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Software Components, Architectures and Reuse

J.UCS Special Issue

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The aim of this special issue is to report the state of research and practice on the theme of software components, architectures, and reuse. This special issue is comprised of selected, extended peer-reviewed papers presented at the 2nd Brazilian Symposium on Software Components, Architectures, and Reuse (SBCARS 2008), held in Porto Alegre, Brazil, 20-22 August, 2008 (http://www.inf.pucrs.br/sbcars2008/en/), and papers selected following an open, international Call for Papers.

The call for this special issue received 14 submissions from co-authors of 12 countries (Brazil, Canada, Cyprus, France, Germany, Great Britain, India, Ireland, Portugal, Sweden, Tunisia, and USA). Half of the submissions were extended and revised versions of papers accepted for SBCARS 2008.

Each of the 14 submissions was reviewed by 3 reviewers. In total, 42 reviewers (3 reviewers per paper – 1 paper per reviewer) participated in the reviewing process. They are well-known researchers in the area, coming from 13 countries (Australia, Brazil, Canada, France, Great Britain, Ireland, Italy, Portugal, Spain, Sweden, The Netherlands, USA, and Venezuela).

After a thorough reviewing process, 7 submissions were selected to provide revised versions based on the reviewer's recommendations. These revised versions were then checked by the corresponding reviewers and 5 high-quality papers were finally selected to be included in this special issue, of which 3 are extended and revised versions of SBCARS papers. They present high-quality research carried out by co-authors from Brazil, Canada, Ireland, and Portugal.

Contents of this Issue

The first paper, entitled "An Approach for Estimating Execution Time Probability Distributions of Component-based Real-Time Systems" (R. Perrone, R. Macêdo, G. Lima, V. Lima), addresses Component-Based Development (CBD). It presents a methodology for estimating probability distributions of execution time in the context of such systems, where no access to component internal code is assumed. In order to evaluate the proposed methodology, experiments were conducted with components,

and related compositions, implemented over CIAO and ARCOS, where CIAO is a real-time component-based middleware and ARCOS a software framework devoted to the construction of real-time control and supervision applications, developed over CIAO. The collected experimental data show that the proposed approach is a good approximation for component execution time probability distributions.

The second paper, entitled "Distribution Pattern-driven Development of Service Architectures" (R. Barrett, C. Pahl), addresses Service-Oriented Architectures (SOA). It presents a distribution pattern-driven approach to service composition and architecting, where architectural configurations or distribution patterns express how a composed system is to be deployed in a distributed environment. It develops, based on a catalog of patterns, a UML-compliant framework, which takes existing Web service interfaces as its input and generates executable Web service compositions based on distribution patterns chosen by the software architect.

The third paper, entitled "Checking Semantics Equivalence of MDA Transformations in Concurrent Systems" (P. Barbosa, F. Ramalho, J. Figueiredo, A. Júnior, A. Costa, L. Gomes), addresses Model Driven Architecture (MDA). Based on previous work extending the standard MDA architecture, supporting formal verification of semantics preserving transformations of Platform Specific Models (PSM), it presents how the extended MDA architecture copes with the correctness verification of horizontal model transformations involving Platform Independent Models (PIM) of concurrent systems. The proposed approach is supported by four formal techniques: behavioral equivalence relation, category theory, bisimulation, and model-checking. This set of techniques allows the analysis of semantics equivalence between system model before and after transformation enabling the decomposition of the system model into a set of concurrent sub-models, considered as components. The validation of the approach occurs in a net splitting operation, where PIMs are defined as Petri nets models according to the PNML metamodel with transformations representing formal operations in this domain.

The fourth paper, entitled "A Flexible Strategy-Based Model Comparison Approach: Bridging the Syntactic and Semantic Gap" (K. Oliveira, K. Breitman, T. Oliveira), addresses Model Driven Development (MDD). It discusses the importance of model comparison as one of the pillars of MDD and proposes an innovative, flexible, model comparison approach, based on the composition of matching strategies. The proposed approach is implemented by a match operator that combines syntactical matching rule, synonym dictionary, and typographic similarity strategies to a semantic, ontology-based strategy. By relying on ontologies, that are semantically richer and have greater expressive power than UML models and can be formally verified for consistency, the proposed approach provides more reliability and accuracy to model comparison. It is presented in the format of a workflow that provides guidance to users and facilitates the inclusion of new matching strategies and evolution.

Finally, the fifth paper, entitled "Assessment of the Design Modularity and Stability of Multi-Agent System Product Lines" (C. Nunes, U. Kulesza, C. Sant'Anna, I. Nunes, A. Garcia, C. Lucena), addresses Product Lines (PL) for Multi-Agent Systems (MAS). It presents a quantitative study on the design modularity and stability of an evolving MAS-PL, which was built following the reactive product line adoption

approach. The product line was developed and evolved based on several versions of a conference management web-based system. The evaluation is carried out through a series of change scenarios related to new agency features, which are agent characteristics that enhance the system with autonomous behavior. The quantitative study consists of a systematic comparison between two different versions of the MAS-PL based on a MAS-specific platform, i.e. JADE, relying on well-known modularity and change impact metrics.

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