Journal of Systems and Software

Volume 92, June 2014, Pages 32-44

SelfMotion: A declarative approach for adaptive service-oriented mobile applications

Gianpaolo Cugola [a] ... Giordano Tamburrelli [b]

Show more

https://doi.org/10.1016/j.jss.2013.10.057

Highlights

- â€¢ We defined a novel declarative language and a middleware to effectively design adaptive service-oriented mobile applications.
- â€¢ We investigated the advantages of the proposed approach w.r.t. existing related solutions.
- â€¢ We fully implemented and tested our framework with an existing worldwide distributed mobile application.
- â€¢ We performed a series of experiments to evaluate the applicability of the proposed solution in various scenarios.

â€¢ We publicly released the implementation of the proposed approach to facilitate its adoption and allow the replicability of the obtained findings.

Abstract

Modern society increasingly relies on mobile devices. This explains the growing demand for high quality software for such devices. To improve the efficiency of the development life-cycle, shortening time-to-market while keeping quality under control, mobile applications are typically developed by composing together ad-hoc developed components, services available on-line, and other third-party mobile applications. Applications are thus built as *heterogeneous compositions*, whose characteristics strongly depend on the components and services they integrate. To cope with unpredictable changes and failures, but also with the various settings offered by the plethora of available devices, mobile applications need to be as adaptive as possible. However, mainstream adaptation strategies are usually defined imperatively and require complex control strategies strongly intertwined with the application logic, yielding to applications that are difficult to build, maintain, and evolve. We address this issue by proposing a declarative approach to compose adaptive heterogeneous mobile applications. The advantages of this approach are demonstrated through an example inspired by an existing worldwide distributed mobile application, while the implementation of the proposed solution has been validated through a set of simulations and experiments aimed at illustrating its performance.

Previous article

Next article

Keywords

Mobile applications; Self-adaptive systems; Declarative language

Gianpaolo Cugola received his Dr.Eng. degree in Electronic Engineering from Politecnico di Milano. In 1998 he received the Prize for Engineering and Technology from the Dimitri N. Chorafas Foundation for his Ph.D. thesis on Software Development Environments. He is currently Associate Professor at Politecnico di Milano where he teaches several courses in the area of Computer Science. He is co-author of tens of scientific papers published in international journals and conference proceedings. His research interests are in the area of Software Engineering and Distributed Systems. In particular, his current research focuses on middleware technology for largely distributed and highly reconfigurable distributed applications with a special attention to the issue of Complex Event Processing..

Carlo Ghezzi is an ACM Fellow, an IEEE Fellow, a member of the European Academy and of the Italian Academy of Sciences. He received the ACM SIGSOFT Distinguished Service Award. He is the current President of Informatics Europe. He is a regular member of the program committee of flagship conferences in the software engineering field, such as the ICSE and ESEC/FSE, for which he also served as Program and General Chair. He has been the Editor in Chief of the ACM Trans. on Software Engineering and Methodology and is currently an Associate Editor of the Communications of the ACM, IEEE Trans. on Software Engineering, Science of Computer Programming, Computing, and Service Oriented Computing and Applications. Ghezzi's research has been mostly focusing on different aspects of software engineering. He co-authored over 200 papers and 8 books. He coordinated several national and international research projects. He is currently the PI of the ERC Advanced Grant SMScom.

Leandro Sales Pinto received the MSc degree in computer science from the Universidade de Fortaleza - Brazil. He received the PhD degree in computer science

engineering at Politecnico di Milano, where his main focus was on Self-adaptive systems and service compositions.

Giordano Tamburrelli received the MSc degree in computer science from the University of Illinois at Chicago, and the MSc degree in computer science engineering from the Politecnico di Milano in a joint degree program. He received the PhD degree inÂ computer science engineering at Politecnico di Milano and, currently, he is Marie Curie Fellow at the University of Lugano. His research interests focus on runtime modeling andÂ verification of systems and software, non-functional requirements, and service-based architectures.

Selfmotion: A declarative approach for adaptive service-oriented mobile applications, luman and P.
DSOL: a declarative approach to self-adaptive service orchestrations, lena commits a subject of power at any of their mutual arrangement.