Lecture Notes in Computer Science 13585

More information about this series at https://link.springer.com/bookseries/558

João Paulo A. Almeida · Dimka Karastoyanova ·
Giancarlo Guizzardi · Marco Montali ·
Fabrizio Maria Maggi ·
Claudenir M. Fonseca (Eds.)

Enterprise Design, Operations, and Computing

26th International Conference, EDOC 2022 Bozen-Bolzano, Italy, October 3–7, 2022 Proceedings

Springer

Editors
João Paulo A. Almeida
Universidade Federal do Espírito Santo
Vitória, Espírito Santo, Brazil

Giancarlo Guizzardi
University of Twente
Enschede, The Netherlands

Fabrizio Maria Maggi
Free University of Bozen-Bolzano
Bolzano, Italy

Dimka Karastoyanova
University of Groningen
Groningen, The Netherlands

Marco Montali
Free University of Bozen-Bolzano
Bolzano, Italy

Claudenir M. Fonseca
University of Twente
Enschede, The Netherlands

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Computer Science
ISBN 978-3-031-17603-6 ISBN 978-3-031-17604-3 (eBook)
https://doi.org/10.1007/978-3-031-17604-3

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

Preface

EDOC 2022 is the 26th conference in the EDOC series which provides a key forum for researchers and practitioners in the field of Enterprise Computing. EDOC addresses the full range of models, methodologies, and engineering technologies contributing to building and evolving intra- and inter-enterprise software systems. This year's conference has a special emphasis on the theme of designing and operating "Flexible Enterprises". The theme reflects an ever-changing world under the influence of disruptive events, trends and technologies, as well as the increasing role of artificial intelligence.

We are happy to announce a number of developments for EDOC. First, the EDOC acronym is now spelled-out "Enterprise Design, Operations and Computing" to reflect the broad range of aspects of interest to the conference. Second, proceedings are now published by Springer in the Lecture Notes in Computer Science (LNCS) series. Finally, EDOC is collocated for the first time with the International Conference on Cooperative Information Systems (CoopIS) now in its 28th edition. This collaboration led to a program with several joint events, including shared keynote speeches, panels, technical sessions and social functions. We look forward to a most fruitful interaction between the communities involved in the two conferences, and an exciting overall program.

These proceedings include 15 full papers selected out of 48 full papers sent for peer review (31.25% acceptance rate). All submissions were thoroughly reviewed in a single-blind process by at least three program committee members and, in the vast majority of cases, by four program committee members. The review process was led by the program committee chairs João Paulo A. Almeida and Dimka Karastoyanova and overseen by the general chairs Giancarlo Guizzardi, Marco Montali and Fabrizio Maria Maggi. The selected papers cover topical areas such as Enterprise Architecture, Enterprise Security, Business Process Mining and Discovery, Business Process Modeling and Monitoring and Development of Process-Driven Applications. We would like to show our greatest appreciation to the submitting authors and to the members of the program committee as well as additional reviewers for their hard work.

These proceedings further include abstracts which pair with the invited talks of our three renowned keynote speakers: Carliss Y. Baldwin (Harvard Business School, USA, *emerita*), Jordi Cabot (Universitat Oberta de Catalunya, Spain) and Giovanni Sartor (University of Bologna & European University Institute of Florence, Italy); and with the tutorial offered by Gerd Wagner (Brandenburg University of Technology, Cottbus, Germany.) We would like to thank them all for their generosity in joining us in Bolzano.

Companion post-conference proceedings will be published separately and will include papers selected for the EDOC forum alongside workshop papers, doctoral consortium papers and demonstration-track papers.

We would also like to thank the EDOC steering committee for entrusting us with the responsibility of organizing this year's conference. We would like to express our gratitude to all members of the organizing committee, and in particular our local organization committee. The local organization chairs Tiago P. Sales, Mattia Fumagalli, Pedro Paulo F. Barcelos and Claudenir M. Fonseca put in a lot of energy for a successful event.

Claudenir M. Fonseca should be acknowledged for his key role in our web presence, registration, and for supporting us in putting the program and these proceedings together.

We would like to thank the Free University of Bozen-Bolzano and the NOI Techpark for generously sponsoring and hosting the conference.

Finally, there can be no conference without engaged participation: we would like to express our deep gratitude to all who contributed with their insights to make our conference program interesting and all those who came to Bolzano to make EDOC lively. We were thrilled to organize the first in-person edition of EDOC after two years of online editions.

October 2022

João Paulo A. Almeida
Dimka Karastoyanova
Giancarlo Guizzardi
Marco Montali
Fabrizio Maria Maggi
Claudenir M. Fonseca

Organization

General Chairs

Giancarlo Guizzardi	Free University of Bozen-Bolzano, Italy & University of Twente, The Netherlands
Marco Montali	Free University of Bozen-Bolzano, Italy
Fabrizio Maria Maggi	Free University of Bozen-Bolzano, Italy

Program Committee Chairs

João Paulo A. Almeida	Federal University of Espírito Santo, Brazil
Dimka Karastoyanova	University of Groningen, The Netherlands

Steering Committee Chair

Selmin Nurcan	University Paris 1 Panthéon-Sorbonne, France

Steering Committee

Colin Atkinson	University of Mannheim, Germany
Georg Grossmann	University of South Australia, Australia
João Paulo A. Almeida	Federal University of Espírito Santo, Brazil
Marten van Sinderen	University of Twente, The Netherlands
Remco Dijkman	Eindhoven University of Technology, The Netherlands
Robert Lagerström	KTH, Sweden
Stefanie Rinderle-Ma	University of Vienna, Austria
Sylvain Hallé	Université du Québec à Chicoutimi, Canada
Zoran Milosevic	Deontik & Best Practice Software, Australia

Workshop Chairs

Tiago P. Sales	University of Twente, The Netherlands
Henderik A. Proper	Luxembourg Institute of Science and Technology & University of Luxembourg, Luxembourg

Demo Track Chairs

Massimiliano de Leoni	University of Padua, Italy
Ivan Donadello	Free University of Bozen-Bolzano, Italy
Cristine L. Griffo	Free University of Bozen-Bolzano, Italy

Industrial Chairs

Zoran Milosevic	Deontik/Best Practice Software, Australia
Flavia Santoro	Rio de Janeiro State University, Brazil

Doctoral Consortium Chairs

Felix Mannhardt	Eindhoven University of Technology, The Netherlands
Chiara Di Francescomarino	Fondazione Bruno Kessler, Italy

Proceedings Chair

Claudenir M. Fonseca	University of Twente, The Netherlands

Website Chair

Claudenir M. Fonseca	University of Twente, The Netherlands

Financial Chairs

Cristine L. Griffo	Free University of Bozen-Bolzano, Italy
Glenda Amaral	Free University of Bozen-Bolzano, Italy
Renata S. S. Guizzardi	University of Twente, The Netherlands

Publicity Chairs

Dominik Bork	TU Wien, Austria
Estefanía Serral	KU Leuven, Belgium

Local Organization Chairs

Tiago P. Sales	University of Twente, The Netherlands
Mattia Fumagalli	Free University of Bozen-Bolzano, Italy
Pedro Paulo F. Barcelos	Free University of Bozen-Bolzano, Italy
Claudenir M. Fonseca	University of Twente, The Netherlands

Local Organization Committee

Isadora Valle Sousa	Free University of Bozen-Bolzano, Italy
Riccardo Baratella	Free University of Bozen-Bolzano, Italy
Elena Romanenko	Free University of Bozen-Bolzano, Italy

Program Committee

Aditya Ghose	University of Wollongong, Australia
Andrea Marrella	Università di Roma, Italy
Alan Wee-Chung Liew	Griffith University, Australia
Alexander Knapp	Universität Augsburg, Germany
Alfred Zimmermann	Reutlingen University, Germany
Amin Beheshti	Macquarie University, Australia
Andreas L. Opdahl	University of Bergen, Norway
Andrew Berry	ResMed Inc., Australia
Aniruddha Gokhale	Vanderbilt University, USA
Antonio Vallecillo	Universidad de Málaga, Spain
Artem Polyvyanyy	University of Melbourne, Australia
Asif Qumer Gill	University of Technology, Australia
Axel Korthaus	Swinburne University of Technology, Australia
Barbara Weber	University of St. Gallen, Switzerland
Ben Roelens	Open University of The Netherlands, The Netherlands & Ghent University, Belgium
Benjamin Yen	The University of Hong Kong, Hong Kong, China
Carlos L. B. Azevedo	Federal Institute of Espírito Santo, Brazil
Chiara Di Francescomarino	Fondazione Bruno Kessler-IRST, Italy
Christian Zirpins	Karlsruhe University of Applied Sciences, Germany
Claudenir M. Fonseca	Free University of Bozen-Bolzano, Italy
Claudio Di Ciccio	Sapienza University of Rome, Italy
Colin Atkinson	University of Mannheim, Germany
Cristine L. Griffo	Free University of Bozen-Bolzano, Italy
Dimka Karastoyanova	University of Groningen, The Netherlands
Dominik Bork	TU Wien, Austria
Fatih Turkmen	University of Groningen, The Netherlands
Fethi Rabhi	University of New South Wales, Australia
Flavia Santoro	Rio de Janeiro State University, Brazil
Florian Matthes	Technical University of Munich, Germany
Frank Leymann	University of Stuttgart, Germany
Frederik Gailly	Ghent University, Belgium
Georg Grossmann	University of South Australia, Australia
Georg Weichhart	PROFACTOR GmbH, Austria

Giuseppe Di Lucca	University of Sannio (RCOST), Italy
Guido Governatori	CSIRO, Australia
Hans Weigand	Tilburg University, The Netherlands
Henderik A. Proper	Luxembourg Institute of Science and Technology & University of Luxembourg, Luxembourg
Hiroshi Miyazaki	Keio University, Japan
Irina Rychkova	Centre de Recherches en Informatique & University Paris 1 Pantheon-Sorbonne, France
Jaap Gordijn	Vrije Universiteit Amsterdam, The Netherlands
Jan Øyvind Aagedal	Equatex, Norway
João Moreira	Univesity of Twente, The Netherlands
João Paulo A. Almeida	Federal University of Espírito Santo, Brazil
John Mylopoulos	University of Ottawa, Canada
José Raúl Romero	University of Cordoba, Spain
Julio C. Nardi	Federal Institute of Espírito Santo, Brazil
Julius Köpke	Alpen-Adria-Universität Klagenfurt Institute for Informatics Systems, Austria
Lam Son Lê	HCMC Tech, Vietnam
Ljiljana Brankovic	University of Newcastle, Australia
Luis Ferreira Pires	University of Twente, The Netherlands
Luise Pufahl	TU Berlin, Germany
Madhushi Bandara	University of Technology Sydney, Australia
Manfred Reichert	University of Ulm, Germany
Marco Montali	Free University of Bozen-Bolzano, Italy
Maria Teresa Gómez López	University of Seville, Spain
Maria-Eugenia Iacob	University of Twente, The Netherlands
Marten van Sinderen	University of Twente, The Netherlands
Mathias Weske	HPI & University of Potsdam, Germany
Mattia Fumagalli	Free University of Bozen-Bolzano, Italy
Michael Schrefl	University of Linz, Austria
Michael Rosemann	Queensland University of Technology, Australia
Nicolas Herbaut	Université Paris 1 Panthéon-Sorbonne, France
Oscar Pastor	Universitat Politècnica de València, Spain
Paolo Ceravolo	Università degli Studi di Milano, Italy
Peter Bernus	Griffith University, Australia
Peter F. Linington	University of Kent, UK
Pierluigi Plebani	Politecnico di Milano, Italy
Pontus Johnson	KTH Royal Institute of Technology, Sweden
Rainer Schmidt	Munich University of Applied Sciences, Germany
Rajeev Raje	IUPUI, USA

Remco Dijkman	Eindhoven University of Technology, The Netherlands
Renata Guizzardi	University of Twente, The Netherlands
Ronny Seiger	University of St. Gallen, Switzerland
Ruth Breu	Research Group Quality Engineering, Italy
Rüdiger Pryss	University of Würzburg, Germany
Sagar Sunkle	Tata Consultancy Services, India
Saïd Assar	Institut Mines-Telecom Business School, France
Schahram Dustdar	Vienna University of Technology, Austria
Selmin Nurcan	Université Paris 1 Panthéon-Sorbonne, France
Sharmistha Dey	Griffith University, Australia
Simon Hacks	University of Southern Denmark, Denmark
Stefan Tai	TU Berlin, Germany
Stefanie Rinderle-Ma	Technical University of Munich, Germany
Sylvain Hallé	Université du Québec à Chicoutimi, Canada
Tiago P. Sales	Free University of Bozen-Bolzano, Italy
Ulrich Frank	University of Duisburg Essen, Germany
Ulrik Franke	RISE, Sweden
Uwe Zdun	University of Vienna, Austria
Vinay Kulkarni	Tata Consultancy Services Research, India
Wolfgang Maass	Saarland University, Germany
Yigal Hoffner	Shenkar College of Engineering and Design, Israel
Zoran Milosevic	Deontik & Best Practice Software, Australia

Additional Reviewers

Barat, Souvik
Berry, Andrew
Bühler, Fabian
Cremerius, Jonas
de Alencar Silva, Patrício
Dexe, Jacob
Gamage, Dimuthu
Guy, Ed
Gökstorp, Simon
Kaczmarek-Heß, Monika
Katsikeas, Sotirios
Khorshidi, Samira
Kuhn, Peter
Lichtenstein, Tom
Murturi, Ilir
Muñoz, Paula
Peregrina Pérez, José Antonio
Ristov, Sasko
Roychoudhury, Suman
Yilmaz, Fatih
Yussupov, Vladimir

Keynote Speeches

“We Are All Digital Now”: Platform Systems and Flow Processes in Modern Enterprises

Carliss Y. Baldwin

Harvard Business School, Boston, USA
cbaldwin@hbs.edu

In the last 25 years, modern enterprises have become centered on digital systems. IT applications, knit together by enterprise architectures, now pervade all business functions. But there is still doubt and confusion as to how a firm’s digital infrastructure should be managed and maintained. On the one hand, modern enterprises must be flexible, capable of generating a stream of new products and providing customers with numerous options. On the other hand, they must be efficient providing timely solutions at low cost.

These contrasting requirements are exemplified by two opposing technical paradigms: flow processes and platform systems. In the talk, I will characterize flow processes and platform systems in terms of their innate properties and organizational implications. I will also indicate when and why each patterns is more valuable. In modern establishments, the two patterns are not mutually exclusive: technologically sophisticated organizations must use both. At the end of the talk, I will speculate on where each pattern is likely to be needed and invite comments on the tensions they are likely to cause within organizations.

Smart Modeling of Smart Software

Jordi Cabot

ICREA – Universitat Oberta de Catalunya, Barcelona, Spain
jordi.cabot@icrea.cat

There is an increasing demand for embedding intelligence in software systems as part of its core set of features both in the front-end (e.g. conversational user interfaces) and back-end (e.g. prediction services). This combination is usually referred to as AI-enhanced software or, simply, smart software.

The development of smart software poses new engineering challenges, as now we need to deal with the engineering of the "traditional" components, the engineering of the "AI" ones but also of the interaction between both types that need to co-exist and collaborate.

In this talk we'll see how modeling can help tame the complexity of engineering smart software by enabling software engineers specify and generate smart software systems starting from higher-level and platform-independent modeling primitives.

But, unavoidably, these models will be more diverse and complex than our usual ones. Don't despair, we'll also see how some of these same AI techniques that are making our modeling life challenging can be turned into allies and be transformed into modeling assistants to tackle the engineering of smart software with a new breed of smart modeling tools.

Modelling Ethical and Legal Norms/Explaining Compliance and Violation

Giovanni Sartor

[1] University of Bologna, Bologna, Italy
jordigiovanni.sartor@unibo.it
[2] European University Institute, Fiesole, Italy

A utomation-supported compliance checking has become necessary in increasingly automated socio-technical contexts. AI & law research, since the 70's has addressed ways to model ethical and legal knowledge, and has developed approaches that are relevant to compliance-checking.

I will shortly review approaches to the modeling of legal content: Rules- and logic-based models; Argumentation-based models; Case-based reasoning models.

I will the address some recent approaches aimed at providing logical models in a way which is understandable to non-technical people, and consider whether this idea may support developments in automated compliance checking. I will also consider the significance of argumentation-based models and ontologies to provide rationales for compliance assessments.

I will argue for the construction of human-understandable models of law and ethics, to be used for the purpose of compliance checking, also over the functioning of machine-learning based systems. How to integrate logical modeling and machine learning, in eliciting and applying normative knowledge is a challenging task for the future.

Tutorial

Business Process Modeling and Simulation with DPMN

Gerd Wagner

Department of Informatics, Brandenburg University of Technology,
Cottbus, Germany
G.Wagner@b-tu.de

The Business Process Modeling Notation (BPMN) has been successfully established as the defacto standard in Business Process (BP) Management. However, BPMN does not have a convincing formal semantics and lacks several important elements needed for BP simulation. BPMN is also not well-aligned with the Processing/Queuing Network paradigm of Operations Research (OR) and the related business process simulation paradigm pioneered by the Discrete Event Simulation (DES) languages/tools GPSS and SIMAN/Arena. The Discrete Event Process Modeling Notation (DPMN) is based on the Object Event Modeling and Simulation (OEM&S) paradigm and on Event Graphs (Schruben 1983), which capture the event scheduling paradigm of DES. DPMN supports modeling resource-constrained activities (with resource roles and resource pools) in Activity Networks and Processing Networks, as well as basic agent concepts (perception, action, communication) and agent-based BP modeling.

Contents