

Review of a PhD thesis

Kamil Ježek: Extra-Functional Properties Support For a Variety of Component Models

Thesis advisor: Ing. Přemysl Brada MSc., Ph.D.

Reviewer: RNDr. Petr Hnětynka, Ph.D.

Overview

The work of Kamil Ježek is done in the important topical area of supporting extra-functional properties in component systems, which are, usually, in contemporary component systems supported either particularly or not at all. Even though there exist a number of approaches for adding support of extra-functional properties to the component system, they are not widely used as for their usage, they require changes in the component systems and/or tool infrastructure. Thus the author of the thesis proposes a new approach allowing addition of support for extra-functional properties to the component systems but without the need to modify them. The approach is evaluated on three particular component systems.

Organization of the thesis

The thesis is organized around 8 chapters. Chapter 1 introduces the work, explains the motivation and states the overall goals of the thesis. Chapter 2 presents a basis of component models while Chapter 3 provides a survey of approaches for supporting extra-functional properties (EFPs) in component systems. The survey covers both standalone approaches for management of EFPs but also goes through the contemporary component systems and analyses their support of EFPs. Chapters 4 and 5 can be considered as the core of the thesis as they describe the author's contributions. Chapter 4 describes the proposed approach, the principles of its application to component systems, and also the process of evaluation of EFPs during composition of a component application. Chapter 5 describes an implementation of the proposed approach and its application to three component systems (OSGi, CoSi, Spring). Chapter 6 describes a case-study on which the approach and implementation are evaluated and Chapter 7 offers further evaluation of the approach with respect to the existing approaches and proposes future work. Finally, Chapter 8 concludes the thesis.

The structure of the thesis is in general good; there are only two issues. First, as the related works (Chapter 3) are presented before the author's contributions, the evaluation with respect to these works (Chapter 7) is harder to follow since it requires jumping between the chapters. The second issue is that from the text it is not clear, which parts of the thesis are covered by the author's publications; the publications are just listed in the appendix without further mentioning. I would expect that a description how the thesis contributions are covered by the publications would be presented for example in the introduction.

The text of the thesis is readable and easy to follow. Sometimes, the text contains language usage errors, misspellings, etc., however they do not hinder readability.

Main research findings and results

The main result of the work is an approach allowing to support EFPs independently of a component system, i.e. without changes to the system and/or its tool infrastructure. Such an independence allows for easier adoption of managing EFPs in development of component-based applications. The thesis also defines how the proposed approach is integrated to the development life-cycle of component applications.

The independence of the approach is achieved by its modular design. While the EFPs repository and EFPs evaluator are common, the module for assignment of particular EFPs to components is pluggable and sub-modules for individual supported component systems are inserted to it.

The elements used in the approach are defined formally and, typically, also by a meta-model.

The applicability of the proposed approach is evaluated by its implementation for three component systems and also by a case study, which uses the approach during the development of a particular component application.

The presented approach can be used not only in the area of component systems but also in the service-oriented development.

Also, the survey (Chapter 3) of approaches used for managing EFPs in component systems has to be highlighted as an important contribution as it is quite extensive.

The results of the work have been published at several international conferences and workshops.

Issues

The goals of the thesis are motivated by real problems and they are reasonable and well-defined. Also the presented results are interesting and adequate. However there are several issues.

First, in Section 4.3 there is written that the proposed structure of EFPs is created following a set of other approaches, however it is not stated why a completely new structure is needed (in fact it can be found in the survey but the information is spread through several subsections of the survey).

Next, I would expect also an implementation of the proposed approach for a component system with a hierarchical composition (all three component systems for which the implementation is described, are flat). For example SOFA 2 (which is even mentioned in Chapter 3) can be considered as a good candidate as its composite components exist even at run-time. In a case the author would prefer industrial component systems, for example iPOJO or SCA can be used.

Regarding the EFPs evaluation process, the assumption that with the increasing version the quality of a component also increases (Sect. 4.6.3) is in my opinion too strong. It is not clear what a term “better component” (used in this context) means (even the author uses the quotation marks).

Also regarding the evaluation process and resolution of incompatible components, there is written that “it is assumed that the method is usable in real scenarios”. I think the usability is not so clear and should be supported by an evaluation (if not on a real-life application then for example on a rather larger set of generated components and compositions).

There are also several minor issues.

With regards to the survey of other EFPs approaches, it is sometimes unbalanced as some approaches are evaluated in-depth while other ones just described.

Also, I think the thesis should mention the term “non-functional properties – NFPs” (even if they are commonly considered as synonyms) since several mentioned approaches use NFPs instead of EFPs.

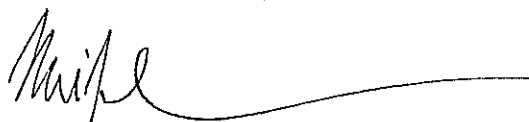
The structure of EFPs and other elements are in the work described formally but also by a meta-model. However, it is not clear why both approaches are used (also it is not clear whether the meta-models are used for generation of the implementation).

Judgement

In summary, I believe that despite the occasional weak points, the work makes a good contribution to the area of component systems and EFPs and shows the candidate’s ability to perform research work. Therefore I recommend the thesis for a defence and suggest that Kamil Ježek be awarded the degree of Ph.D.

Prague, July 2, 2012

RNDr. Petr Hnětynka, Ph.D. (Charles University, Prague)



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Oponentský posudok dizertačnej práce

Názov práce: Extra-Functional Properties Support
For a Variety of Component Models

Doktorand: Ing. Kamil Ježek

Predložená dizertačná práca prináša komplexný pohľad na mimofunkcionálne (alebo nefunkcionálne) vlastnosti. Hlavným prínosom je vlastný prístup doktoranda pod názvom Extra-Functional Property Featured Compatibility (EFFCC), ktorý vychádza z dôkladnej analýzy jestvujúcich prístupov, a ktorý je dôsledne formálne podchytený a následne aj implementovaný vo forme prostredia na prácu s mimofunkcionálnymi vlastnosťami s prispôbeniami pre modely komponentov Spring, OSGi a CoSi. Implementácia a následná štúdia na rade softvérových výrobkov (software product line) webového prehliadača má veľký význam pre evaluáciu prístupu, ktorá často v takýchto prácach chýba.

Fokus na dotiahnutie po úroveň praktickej použiteľnosti, ktorý je v práci evidentný, pramení v analýze radu prístupov k definovaniu mimofunkcionálnych vlastností softvéru vo forme textovo založených jazykov, v zmysle modelovania vo všeobecnosti a zvlášť v modelovaní založenom na komponentoch, ako aj k využitiu mimofunkcionálnych vlastností, ktorá ukázala, že napriek rozmanitosti ponúkaných riešení, chýba ich praktické uplatnenie.

K práci nemám vážnejšie výhrady, len by som rád upozornil na niekoľko partikulárnych záležitostí. V úvodnom priblížení vývoja softvéru založenom na komponentoch doktorand ignoruje softvérové rámce (software frameworks) ako najrozšírenejší typ komponentov¹ a potrebu prispôbenia komponentov. Doktorand sa uspokojuje s citovaním niekoľkých definícií komponentu bez pokusu o preskúmanie rozpätia chápania komponentu. Tu mohol zohľadniť generatívne programovanie alebo rady softvérových výrobkov.

Doktorand nekriticky uvádza zavádzajúce Szyperského porovnanie komponentov a objektov, podľa ktorého komponenty nemajú stav, neopakujú sa v aplikácii a pod. Aj keď uvádza protipríklady, chýba jasné vyjadrenie.

Doktorand tvrdí, že jeho prístup prináša významné zlepšenie vzhľadom na iné systémy akým je napríklad Java, lebo všetky typy implementujú

¹Jan Bosch. Design and Use of Software Architectures: Adopting and Evolving a Product-Line Approach. Addison-Wesley, 2000.

spoločné rozhranie. Toto je však prípad aj v Jave, v ktorej Object predstavuje spoločný nadtyp.

Na obr. 4.5 sa doktorand pokúša modelovať funkciu diagramom tried. Adekvátne by tu bol diagram sekvencií.

Práca je písaná v angličtine. Chyby a mylné konštrukcie, ktoré sa vyskytujú najmä v prvých kapitolách, sťažujú pochopenie textu. Orientácii v texte by pomohol opis štruktúry kapitol v ich úvodných častiach. Časti 4.4.1 a 4.5.1 stoja samé, bez ďalších častí na danej úrovni.

Podstatnú časť výskumných výsledkov doktorand publikoval a to na veľmi relevantných fórach.

Predložená dizertačná práca potvrdzuje schopnosť doktoranda vedecky skúmať a kvalifikovane sa vyjadrovať a prezentovať výsledky výskumu. Doktorand splnil ciele dizertačnej práce. Samotná dizertačná práca obsahuje rad vynikajúcich výsledkov. Dizertačnú prácu odporúčam k obhajobe a navrhujem doktorandovi udeliť akademický titul doktor (PhD.). Chcel by som požiadať doktoranda, aby sa v rámci obhajoby vyjadril o súvisi jeho prístupu a softvérového rámca ako komponentu.

Bratislava, 10. júl 2012

