Lecture Notes in Computer Science 7702

Roberto Baldoni Paola Flocchini
Ravindran Binoy (Eds.)

Principles of Distributed Systems

16th International Conference, OPODIS 2012
Rome, Italy, December 18-20, 2012
Proceedings

Springer

Volume Editors

Roberto Baldoni
Università degli Studi di Roma “La Sapienza”
Dipartimento di Informatica, Automatica e Gestionale "Antonio Ruberti"
Via Ariosto 25, 00168 Rome, Italy
E-mail: baldoni@dis.uniroma1.it

Paola Flocchini
University of Ottawa
School of Electrical Engineering and Computer Science
800 King Edward Street, K1N 6N5, Ottawa, ON, Canada
E-mail: flocchin@site.uottawa.ca

Ravindran Binoy
Virginia Technical University
Electrical and Computing Engineering Department
302 Whittemore Street, Blacksburg, VA 24061, USA
E-mail: binoy@vt.edu

ISSN 0302-9743 e-ISSN 1611-3349
ISBN 978-3-642-35475-5 e-ISBN 978-3-642-35476-2
DOI 10.1007/978-3-642-35476-2
Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2012953317

CR Subject Classification (1998): C.2.4, C.2, F.2, D.2, I.2.11, G.2.2

LNCS Sublibrary: SL 1 – Theoretical Computer Science and General Issues

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

OPODIS, the International Conference on Principles of Distributed Systems, is an international forum for the exchange of state-of-the-art knowledge on distributed computing and systems among researchers from around the world. The 16th edition of OPODIS was held during December 18–20, 2012, in Rome, Italy.

Papers were sought soliciting original research contributions to the theory, specification, design, and implementation of distributed systems. In response to the call for papers, 89 submissions were received, out of which 24 papers were accepted, after a rigorous reviewing process that involved 31 Program Committee members and at least three reviews per paper.

We would like to thank the Program Committee members, as well as the external reviewers, for their fundamental contribution in selecting the best papers.

In addition to the technical papers, the program included three invited presentations by: Giuseppe Ateniese (Sapienza University of Rome), Pierre Fraigniaud (University of Paris 7), and Antony Rowstron (Microsoft Research Cambridge).

This event would not have been possible without the technical support of Adriano Cerocchi and the administrative support of Carola Aiello and Gabriella Caramagno. We would like to express our gratitude to our sponsors and particularly to Sapienza University of Rome, Over Technologies, and the Sapienza Research Center of Cyber Intelligence and Information Security.

December 2012

Roberto Baldoni
Paola Flocchini
Binoy Ravindran

Organization

Program Committee

Bjorn Andersson	Polytechnic Institute of Porto, Portugal
James Aspnes	Yale, USA
Hagit Attiya	Technion, Israel
Roberto Baldoni	University of Rome “La Sapienza”, Italy
Xavier Defago	Japan Advanced Institute of Science and Technology (JAIST)
Carole Delporte-Gallet	University of Paris Diderot, France
Stefan Dobrev	Slovak Academy of Sciences, Bratislava, Slovakia
Shlomi Dolev	Ben-Gurion University of the Negev, Israel
Paola Flocchini	University of Ottawa, Canada
Hacene Fouchal	Université de Reims Champagne-Ardenne, France
Shelby Funk	University of Georgia, USA
Vijay Garg	University of Texas at Austin, USA
David Ilcinkas	LaBRI, CNRS & Université de Bordeaux, France
Boris Koldehofe	University of Stuttgart, Germany
Eric Koskinen	New York University, USA
Fabian Kuhn	University of Freiburg, Germany
Xu Li	University of Waterloo, Canada
Bernard Mans	Macquarie University, Australia
Alessia Milani	University of Bordeaux 1-IPB, France
Sotiris Nikoletseas	University of Patras and CTI, Greece and The Netherlands
Marina Papatriantafilou	Chalmers University of Technology, Sweden
Marta Patiño	Universidad Politecnica de Madrid, Spain
Giuseppe Prencipe	Università di Pisa, Italy
Leonardo Querzoni	Università degli Studi di Roma “La Sapienza”, Italy
Binoy Ravindran	Virginia Tech, USA
Paulo Romano	INESC-ID, Portugal
Nicolas Schiper	Cornell University, USA
Michael Spear	Lehigh University, USA
Sebastien Tixeuil	Université Pierre et Marie Curie, France
Roman Vitenberg	University of Oslo, Norway
Jennifer Welch	Texas A&M University, USA

Wenyuan Xu University of South Carolina, USA
Masafumi Yamashita Kyushu University, Japan
Shmuel Zaks Technion, Israel

Additional Reviewers

Abdurusul, Kudireti
Alglave, Jade
Ayaida, Marwane
Balasubramanian, Bharath
Barbalace, Antonio
Benzing, Andreas
Bernard, Thibault
Bonnet, François
Bonomi, Silvia
Bridgman, John
Callau-Zori, Mar
Carabelli, Ben
Casteigts, Arnaud
Chang, Yen-Jung
Chatterjee, Bapi
Chung, Hyun Chul
Cohen, Asaf
Devismes, Stephane
Drachsler, Dana
Fauconnier, Hugues
Fernandez Anta, Antonio
Fodor, Viktoria
Fouchal, Hacene
Fu, Zhang
Georgiadis, Giorgos
Golab, Wojciech
Gulisano, Vincenzo
Harris, Tim
He, Liang
Herlihy, Maurice
Hung, Wei-Lun
Johnen, Colette
Kamei, Sayaka
Kamiyama, Naoyuki
Kijima, Shuji
Klasing, Ralf
Koutsopoulos, Andreas
Kralovic, Rastislav
Larsson, Andreas
Le Merrer, Erwan
Li, Ximing
Liang, Xiaohui
Liu, Zhenhua
Mei, Yongguo
Michael, Maged
Michail, Othon
Nesterenko, Mikhail
Nikolakopoulos, Ioannis
Ottenwälder, Beate
Pagli, Linda
Peluso, Sebastiano
Platania, Marco
Potop-Butucaru, Maria
Provensi, Lucas
Raptopoulos, Christoforos
Ridge, Tom
Rinetsky, Noam
Samanta, Roopsha
Santoro, Nicola
Setty, Vinay
Sharma, Shantanu
Singh, Abhishek
Sohier, Devan
Sorriente, Claudio
Steffenel, Luiz Angelo
Tan, Yongmin
Tariq, M. Adnan
Travers, Corentin
Tripp, Omer
Tudor, Valentin
Viglietta, Giovanni
Viqar, Saira
Wade, Ahmed
Widder, Josef
Widmayer, Peter
Xu, Miao
Yamauchi, Yukiko

The Cloud Was Tipsy and Ate My Files!
(Invited Talk)

Giuseppe Ateniese

Department of Computer Science
Sapienza - University of Rome
ateniese@di.uniroma1.it

Cloud computing is shaping the future of computer science and it is affecting the way we perform business and operate daily. Our entire digital life is stored on remote storage servers such as Amazon S3, Microsoft Azure, Google, iCloud, etc. Our emails, pictures, calendars, documents, music/video playlists, and generic files are readily available, anytime and anywhere.

Not everyone, however, is ready to move to the Cloud. Businesses and organizations are still reluctant to outsource their databases for fear of losing control on their files or, worse, releasing sensitive information to third parties. While encryption can help, it is not yet clear how to operate efficiently on encrypted data stored remotely. In addition, encrypted data can still be intentionally lost or damaged.

In Cloud storage, the major stumbling block is that there is no local copy of data anymore. Thus, there is nothing in our hands that can be used to check against the version of our files stored remotely. This is somehow exacerbated by the fact that outsourced data could be very large and thus impossible to retrieve in its entirety. In this scenario: How can we be certain that Cloud providers are storing the entire database intact, even portions that are rarely accessed? Can we check the integrity of files without downloading them from the Cloud?

In this invited talk, we will provide answers to the questions above. We will introduce some novel cryptographic tools that allow users to check the integrity of their files in the Cloud while keeping local storage and bandwidth consumption *essentially* constant. These new cryptographic primitives are efficient and scalable and may help persuade skeptics to adopt full-fledged Cloud computing solutions.

Distributed Local Decision and Verification
(Invited Talk)

Pierre Fraigniaud*

CNRS and University Paris Diderot, France

Abstract. Distributed *decision* refers to the task in which every process p_i, $i = 1, \ldots, n$, is given some input x_i, and the processes have to collectively decide whether $x = (x_1, \ldots, x_n)$ satisfies some prescribed property, i.e., belongs to some language $\mathcal{L}$. For instance, one may want to decide whether the x_is provide a proper coloring of the actual network, or one may want to decide whether the x_is are all identical, and equal to a proposed value. A typical application of distributed decision is actually distributed *checking*, in which the processes have to check whether the result of a computation performed by some black box is correct. In the above examples, the issue was checking proper coloring, and checking consensus.

Distributed *verification* refers to the task in which every process p_i is given some input x_i, together with a *certificate* y_i, and the processes have to collectively verify, with the help of the certificate $y = (y_1, \ldots, y_n)$, whether $x = (x_1, \ldots, x_n)$ belongs to some language $\mathcal{L}$, in the following sense: if $x \in \mathcal{L}$ then there must exist y such that the processes collectively accept x; and if $x \notin \mathcal{L}$ then for every y the processes must collectively reject x. A typical application of distributed verification is to certify the correctness of some data structure, e.g., x is a spanning tree of the actual network.

This talk will survey our recent results about distributed decision and distributed verification. It will mostly focus on the $\mathcal{LOCAL}$ model. In this latter context, one expects each node to take its decision after having inspected just a restricted neighborhood around itself in the network. If time permits, the talk will also provide a brief survey of recent results in other distributed models, including the $\mathcal{CONGEST}$ model, the *wait-free* model, and mobile agent computing.

* Additional support from ANR project DISPLEXITY, and INRIA project GANG.

Converged Data Centers
(Invited Talk)

Antony Rowstron

Microsoft Research, Cambridge, UK

Abstract. We have been exploring what happens when you take the best ideas from distributed systems, networking, high-performance computing (HPC) and recent advances in hardware and apply them to commodity data center clusters. The motivation is that as a distributed systems builder I have often had to build distributed systems that need to handle problems that are really simply consequences of design choices of the underlying hardware platform. When running distributed systems across the Internet it is hard to change the hardware platform, but when running inside a data center it is very feasible. This led us to start build a number of different clusters with very different properties from the clusters traditional used in data centers.

The talk will use two motivating examples to demonstrate the concepts. The first example is the based on the CamCube project which explores using different interconnects, inspired by the HPC world, to run distributed applications like Map Reduce. The second example is looking at how hardware trends should be changing the way we think of implementing some services in the data center. This should be driving us to close the gap between hardware and software, leading to converged data centers.

Table of Contents