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Principles of Distributed Systems

16th International Conference, OPODIS 2012
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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

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The Cloud Was Tipsy and Ate My Files!

(Invited Talk)

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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 , $i = 1, \dots, n$, is given some input x_i , and the processes have to collectively decide whether $x = (x_1, \dots, x_n)$ satisfies some prescribed property, i.e., belongs to some language $\mathcal{L}$. For instance, one may want to decide whether the x_i s provide a proper coloring of the actual network, or one may want to decide whether the x_i s 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 $y = (y_1, \dots, y_n)$, whether $x = (x_1, \dots, x_n)$ 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 *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 *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

FixMe: A Self-organizing Isolated Anomaly Detection Architecture for Large Scale Distributed Systems	1
<i>Emmanuelle Anceaume, Erwan Le Merrer, Romaric Ludinard, Bruno Sericola, and Gilles Straub</i>	
Analyzing Global-EDF for Multiprocessor Scheduling of Parallel Tasks.....	16
<i>Björn Andersson and Dionisio de Niz</i>	
Range Queries in Non-blocking k -ary Search Trees	31
<i>Trevor Brown and Hillel Avni</i>	
On the Polling Problem for Social Networks	46
<i>Bao-Thien Hoang and Abdessamad Imine</i>	
Non-deterministic Population Protocols	61
<i>Joffroy Beauquier, Janna Burman, Laurent Rosaz, and Brigitte Rozoy</i>	
Stochastic Modeling of Dynamic Distributed Systems with Crash Recovery and Its Application to Atomic Registers	76
<i>Silvia Bonomi, Andreas Klappenecker, Hyunyoungh Lee, and Jennifer L. Welch</i>	
When and How Process Groups Can Be Used to Reduce the Renaming Space	91
<i>Armando Castañeda, Michel Raynal, and Julien Stainer</i>	
Electing a Leader in Multi-hop Radio Networks	106
<i>Bogdan S. Chlebus, Dariusz R. Kowalski, and Andrzej Pelc</i>	
Tree Exploration by a Swarm of Mobile Agents	121
<i>Jurek Czyzowicz, Andrzej Pelc, and Mélanie Roy</i>	
Crash Resilient and Pseudo-Stabilizing Atomic Registers	135
<i>Shlomi Dolev, Swan Dubois, Maria Gradinariu Potop-Butucaru, and Sébastien Tixeuil</i>	
Directed Graph Exploration	151
<i>Klaus-Tycho Förster and Roger Wattenhofer</i>	
Lattice Completion Algorithms for Distributed Computations	166
<i>Vijay K. Garg</i>	

Optimal Broadcast in Shared Spectrum Radio Networks	181
<i>Mohsen Ghaffari, Seth Gilbert, Calvin Newport, and Henry Tan</i>	
Attack-Resilient Multitree Data Distribution Topologies	196
<i>Sascha Grau</i>	
On the Complexity of Distributed Broadcasting and MDS Construction in Radio Networks	209
<i>Tomasz Jurdzinski and Dariusz R. Kowalski</i>	
On the Impact of Identifiers on Local Decision	224
<i>Pierre Fraigniaud, Magnús M. Halldórsson, and Amos Korman</i>	
Black Hole Search and Exploration in Unoriented Tori with Synchronous Scattered Finite Automata	239
<i>Euripides Markou and Michel Paquette</i>	
Algorithms for Partial Gathering of Mobile Agents in Asynchronous Rings	254
<i>Masahiro Shibata, Shinji Kawai, Fukuhito Ooshita, Hirotsugu Kakugawa, and Toshimitsu Masuzawa</i>	
Causality, Influence, and Computation in Possibly Disconnected Synchronous Dynamic Networks	269
<i>Othon Michail, Ioannis Chatzigiannakis, and Paul G. Spirakis</i>	
Wait-Free Stabilizing Dining Using Regular Registers	284
<i>Srikanth Sastry, Jennifer L. Welch, and Josef Widder</i>	
Node Sampling Using Random Centrifugal Walks	300
<i>Andrés Sevilla, Alberto Mozo, and Antonio Fernández Anta</i>	
Physarum-Inspired Self-biased Walkers for Distributed Clustering	315
<i>Devan Sohler, Giorgos Georgiadis, Simon Clavière, Marina Papatriantafileou, and Alain Bui</i>	
Wait-Free Linked-Lists	330
<i>Shahar Timnat, Anastasia Braginsky, Alex Kogan, and Erez Petrank</i>	
Byzantine Chain Replication	345
<i>Robbert van Renesse, Chi Ho, and Nicolas Schiper</i>	
Author Index	361