Introduction to the Special Issue on Emerging Software Technologies for Internet-Based Systems: Internetwork and DevOps

TAO XIE, University of Illinois at Urbana-Champaign

ANDRE VAN HOORN, University of Stuttgart

HUAIMIN WANG, National University of Defense Technology

INGO WEBER, Data61, CSIRO

The open, dynamic, and constantly changing nature of Internet-based systems poses special challenges for software technologies. Unlike traditional software systems, Internet-centered software systems need to be autonomous, cooperative, situational, evolvable, emergent, and trustworthy. To cope with these characteristics, emerging software technologies are attracting attention from the research community, such as Internetwork [1, 2, 5] (focusing on software paradigms) and DevOps [3, 4, 6] (focusing on software processes, culture, and methodologies). Internetwork is a new software paradigm that can model the above characteristics of Internet-centered software systems, where the software is architected like the Internet, developed with the Internet, operated on the Internet, and provided as services via the Internet. While ensuring high quality, DevOps aims at increasing the frequency and speed of bringing changes from development into production, usually achieved by new organizational structures and processes with a high degree of automation (such as continuous deployment to production and feedback to developers).

We present a selection of nine articles on Internetwork and DevOps. Each article has undergone multiple rounds of review by at least three experts following the highest standards.

The article “i-Jacob: An Internetwork-Oriented Approach to Optimizing Computation-Intensive Mobile Web Browsing” by Liu et al. proposes the i-Jacob approach to improving the performance of mobile Web browsing by systematically enabling offloading of JavaScript computations between various mobile devices and clouds.

The article “Adaptive Speculation for Efficient Internetwork Application Execution in Clouds” by Ouyang et al. presents an algorithm to improve the execution efficiency of Internetwork applications by dynamically adapting to different job types and system conditions.

The article “CloudMF: Model-Driven Management of Multi-Cloud Applications” by Ferry et al. presents the evaluation and two significant extensions of the Cloud Modelling Framework (CloudMF), which fosters the design, deployment, and maintenance of multi-cloud applications.

The article “Architectural Principles for Cloud Software” by Pahl et al. proposes an architectural style and its building blocks for cloud-based software systems, with its principles

Authors' addresses: T. Xie, 201 N. Goodwin Ave. Urbana, IL 61801, USA; email: taoxie@illinois.edu; A. van Hoorn, Universitätsstraße 38, D-70569 Stuttgart, Germany; email: van.hoorn@informatik.uni-stuttgart.de; H. Wang, College of Computer, National University of Defense Technology, 410073, Changsha, Hunan, China; email: whm_w@163.com; I. Weber, Data61, CSIRO, Level 5, 13 Garden St, Eveleigh, NSW 2015, Australia; email: ingo.weber@data61.csiro.au.

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1533-5399/2018/03-ART13

<https://doi.org/10.1145/3173572>

(service-orientation, virtualization, adaptation, and uncertainty) and patterns (microservices, quality models at runtime, control loop, and controller architecture).

The article “Fuzzy Clustering of Crowdsourced Test Reports for Apps” by Jiang et al. presents TEst Report Fuzzy clUstering fRamework (TERFUR), a new framework that aggregates redundant and multi-bug crowdsourced test reports for mobile apps into clusters to reduce the number of inspected test reports.

The article “CrowdService: Optimizing Mobile Crowdsourcing and Service Composition” by Peng et al. presents the CrowdService framework to supply crowd intelligence and labor as publicly accessible crowd services via mobile crowdsourcing.

The article “Improving Verification Accuracy of CPS by Modeling and Calibrating Interaction Uncertainty” by Yang et al. proposes an approach to verifying Cyber-Physical Systems (CPS) applications with explicit modeling of uncertainty in the interaction between the systems and the environment.

The article “Multi-Objective Optimization of Deployment Topologies for Distributed Applications” by Willnecker and Krcmar proposes a software-based approach for distributed applications to select an optimized topology for a specified workload and consider on-premise, cloud, and hybrid topologies.

The article “Utility-based Decision Making for Migrating Cloud-based Applications” by Gómez Sáez et al. presents a utility-based decision support model and method during design time for evaluating and ranking potential application distributions spanned among heterogeneous cloud services.

We hope you will find the selected articles interesting and inspiring!

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