



**HAL**  
open science

## Testing Software and Systems

Valentina Casola, Alessandra de Benedictis, Massimiliano Rak

► **To cite this version:**

Valentina Casola, Alessandra de Benedictis, Massimiliano Rak. Testing Software and Systems: 32nd IFIP WG 6.1 International Conference, ICTSS 2020, Naples, Italy, December 9–11, 2020, Proceedings. Springer International Publishing, LNCS-12543, 2020, Lecture Notes in Computer Science, 978-3-030-64880-0. 10.1007/978-3-030-64881-7 . hal-03239808

**HAL Id: hal-03239808**

**<https://inria.hal.science/hal-03239808>**

Submitted on 27 May 2021

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

## Founding Editors

Gerhard Goos

*Karlsruhe Institute of Technology, Karlsruhe, Germany*

Juris Hartmanis

*Cornell University, Ithaca, NY, USA*


## Editorial Board Members

Elisa Bertino

*Purdue University, West Lafayette, IN, USA*

Wen Gao

*Peking University, Beijing, China*

Bernhard Steffen 

*TU Dortmund University, Dortmund, Germany*

Gerhard Woeginger 

*RWTH Aachen, Aachen, Germany*

Moti Yung

*Columbia University, New York, NY, USA*


More information about this subseries at <http://www.springer.com/series/7408>


Valentina Casola · Alessandra De Benedictis ·  
Massimiliano Rak (Eds.)


# Testing Software and Systems

32nd IFIP WG 6.1 International Conference, ICTSS 2020  
Naples, Italy, December 9–11, 2020  
Proceedings

*Editors*

Valentina Casola   
University of Naples Federico II  
Naples, Italy

Alessandra De Benedictis   
University of Naples Federico II  
Naples, Italy

Massimiliano Rak   
University of Campania “Luigi Vanvitelli”  
Aversa, Italy

ISSN 0302-9743                      ISSN 1611-3349 (electronic)  
Lecture Notes in Computer Science  
ISBN 978-3-030-64880-0              ISBN 978-3-030-64881-7 (eBook)  
<https://doi.org/10.1007/978-3-030-64881-7>

LNCS Sublibrary: SL2 – Programming and Software Engineering

© IFIP International Federation for Information Processing 2020

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG  
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

# Preface

This volume contains the proceedings of the 32nd IFIP International Conference on Testing Software and Systems (ICTSS 2020). IFIP-ICTSS has become a traditional event of the WG 6.1 of the International Federation for Information Processing (IFIP). The conference was supposed to be in Napoli, Italy, during December 9–11, 2020, but, due to the COVID-19 pandemic, it was held online, as a virtual conference.

ICTSS is a series of international conferences addressing conceptual, theoretical, and practical problems of testing software systems, including communication protocols, services, distributed platforms, middleware, embedded, cyber-physical systems, and security infrastructures. It is a forum for researchers, developers, testers, and users from industry to review, discuss, and learn about new approaches, concepts, theories, methodologies, tools, and experiences in the field of testing of software and systems.

IFIP-ICTSS 2020 received 43 submissions. Each paper was reviewed in a single-blind process by three reviewers on average and discussed by the Program Committee. After a careful selection process, the Program Committee accepted 17 regular papers and 4 short papers. The papers cover a large range of subjects such as test-case generation, testing in relation with artificial intelligence, proof and verification techniques, security, performance, as well as empirical studies. In particular, in the 32nd conference edition, a large space was given to security testing models and techniques.

IFIP-ICTSS 2020 also hosted an industrial event with the participation of big and small enterprises, discussing about their vision and practical experiences on software and security testing, with the aim to encourage interactions and exchanges between the scientific and industrial communities interested in testing.

We would like to thank the Steering Committee for their advice and support in the organization of the conference. Many thanks to the Program Committee members, as well as to the additional reviewers, for their careful reviews and participation in the discussions during the paper selection. The process of reviewing and selecting the papers was significantly simplified through the use of EasyChair. We would also like to thank IFIP for their continuous support of the conference series, as well as Springer for having published this volume.

We would like to thank the CERICT Organizing Committee, particularly Marco Guarino, Michele Salza, and Tiziana Cibelli for their support in the preparation of the conference, as well as in financial and organizational aspects. We kindly thank Silvio Stefanucci, the conference webmaster.

Finally, we are very grateful to the scientific sponsors of the conference: the University of Naples Federico II, the University of Campania Luigi Vanvitelli, and the University of Sannio. Their support strongly contributed to the success of this event.

On behalf of the IFIP-ICTSS organizers, we hope that you find the proceedings useful, interesting, and challenging.

December 2020

Valentina Casola  
Alessandra De Benedictis  
Massimiliano Rak

# Organization

## General Chairs

Valentina Casola                      University of Naples Federico II, Italy  
Massimiliano Rak                      University of Campania Luigi Vanvitelli, Italy

## Program Committee Chair

Alessandra De Benedictis              University of Naples Federico II, Italy

## Steering Committee

Inmaculada Medina Bulo              University of Cádiz, Spain  
Ana Cavalli                              Télécom SudParis, France  
Christophe Gaston                      CEA List, France  
Rob Hierons                              The University of Sheffield, UK  
Nikolai Kosmatov                      CEA List, France  
Pascale Le Gall                        CentraleSupélec, France  
Francisco Palomo Lozano              University of Cádiz, Spain  
Mercedes Merayo                      Universidad Complutense de Madrid, Spain  
Andreas Ulrich                        Siemens AG, Germany  
Husnu Yenigun                        Sabanci University, Turkey  
Nina Yevtushenko                      Tomsk State University, Russia

## Program Committee

Rui Abreu                                INESC-ID/IST, University of Lisbon, Portugal  
Bernhard K. Aichernig                TU Graz, Austria  
Antonia Bertolino                      ISTI-CNR, Italy  
Valentina Casola                      University of Naples Federico II, Italy  
Ana Rosa Cavalli                      Télécom SudParis, France  
Xiao Chen                                Monash University, Australia  
David Clark                              University College London, UK  
Giovanni Cozzolino                    University of Naples Federico II, Italy  
Alessandra De Benedictis              University of Naples Federico II, Italy  
Pedro Delgado-Pérez                University of Cádiz, Spain  
Sergio Di Martino                      University of Naples Federico II, Italy  
Khaled El-Fakih                        American University of Sharjah, UAE  
Ylies Falcone                            Université Grenoble Alpes, France  
Anna Rita Fasolino                    University of Naples Federico II, Italy  
Jun Gao                                  University of Luxembourg, Luxembourg  
Angelo Gargantini                      University of Bergamo, Italy



Christophe Gaston	CEA, France
Juergen Grossmann	Fraunhofer, Germany
Roland Groz	Grenoble INP, LIG, France
Rob Hierons	The University of Sheffield, UK
Teruo Higashino	Osaka University, Japan
Thierry Jéron	Inria, France
Ferhat Khendek	Concordia University, Canada
Pingfan Kong	University of Luxembourg, Luxembourg
Nikolai Kosmatov	CEA List, France
Moez Krichen	ReDCAD Research Unit, Tunisia
Natalia Kushik	Télécom SudParis, France
Pascale Le Gall	CentraleSupélec, France
Kui Liu	Nanjing University of Aeronautics and Astronautics, China
Luis Llana	Universidad Complutense de Madrid, Spain
Delphine Longuet	Université Paris-Sud, LRI, France
Jorge Lopez	Airbus Defense and Space, France
Radu Mateescu	Inria, France
Inmaculada Medina-Bulo	University of Cádiz, Spain
Mercedes Merayo	Universidad Complutense de Madrid, Spain
Roberto Nardone	Mediterranean University of Reggio Calabria, Italy
Roberto Natella	University of Naples Federico II, Italy
Manuel Núñez	Universidad Complutense de Madrid, Spain
Mike Papadakis	University of Luxembourg, Luxembourg
Antonio Pecchia	University of Sannio, Italy
Jan Peleska	TZI, Universtät Bremen, Germany
Roberto Pietrantuono	University of Naples Federico II, Italy
Massimiliano Rak	University of Campania Luigi Vanvitelli, Italy
Antoine Rollet	LaBRI, Bordeaux INP, CNRS, University of Bordeaux, France
Stefano Russo	University of Naples Federico II, Italy
Sébastien Salva	LIMOS, France
Sergio Segura	University of Seville, Spain
Hasan Sozer	Ozyegin University, Turkey
Daniel Sundmark	Mälardalen University, Sweden
Kenji Suzuki	Kennisbron Co., Ltd, Japan
Masaki Suzuki	KDDI Research, Inc., Japan
Porfirio Tramontana	University of Naples Federico II, Italy
Andreas Ulrich	Siemens AG, Germany
Umberto Villano	University of Sannio, Italy
Burkhardt Wolff	Université Paris-Sud, France
Franz Wotawa	TU Graz, Austria
Hüsnü Yenigün	Sabancı University, Turkey
Nina Yevtushenko	Institute for System Programming, RAS, Russia
Fatiha Zaidi	Université Paris-Sud, France

**Workshop Chair**

Roberto Nardone

Mediterranean University of Reggio Calabria, Italy

**Publicity Chair**

Umberto Villano

University of Sannio, Italy

**Additional Reviewers**

Nicola Amatucci

Christian Esposito

Massimo Ficco

Salah Ghamizi

Daniele Granata

Alessio Merlo

Francesco Moscato

Giovanni Salzillo

Luigi Libero Lucio Starace

Salvatore Venticinque

Vincenzo Norman Vitale

# Contents

## Model-Based Testing

Using Model Learning for the Generation of Mock Components . . . . .	3
<i>Sébastien Salva and Elliott Blot</i>	
Interrogating Virtual Agents: In Quest of Security Vulnerabilities . . . . .	20
<i>Josip Bozic and Franz Wotawa</i>	
Giving a Model-Based Testing Language a Formal Semantics via Partial MAX-SAT . . . . .	35
<i>Bernhard K. Aichernig and Christian Burghard</i>	
Learning Abstracted Non-deterministic Finite State Machines . . . . .	52
<i>Andrea Pferscher and Bernhard K. Aichernig</i>	

## Security Testing

APPregator: A Large-Scale Platform for Mobile Security Analysis . . . . .	73
<i>Luca Verderame, Davide Caputo, Andrea Romdhana, and Alessio Merlo</i>	
Vulsploit: A Module for Semi-automatic Exploitation of Vulnerabilities. . . . .	89
<i>Arcangelo Castiglione, Francesco Palmieri, Mariangela Petraglia, and Raffaele Pizzolante</i>	
About the Robustness and Looseness of Yara Rules . . . . .	104
<i>Gerardo Canfora, Mimmo Carapella, Andrea Del Vecchio, Laura Nardi, Antonio Pirozzi, and Corrado Aaron Visaggio</i>	
Measurement-Based Analysis of a DoS Defense Module for an Open Source Web Server . . . . .	121
<i>Marta Catillo, Antonio Pecchia, and Umberto Villano</i>	
Trust Is in the Air: A New Adaptive Method to Evaluate Mobile Wireless Networks . . . . .	135
<i>Alexandra-Elena Mocanu (Mihaita), Bogdan-Costel Mocanu, Christian Esposito, and Florin Pop</i>	
Enabling Next-Generation Cyber Ranges with Mobile Security Components. . . . .	150
<i>Enrico Russo, Luca Verderame, and Alessio Merlo</i>	

## Testing Methods and Applications

A Technique for Parallel GUI Testing of Android Applications . . . . .	169
<i>Porfirio Tramontana, Nicola Amatucci, and Anna Rita Fasolino</i>	
Trigger Alarm: A Smart NFC Sniffer for High-Precision Measurements. . . . .	186
<i>Martin Erb, Christian Steger, Martin Troyer, and Josef Preishuber-Pflügl</i>	
Methods for Live Testing of Cloud Services. . . . .	201
<i>Oussama Jebbar, Ferhat Khendek, and Maria Toeroe</i>	

## Testing Methods and Automation

Automated Transition Coverage in Behavioural Conformance Testing . . . . .	219
<i>Lina Marsso, Radu Mateescu, and Wendelin Serwe</i>	
An Executable Mechanised Formalisation of an Adaptive State Counting Algorithm . . . . .	236
<i>Robert Sachtleben</i>	
Automatic Fairness Testing of Machine Learning Models. . . . .	255
<i>Arnab Sharma and Heike Wehrheim</i>	
Inspecting Code Churns to Prioritize Test Cases . . . . .	272
<i>Francesco Altiero, Anna Corazza, Sergio Di Martino, Adriano Peron, and Luigi Libero Lucio Starace</i>	

## Short Contributions

Using an SMT Solver for Checking the Completeness of FSM-Based Tests . . . . .	289
<i>Evgenii Vinarskii, Andrey Laputenko, and Nina Yevtushenko</i>	
Hacking Goals: A Goal-Centric Attack Classification Framework . . . . .	296
<i>Francesco Caturano, Gaetano Perrone, and Simon Pietro Romano</i>	
A Comparative Study on Combinatorial and Random Testing for Highly Configurable Systems . . . . .	302
<i>Hao Jin, Takashi Kitamura, Eun-Hye Choi, and Tatsuhiro Tsuchiya</i>	
Architecture Based on Keyword Driven Testing with Domain Specific Language for a Testing System. . . . .	310
<i>Ricardo B. Pereira, Miguel A. Brito, and Ricardo J. Machado</i>	
<b>Author Index</b> . . . . .	317