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Active Object Languages: Current Research Trends

 Springer

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Preface

Our interest in active object languages started almost twenty years ago and continued through a series of European research projects: CREDO (FP6, during 2006–2009), HATS (FP7, during 2010–2013), ENVISAGE (FP7, during 2013–2016), UpScale (FP7, during 2014–2017), and HyVar (H2020, during 2015–2018). At the time, we were attracted to the concurrency model of Actors and the code structuring mechanisms of Object-Oriented Programming. These projects developed the active object paradigm in the context of service-oriented distributed systems, software variability, cloud computing, multicore computing and IoT-driven dynamic software reconfiguration. Many of the problems that were explored in this work remain relevant in research today, e.g., asynchronous method calls and futures, asynchronous distributed workflows, parallel programs with explicit units of composition and deployment, resource-sensitive systems, software modularity and variability, programming and reasoning techniques for asynchronous systems.

Active objects is a programming paradigm that supports a non-competitive, data-driven concurrency model, a generalization of the popular actor paradigm. Active object languages study how actor-like concurrency can be combined with object-oriented structuring concepts. This makes active object languages well-suited for simulation, data race-free programming, and formal verification. For a comprehensive discussion of different active object languages and their design choices, we refer to the state-of-the-art survey¹. Concepts from active objects made their way into languages such as Rust, ABS, Akka, JavaScript, and Go.

Today, we can say that we were intrigued by the compositionality mechanisms at play in active object languages, and their application in language semantics and formal reasoning techniques as well as in the executable modelling and analysis of complex, distributed systems. This volume collects a series of articles on recent trends on the topic of programming and reasoning about asynchronous and distributed systems, with active objects at its core but also touching on related techniques. For this volume, we took the opportunity to invite researchers, inside and outside of the projects, to reflect on some state-of-the-art developments in the field. We feel very lucky that so many of our peers responded. The result is a book whose chapters identify and address some of the latest challenges in active objects and asynchronous distributed systems. It captures aspects of novel programming techniques, modelling solutions and reasoning challenges for modern actor and active object languages, and the related field of asynchronous, distributed and decentralised systems.

We thank all authors for accepting our invitation and putting a lot of effort into producing the high-quality content we are proud to present here. With this book, we

¹ Frank S. de Boer, Vlad Serbanescu, Reiner Hähnle, Ludovic Henrio, Justine Rochas, Crystal Chang Din, Einar Broch Johnsen, Marjan Sirjani, Ehsan Khamespanah, Kiko Fernandez-Reyes, Albert Mingkun Yang: A Survey of Active Object Languages. *ACM Comput. Surv.* 50(5): 76:1–76:39 (2017).

hope to provide the community with insights into recent and latest developments in important subareas of active object languages and related research.

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