CHARLES UNIVERSITY PRAGUE

faculty of mathematics and physics

The Board of Doctoral Study
Faculty of Mathematics and Physics
Charles University Prague
Ke Karlovu 3
12116 Prague 2

Prague, August 11, 2012

**Re: Pavel Ježek, Doctoral Thesis – Advisor's Reference**

The submitted PhD thesis concentrates on analysis of component-based software engineering (CBSE) concepts, and problems related to application of hierarchical component models, especially with respect to formal verification of compositional correctness of component-oriented applications.

The main goals of the thesis include (1) evaluation of hierarchical component models on two major case-studies and (2) provision of solution to problems identified in the evaluation. The sub goals are: (a) to devise an approach to cope with complex error traces resulting from verification of hierarchical composition correctness in component systems, (b) to introduce a novel approach for modeling dynamic changes in hierarchical component architectures, and (c) to design a specification language for modeling component environment behavior.

The thesis starts with a short overview of CBSE concepts and the basic wide goals of the thesis (Chapter 1). The CBSE concepts are in detail elaborated in Chapter 2, followed by presentation of a novel approach to categorization of component models and a structured overview of selected industrial component models. Chapter 2 concludes with revised and more narrowly defined goals of the thesis (as described above). Chapter 3 can be divided into two halves. The first half provides an overview of applicability of hierarchical component models and proposes ideal industrial domains to target. The second half of Chapter 3 contains a detailed guide to the core part of the thesis (Chapter 5 to Chapter 8) that presents the key contribution. In Chapter 5, a novel case-study (from the CRE project) is presented. Based on the case-study experience the thesis elaborates a problem with dynamic changes in hierarchical component architectures (forming a motivation for Chapter 7) and presents a complexity of real-life error traces together with a proposed solution. Chapter 6 is based on the case-study from the CoCoME international component modeling contest (comparison). The text presents challenges of modeling the CoCoME in Fractal hierarchical component model and in detail elaborates problems identified, especially related to formal verification of compositional correctness. In Chapter 7, a novel approach to model dynamism in hierarchical component architectures is presented. The proposed solution focuses on reusing existing CBSE concepts (not to break existing models and methods) and enhancing them in a way suitable for formal modeling of component application behavior. Chapter 7 concludes with an evaluation of the approach on the CRE case-study (presented in Chapter 5). In Chapter 8, a novel modeling language DeSpec is presented and evaluated in context of Windows kernel drivers – its applicability in component environment modeling domain is discussed in Chapter 3. In Chapter 9, related work of Chapter 5 to Chapter 8 is overviewed and discussed. Chapter 10 concludes the thesis by providing a summary of contribution and discusses possible directions of future work.

This work has been partially published as a reviewed book chapter (published by Springer-Verlag), at the Euromicro SEAA 2011 conference (proceedings by IEEE CS), the SERA 2009

conference (proceedings by Springer-Verlag), the FESCA 2007 workshop (part of the ETAPS 2007 conference, proceedings in ENTCS by Elsevier), and at the FACS 2005 workshop (proceedings in ENTCS by Elsevier). With respect to all these facts, I strongly recommend the thesis for defense and to grant the Doctor degree to Pavel Ježek.

František Plášil
Advisor