Welcome message

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Welcome Message

Welcome to SPLC 2021, the 25th International Systems and Software Product Line Conference. Variability is at the core of most modern computer and cyber-physical systems. Product lines provide a structured method for dealing with variability. They represent one of the most exciting paradigm shifts in software and systems development, with new challenges and opportunities for both research and practice. For decades, SPLC has been the flagship venue for practitioners, researchers, and educators interested in systems and software product lines. SPLC is a great venue for learning about the state of the art as well as practice, trends, innovations, industry experiences, and challenges in the area of systems family engineering at large.

SPLC 2021 took place from September 6th to 11th. While originally meant to take place in Leicester, UK, the conference was made fully virtual. For participants, SPLC 2021 proposed a very exciting program of top notch research and industry papers as well as journal-first presentations, workshops, tutorials, challenges, solutions, tool demonstrations, doctoral proposals, artefacts, and great keynote presentations.

SPLC 2021 received 105 submissions: 45 research papers and 7 research artefacts, 7 industry papers, 3 journal-first papers, 6 workshop proposals, 2 challenge proposals and 3 solutions, 7 demo and tool papers, 5 doctoral proposals and 7 tutorial proposals. In the research track, based on at least three reviews and intensive discussions, the committees selected 12 full papers and 3 short papers, translating into a 33% acceptance rate. In the industry track, 3 full papers were accepted following the same rigorous process, translating into a 43% acceptance rate. We are especially grateful to all members of the program committees for helping us to seek submissions and provide valuable and constructive reviews.

We would like to thank our keynote speakers Mattias Nyberg, Julia Rubin, and Thomas Thüm, who graciously agreed to share their perspectives, experiences, and insights with the community. The program committee members and track chairs deserve a particular mention for their hard work in reviewing and discussing the papers. Our thanks also go to the Organisation Committee for taking on the arduous challenges involved in organising a virtual conference. We would like to thank our sponsors and institutional partners for their support and contributions. These include BT Plc. (Gold Sponsor), Robert Bosch GmbH (Gold Sponsor), Elsevier Science BV (Silver Sponsor), MetaCase (Silver Sponsor), the Association of Computing Machinery (ACM), and the ACM Special Interest Group on Software Engineering (SIGSOFT).

Sincerely,

Mohammad Reza Mousavi, Pierre-Yves Schobbens, Ina Schaefer, Maurice H. ter Beek, Xavier Devroey, José Miguel Rojas, Rick Rabiser, Mahsa Varshosaz, Monica Pinto, Leopoldo Teixeira, Thorsten Berger, Joost Noppen, Goetz Botterweck, Natsuko Noda, Iris Reinhartz-Berger, Paul Temple, Ferruccio Damiani, Justyna Petke, Tomoji Kishi, Jaejoon Lee, Hugo Araujo, Jan Oliver Ringert, Uraz Türker, and Carlos Diego Damasceno.

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Microservice-based Development: Something Old, Something New, Something Borrowed, and What We Can Do

Julia Rubin - ***The University of British Columbia, Canada***

Abstract. Whenever you watch Netflix or order from Amazon, you use microservice-based applications. Such applications follow a SOA-inspired architectural principle of building complex systems as a composition of small, loosely coupled components that communicate with each other using language-agnostic APIs. Microservices have recently become popular in industry due to their advantages, such as greater software development agility and improved scalability of deployed applications. Yet, proper adoption of microservices induces numerous technical and organizational changes. This talk will discuss several of these challenges, based on empirical data we gathered from more than 50 industrial practitioners. We will then focus on two of the challenges in more detail: managing variants in microservice-based systems and decomposing monolithic applications into microservices. We will discuss some existing solutions for addressing these challenges and possible future research directions for the SPLC community.

About Julia Rubin. Julia Rubin is an Assistant Professor at the Department of Electrical and Computer Engineering at the University of British Columbia. She holds a Canada Research Chair (Tier II) in Trustworthy Software. Julia received her PhD in Computer Science from the University of Toronto, Canada and worked as a postdoctoral researcher at MIT, USA. She also spent almost 10 years in industry, working for IBM Research, where she was a research staff member and a research group manager. Julia's research interests are in software engineering, program analysis, software security, and reliability in complex software systems. Her work in these areas won five Distinguished/Best Paper Awards at major conferences, such as ICST'21, ISSTA'18, ASE'15, and SPLC'13, and was runner-up for Facebook's Internet Defense Prize at the USENIX Security Symposium'14. Julia serves on program committees of several flagship conferences in software engineering, such as ICSE, FSE, and ASE. She co-chaired the program committees of SPLC'14, ECMFA'14, FASE'17, CASCON'20, and will co-chair the program committee of ASE in 2022.

Generating safety cases for large-scale industrial product lines

Mattias Nyberg - ***Scania and Royal Institute of Technology, Sweden***

Abstract. The heavy-vehicle manufacturer Scania has a complex product line consisting of billions of possible product configurations. Faced with the challenge of arguing that each of the configurations is safe, Scania has, in collaboration with KTH, developed a general methodology to build a so called "safety case" for a complex product line. The goal has been to generate it as automatically as possible from existing engineering data. The presentation will explain the methodology and share experiences from the huge effort of trying to implement it in the industrial context of Scania.

About Mattias Nyberg. Mattias Nyberg is an adjunct (part-time) professor at Royal Institute of Technology (KTH) in the department of Mechatronics. His main affiliation is Scania CV AB, a leading global heavy-truck manufacturer. He received a PhD in Electrical Engineering from Linköping University in 1999 specializing in vehicular systems. After dissertation he has worked mainly in industry; first for Daimler in Stuttgart, Germany, and then at Scania with a current focus on functional safety and product line engineering. In parallel with his industrial career, he is very active in academic research. He has supervised six PhD students. He is also an author of more than 100 scientific publications, and has received the SAE Vincent Bendix award.

Where Are My Constraints and What Do They Constrain?

Thomas Thüm - ***University of Ulm, Germany***

Abstract. The adoption of product lines in industrial practice is challenged by feature interactions. In theory, adding a single feature to a product line can double the number of products. In practice, constraints between the features drastically limit the number of useful products. Where do we find those constraints? What do we do with those constraints? And where on earth are all the smart technologies that help our overwhelmed engineers? Since 2007, I am involved in the development of FeatureIDE. In this keynote, I would like to share experiences made with product-line research and its application to industrial practice.

About Thomas Thüm. Thomas Thüm is a professor for the Construction and Analysis of Secure Software Systems at the University of Ulm since January 2020. His research interests range from Software Engineering and Formal Methods to Artificial Intelligence and Security. In particular, his research focuses on variability and evolution of software systems. From 2015 to 2019, he was a postdoctoral researcher at the TU Braunschweig in Ina Schaefer's institute. He received his Ph.D. in 2015 from the University of Magdeburg under the supervision of Gunter Saake. His Ph.D. thesis received the Dissertation Award 2015 of the University of Magdeburg and his master's thesis the Software Engineering Award 2011 of the Ernst Denert Foundation. He coauthored more than 100 peer-reviewed publications and is known for his contributions to the famous open-source project FeatureIDE. Since 2020, he is an associate editor for ACM Transactions on Software Engineering and Methodology (TOSEM).

Empirical software product line engineering: A systematic literature review. An IST journal publication

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ABSTRACT

The adoption of Software Product Line Engineering (SPLE) is usually only based on its theoretical benefits instead of empirical evidences. In fact, there is no work that synthesizes the empirical studies on SPLE. This makes it difficult for researchers to base their contributions on previous works validated with an empirical strategy. The objective of this work is to discover and summarize the studies that have used empirical evidences in SPLE limited to those ones with the intervention of humans. This will allow evaluating the quality and knowing the scope of these studies over time. Doing so, research opportunities can arise. Analyzing the authors and institutions that investigate SPLE supported by empirical studies will also help to know which institutions have knowledge of the subject, leading to detect and encourage collaboration among researches. A systematic literature review was conducted with the focus on those studies in which there is human intervention and were published between 2000 and 2018 (the systematic literature review was developed in 2019). We considered peer-reviewed papers from journals and top software engineering conferences. Out of a total of 1880 studies in the initial set, a total of 62 primary studies were selected after applying a series of inclusion and exclusion criteria. We found that, approximately 56% of the studies used the empirical case study strategy while the rest used experimental strategies. Around 86% of the case studies were performed in an industrial environment showing the penetration of SPLE in industry while 81% of the experiments were conducted in an academic environment. Around 95.16% of the studies address aspects related to domain engineering while application engineering received less attention. Most of the experiments and case study evaluated showed an acceptable level of quality. The first study found dates from 2005 and since 2008, the interest in the empirical SPLE has increased.

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CCS CONCEPTS

• **Software and its engineering → Software product lines**; • **General and reference → Empirical studies**.

KEYWORDS

Software product lines, Empirical strategies, Case study, Experiment, Systematic literature review

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