranked conferences or journals. This shows, that also the community considers the work to be novel and important. One paper even received a best paper award on a conference of a conference series where I am a member of the steering committee. Overall, I have no doubts about the contribution of Mr. Keznikl to the papers and also no doubts that his overall contribution would not be worth issuing a PhD. In summary, his contributions cover a component model for RDS including a runtime environment, a connector generation facility and a Java based model checking approach. Based on a formalization of the component model, he also contributes a method to refine overall system goals into smaller system invariants. In addition, he provides approaches for model checking certain properties of RDS. The latter also includes a discussion of the limitations of model checking approaches for such highly dynamic systems (which results in severe state space problems). All of this gives very strong evidence of the ability of Mr. Keznikl to perform independent, high-quality scientific research.

The thesis concludes with a paper porting the ideas of the DEECo component model into the area of mobile and cloud-based systems. Together with a brief but interesting future work outlook in chapter 4 this gives strong evidence of the ability of Mr. Keznikl to also transfer his results into other, novel application domains.

Overall, I think that the thesis shows Mr. Keznikls abilities to work scientifically and I see no reasons why not to issue a PhD for his contributions.

Paderborn, 10.08.14

S. Becker

Jun.-Prof. Dr.-Ing. Steffen Becker