

# **2022 IEEE 19th International Conference on Software Architecture (ICSA 2022)**

**Virtual Conference  
12-15 March 2022**



**IEEE Catalog Number: CFP22WIC-POD  
ISBN: 978-1-6654-1729-7**

**Copyright © 2022 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP22WIC-POD
ISBN (Print-On-Demand):	978-1-6654-1729-7
ISBN (Online):	978-1-6654-1728-0

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2022 IEEE 19th International Conference on Software Architecture (ICSA) **ICSA 2022**

## Table of Contents

Message from the ICSA 2022 General Chairs and Program Chairs .....	viii
Organizing Committee .....	xi
Program Committee .....	xiii
Keynotes .....	xv

### ICSA 2022 Main track

Architectural Attack Propagation Analysis for Identifying Confidentiality Issues .....	1
<i>Maximilian Walter (Karlsruhe Institute of Technology (KIT), Germany), Robert Heinrich (Karlsruhe Institute of Technology (KIT), Germany), and Ralf Reussner (Karlsruhe Institute of Technology (KIT), Germany)</i>	
Using Gossip Enabled Distributed Circuit Breaking for Improving Resiliency of Distributed Systems .....	13
<i>Aashay Palliwar (Indian Institute of Technology Bhubaneswar, India) and Srinivas Pinisetty (Indian Institute of Technology Bhubaneswar, India)</i>	
Symptoms of Architecture Erosion in Code Reviews: A Study of Two OpenStack Projects .....	24
<i>Ruiyin Li (Wuhan University, China; University of Groningen, The Netherlands), Mohamed Soliman (University of Groningen, The Netherlands), Peng Liang (Wuhan University, China), and Paris Avgeriou (University of Groningen, The Netherlands)</i>	
Tool-Assisted Componentization of Java Applications .....	36
<i>Mahmoud M. Hammad (Jordan University of Science and Technology, Jordan), Ibrahim Abueisa (Amazon Inc., Jordan), and Sam Malek (University of California, Irvine, USA)</i>	
A Study on the Software Architecture Documentation Practices and Maturity in Open-Source Software Development .....	47
<i>Michel Muszynski (Utrecht University, The Netherlands), Sven Lugtigheid (Utrecht University, The Netherlands), Fernando Castor (Utrecht University, The Netherlands), and Sjaak Brinkkemper (Utrecht University, The Netherlands)</i>	
How Do Developers Search for Architectural Information? An Industrial Survey .....	58
<i>Musengamana Jean de Dieu (Wuhan University, China), Peng Liang (Wuhan University, China), and Mojtaba Shahin (Monash University, Australia)</i>	

Designing Microservice Systems Using Patterns: An Empirical Study on Quality Trade-Offs .....	69
<i>Guilherme Vale (University of Porto, Portugal), Filipe Figueiredo Correia (University of Porto, INESC TEC, Portugal), Eduardo Martins Guerra (Free University of Bozen-Bolzano, Italy), Thatiane de Oliveira Rosa (Institute of Mathematics and Statistics, University of São Paulo, Brazil), Jonas Fritzsche (Institute of Software Engineering, University of Stuttgart, Germany), and Justus Bogner (Institute of Software Engineering, University of Stuttgart, Germany)</i>	
Effort Estimation for Architectural Refactoring of Data Tier Software .....	80
<i>Ersin Ersoy (Turkcell, Turkey) and Hasan Sözer (Ozyegin University, Turkey)</i>	
Architectural Design Decisions for Machine Learning Deployment .....	90
<i>Stephen John Warnett (University of Vienna, Austria) and Uwe Zdun (University of Vienna, Austria)</i>	
Untangling the Knot: Enabling Architecture Evolution with Search-Based Refactoring .....	101
<i>James Ivers (Software Engineering Institute, Carnegie Mellon University, USA), Chris Seifried (Software Engineering Institute, Carnegie Mellon University, USA), and Ipek Ozkaya (Software Engineering Institute, Carnegie Mellon University, USA)</i>	
ROSDiscover: Statically Detecting Run-Time Architecture Misconfigurations in Robotics Systems .....	112
<i>Christopher S. Timperley (Carnegie Mellon University, USA), Tobias Dürschmid (Carnegie Mellon University, USA), Bradley Schmerl (Carnegie Mellon University, USA), David Garlan (Carnegie Mellon University, USA), and Claire Le Goues (Carnegie Mellon University, USA)</i>	
Designing Internet of Behaviors Systems .....	124
<i>Mahyar Tourchi Moghaddam (University of Southern Denmark, Denmark), Henry Muccini (University of L'Aquila, Italy), Julie Dugdale (University Grenoble Alps, France), and Mikkel Baun Kjærgaard (University of Southern Denmark, Denmark)</i>	
Leveraging the Layered Architecture for Microservice Recovery .....	135
<i>Pascal Zaragoza (MAREL, LIRMM, France), Abdelhak-Djamel Seriai (MAREL, LIRMM, France), Abderrahmane Seriai (DRIT, Berger-Levrault, France), Anas Shatnawi (DRIT, Berger-Levrault, France), and Mustapha Derras (DRIT, Berger-Levrault, France)</i>	
Architectural Refactoring for Functional Properties in Evolutionary Architecture .....	146
<i>Nacha Chondamrongkul (Mae Fah Luang University, Thailand) and Jing Sun (University of Auckland, New Zealand)</i>	

Evaluation Methods and Replicability of Software Architecture Research Objects .....	157
<i>Marco Konersmann (University of Koblenz-Landau), Angelika Kaplan (Karlsruhe Institute of Technology), Thomas Kühn (Karlsruhe Institute of Technology), Robert Heinrich (Karlsruhe Institute of Technology), Anne Koziolk (Karlsruhe Institute of Technology), Ralf Reussner (Karlsruhe Institute of Technology), Jan Jürjens (University of Koblenz-Landau, Fraunhofer Institute for Software and Systems Engineering), Mahmood al-Doori (University of Koblenz-Landau), Nicolas Boltz (Karlsruhe Institute of Technology), Marco Ehl (University of Koblenz-Landau), Dominik Fuchß (Karlsruhe Institute of Technology), Katharina Großer (University of Koblenz-Landau), Sebastian Hahner (Karlsruhe Institute of Technology), Jan Keim (Karlsruhe Institute of Technology), Matthias Lohr (University of Koblenz-Landau), Timur Sağlam (Karlsruhe Institute of Technology), Sophie Schulz (Karlsruhe Institute of Technology), and Jan-Philipp Töberg (Karlsruhe Institute of Technology)</i>	
ROUTE: A Framework for Customizable Smart Mobility Planners .....	169
<i>Fahed Alkhabbas (Internet of Things and People Research Center, Malmö University, Sweden), Martina De Sanctis (Gran Sasso Science Institute, Italy), Antonio Bucchiarone (Fondazione Bruno Kessler, Italy), Antonio Cicchetti (Mälardalen University, Sweden), Romina Spalazzese (Internet of Things and People Research Center, Malmö University, Sweden), Paul Davidsson (Internet of Things and People Research Center, Malmö University, Sweden), and Ludovico Iovino (Gran Sasso Science Institute, L'Aquila, Italy)</i>	
<b>Author Index .....</b>	<b>181</b>