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Padmanabhan Krishnan · P. Radha Krishna  
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# Distributed Computing and Internet Technology

13th International Conference, ICDCIT 2017  
Bhubaneswar, India, January 13–16, 2017  
Proceedings

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# Preface

It is our pleasure to welcome you to the proceedings 13th International Conference on Distributed Computing and Internet Technology, ICDCIT 2017, held in Bhubaneswar, India, during January 13–16, 2017. The conference was sponsored by the Kalinga Institute of Industrial Technology (KIIT) University and hosted on their campus. The ICDCIT conference series focuses on foundations and applications of distributed computing, and Internet technologies. The conference enables academics, researchers including students, practitioners, and developers to present their research findings and also to have an exchange of ideas on various relevant topics. Since the inception of the ICDCIT series, the conference proceedings have been published by Springer as *Lecture Notes in Computer Science*, and the 2017 volume is number 10109 in the series.

The call for papers attracted 118 abstracts and 90 full submissions. The full versions were reviewed by members of the Program Committee (PC) and other reviewers. On average each paper received three reviews. After receiving the reviews, the PC had an electronic discussion to finalize the acceptance of the submissions. After a robust discussion that took into account technical merit, presentation style, and relevance to the conference, a total of 25 papers (less than 28%) were accepted. Of these 17 were accepted as full papers and eight as poster papers. Subsequently five of the poster papers were withdrawn.

We wish to thank all the authors for their contributions, and also thank all the 28 PC members and 14 external reviewers for their diligent reviews, which enabled us to have a quality program.

The program also included invited lecturers by Dr. Jorge Cuellar (Siemens, Germany), Prof. Kamalakara Karlapalem (IIIT-Hyderabad, India), Prof. Rajat Moona (C-DAC, India), Prof. Partha Majumder (ISI, NIBG, India), Prof. S. Sudarshan (IIT-Bombay, India), and Prof. Lenore Zuck (UIC, USA). We are very thankful to all the invited speakers for taking time out of their busy schedule and sharing their expertise.

We record our special thanks to KIIT for their generous support and express our gratitude to Dr. Achyuta Samanta (Founder of KIIT University) for his patronage and to the vice-chancellor and administration of the university for providing us with the infrastructure and logistical arrangements. We thankfully acknowledge the support KIIT provides in hosting ICDCIT conferences since the inception of the series.

We are very grateful to the Advisory Committee members for their guidance on all matters pertaining to the conference. We also greatly appreciate the invaluable support and tireless efforts of the organizing chair, finance chair, publicity chair, registration chair, session management chair, the publications chair, and all members of various committees who made a great contribution to the conference's success. We would like to thank Arup Acharya in particular, for his help in communicating all matters related to registration and submissions. We would also like to thank the chairs of the satellite

events, the student symposium, and the industry symposium. Hrushikesh Mohanty, N. Raja, and D.N. Dwivedy deserve special mention for their unwavering support, guidance, and timely advice.

It is our pleasure to acknowledge EasyChair for enabling efficient and smooth handling of all activities starting from paper submissions to preparation of the proceedings. We sincerely thank Alfred Hofmann and Anna Kramer from Springer for their cooperation and constant support throughout the publication process of this LNCS volume. We wish to specifically acknowledge the financial support received from Springer, which enabled us to give special awards.

Finally, we thank all the participants without whom there would have been no conference. We hope you found the conference to be valuable for your own professional development.

January 2017

Padmanabhan Krishnan  
P. Radha Krishna  
Laxmi Parida

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## **Invited Presentations**

# Privacy-Enhanced Authorization in IoT

Jorge Cuéllar

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**Abstract.** It is well known that in Internet of Things applications, at home, mobility scenarios, health and sport, etc., the sensor data will be high in volume and quality, and that, even when the data does not contain personal identifiers, inferences can be drawn that result in the identification of users and personal information is generated. This creates a need to protect the privacy of IoT data, as has been concluded in the 36th International Conference of Data Protection & Privacy Commissioners. On the other hand, an easier, flexible, exchange of information is sought, allowing plug-and-play of devices and applications.

The two goals are in conflict with each other. We expect that user-centric policies will be required in constrained devices, and that devices will have to reason about those policies and credentials, authentication and authorization protocols. In the presentation we discuss some ideas how this complex issue can be approached.

# From Distributed Database to Cloud Database: A Design Perspective

Kamalakar Karlapalem

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**Abstract.** From early 1980s until middle 1990s, over fifteen years, a lot of work done on designing distributed databases for a given set of queries. There were two problems that were addressed (i) fragmentation: reducing irrelevant data accessed by a query, and (ii) allocation: reducing the amount of data transferred between sites for executing a query. Many algorithms were designed and evaluated for fragmentation and allocation. In particular, queries change over time, methodology, algorithms, and policies for when and how to redesign a distributed database was proposed.

In the last decade, with the advent of modern database systems supported by columnar stores and Hadoop like cloud database systems, the users have been following ad-hoc or pre-determined database design methodologies. In this work, we present backgrounds of distributed database design and cloud database systems, and propose possible solutions for cloud database design based on fragmentation and allocation solutions.

# **ESign: Digital Signature Combined with Power of Online Authentication**

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**Abstract.** Digital signatures provide a non-repudiation mechanism for documents or messages. The digital signature are used to validate the integrity of the documents or messages to protect them against tampering as well as to establish the authenticity and to provide genuineness. In order to establish the non-repudiation, digital signature mechanism is backed up by a complex certifying authority (CA) mechanism to certify the individual signers so that their public key can be used with trust on the CA to verify the digital signatures. This mechanism however requires the issuance of digital signature certificates, verification of the individual's credentials and the legal support for digital signatures. Often the verification of the credentials involve physical means for the verification, as is usually demanded by law.

India provides a unique proposition of Aadhaar, where the residents of the country are provided a unique online-verifiable identity after credential verifications, registration of fingerprint and iris biometric. Aadhaar provides a service of authentication as well as “know-your-customer” through online authorization by the identified individual. These services are provided by Aadhaar through a network of Aadhaar-authorized agencies.

Esign integrates the powerful Aadhaar authentication service with certification authority services and provides one-time use certificates along with digital signatures on the documents provided by an individual. This mechanism therefore provide an instant method of obtaining a variety of e-governance services which are tenable under the applicable laws and provide non-repudiation.

In this talk, we discuss the mechanism of ESign, its powerful features and domains where such technology can be effectively used. We also discuss implementation and issues related to the implementation and techniques to overcome them.

# Genomic Excitement and Quantitative Challenges

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**Abstract.** Recent advances in statistical genetics theory and genomic technologies have created a revolution in evolutionary and disease-related inferences. Estimation of the extent of genomic diversity and structures of human populations, reconstruction of their origins, and tracing trails of human migration have become possible in exquisite detail and precision. In this talk, I shall provide a synthesis of the findings of our studies on these aspects conducted during the last decade. The search of genes that drive cancer is important and is now a global endeavor. This search comprises massively-parallel DNA sequencing during which very large data sets are generated. The statistical challenge that one is confronted with is to manage, curate and find patterns in these data that are of statistical significance and biological relevance. In this talk, I shall also provide some relevant results of our analysis of oral cancer genomes and the implications of these findings for precision medicine.

# Holistic Optimization of Data Access from Imperative Programs

S. Sudarshan

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**Abstract.** In this talk we address the problem of optimizing performance of data access from imperative programs. Database optimizers today focus on queries expressed declaratively. However, one of the major causes of performance problems in applications today is inefficiency of data access from imperative code. This inefficiency is addressed neither by database query optimizers, nor by compilers researchers, even though it is a real problem faced by many users of enterprise applications.

In the DBridge project at IIT Bombay, over the past 8 years we have been working on rewriting imperative programs to optimize data access. In this talk we first provide an overview of our results on rewriting application programs to automatically perform batching and prefetching of data access requests. While these techniques are well known and can be done manually, manual rewriting of applications to implement these optimizations is error prone. We describe how we use static analysis of imperative code along with a set of rules for transforming imperative code, akin to algebraic transformation rules used in database query optimizers, to optimize imperative code. Our approach makes it possible to prove correctness of the transformations regardless of the complexity of the code. We then move on to more recent results, which allow parts of imperative code to be rewritten into SQL, which can provide even large performance gains when applicable, especially for legacy ERP code.

Our techniques have been implemented using the SOOT program analysis framework. Our experiments on several real world applications demonstrate the applicability and significant performance gains due to our techniques.

Describes joint work with K. Venkatesh Emani, Karthik Ramachandra, Ravindra Guravannavar, Subhro Bhattacharya and Mahendra Chavan, published at VLDB 2008, ICDE 2011, SIGMOD 2012, ICDE 2014, IEEE TKDE 2015, and SIGMOD 2016.

# Ethics in Computer Science Research circa the 21st Century

Lenore Zuck

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**Abstract.** Traditionally ethics is a branch of philosophy while computer science is a branch of the techne. The two seem to have nothing in common. But when software, with its inherent biases, is underlying much of what we do, the lines between the two have been blurred. The Russell-Einstein manifesto is perhaps the first to warn about the ethical impact of the techne. Unfortunately, it has been largely forgotten. For example, the core of much of the dystopian literature (1984, Fahrenheit 451, The Minority Report, to name a few) is government surveillance and its adverse impact on humanity. The surveillance we are under nowadays, aided by “big” data mining, is much more comprehensive than that envisioned by the authors of this literature. Unlike the society described by such dystopian literature, current societal tendencies are to welcome such surveillance for the material conveniences they provide.

The talk will discuss some of the ethical aspects of the work of software developers, from privacy to the impact of cryptography to democracies. Examples will be given from diverse areas such as medical data and autonomous (lethal or not) robots, with emphasis on data sharing and transfers across jurisdictions and borders.

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