Towards Fully Decentralized Self-Adaptive Reactive Systems

Mauro Caporuscio
Linnaeus University
Växjö, Sweden
mauro.caporuscio@lnu.se

ABSTRACT

With the growing demand for real-time data originating from myriads of Internet-connected devices, the number of requests hitting today's computing infrastructures goes beyond what is manageable for operations and affordable for management. Coping with these challenges requires a modernization of the application architectures and the underlying infrastructures. The mobile nature inherent to modern communications and interactions requires a radical shift towards new computing paradigms that reflect the fully decentralized perspective of the emerging execution environment.

To this end, the trend is to switch thinking from assembling components into systems to dynamically composing autonomous systems into systems-of-systems. Indeed, systems-of-systems possibly emerge dynamically as an opportunistic aggregation of systems available at a given time. Since these systems operate under highly dynamic conditions where both the entities and their interconnections are subject to continuous change, the traditional stability assumptions made on distributed systems' design are no longer valid. Indeed, the dynamic operating conditions introduce uncertainty, which may harm the dependability of the system. In order to guarantee the provision of dependable functionality in such an unknown, ever-changing execution environment, systems should be fluid and able to self-adapt their structure depending on the changing situation.

This talk examines a set of principles and techniques facilitating the design and development of fully decentralized systems that leverage on self-adaptivity to mitigate run-time uncertainty. Specifically, the key objective is to efficiently and effectively provide engineers with proper abstractions to develop self-adaptive systems capable of being at the same time fluid, as well as dependable.

CCS Concepts

•Software and its engineering → Software architectures; Distributed systems organizing principles; Extra-functional properties;

ICPE '17 Companion April 22-26, 2017, L'Aquila, Italy

ACM ISBN 978-1-4503-4899-7/17/04.

DOI: http://dx.doi.org/10.1145/3053600.3053607

Keywords

Pure-Edge Computing; Fluid Architecture; Self-adaptation; Reactive Systems;

BIOGRAPHY

Mauro Caporuscio is Associate Professor at the Department of Computer Science, Linnaeus University (Växjö, Sweden). He received his Ph.D. in Computer Science from the University of L'Aquila, Italy in 2006. He was Postdoc at INRIA Paris-Rocquencourt (2006-2009) and Assistant Professor at Politecnico di Milano (2010-2014). He has published several papers in the most important international journals and conferences and has been serving on the program committee of international conferences. His research interests mainly focus on the application of software engineering methodologies to the field of distributed systems, with particular emphasis to middleware supporting Service Oriented Architecture and Pervasive Computing. Further information is available at http://www.maurocaporuscio.net.