Communications in Computer and Information Science 1166

Commenced Publication in 2007
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Information and Cyber Security

18th International Conference, ISSA 2019
Johannesburg, South Africa, August 15, 2019
Proceedings

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Preface

ISSA 2019 is the annual conference for the information security community that continues on the successful recipe established in 2001. The conference is held under the auspices of the Academy for Computer Science and Software Engineering at the University of Johannesburg, the School of Computing at the University of South Africa, and the Department of Computer Science at the University of Pretoria.

ISSA 2019 was held on August 15, 2019. The conference has evolved each year in various ways. For the first time the conference was hosted at the premises of the University of Pretoria. We believe that the quality and relevance of the information presented by industry practitioners and academics has also evolved over the years, as have the opportunities for senior research students to present their research to a critical and representative audience. This year university students were allowed to register for the conference for an unprecedented 200 ZAR per person in order to make the conference extremely accessible to students.

Conferences have become a major focus area – and often a money spinner – in many industries, so at any time a number of conferences are always being advertised in similar fields such as information or cyber security. What sets the ISSA conference apart is that it is not intended to generate a profit for an organization and it does not encourage marketing of products and services through presentations. Instead, the proceeds from registration fees are reinvested to ensure that the conference evolves each year. In exchange for their investment in the conference, sponsors are afforded an opportunity to present company-specific information that has a bearing on the conference themes and presentations submitted by potential speakers are sent through a vigorous double-blind review process, managed by a team of respected international experts in information security.

We trust that the annual ISSA conference will continue to be recognized as a platform for professionals from industry as well as researchers to share their knowledge, experience, and research results in the field of information security on a South African, but also on an international level.

To ensure ongoing improvement, every year we encourage input from all those interested in the field of information security, particularly those who are actively seeking to progress the field, to take part and share their knowledge and experience.

August 2019

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Conference Focus

Information security has evolved and in the last few years there has been renewed interest in the subject worldwide. This is evident from the many standards and certifications now available to guide security strategy. This has led to a clearer career path for security professionals.

The Internet of Things (IoT) together with advances in wireless communications, have brought new security challenges for the information security fraternity. As these IoT devices become more available, and more organizations attempt to rid their offices of "spaghetti", the protection of data in these environments becomes a more important consideration. It is this fraternity that organizations, governments, and communities in general look to for guidance on best practice in this converging world.

Identity theft and phishing are ongoing concerns. What we are now finding is that security mechanisms have become so good and are generally implemented by companies wanting to adhere to good corporate governance, that attackers are now looking to the weak link in the chain, namely the individual user. It is far easier to attack them than attempt to penetrate sophisticated and secure corporate systems. A spate of ransomware is also doing the rounds, with waves of viruses still striking periodically. Software suppliers have started stepping up to protect their users and take some responsibility for security in general and not just for their own products.

The conference therefore focused on all aspects of information and cyber security and invited participation across the information security spectrum including but not limited to functional, business, managerial, theoretical, and technological issues.

Invited speakers talked about the international trends in information security products, methodologies, and management issues. In the past, ISSA has secured many highly acclaimed international speakers, including:

– Pieter Geldenhuys, Vice-chair of the Innovation Focus Group at the International Communications Union, Geneva, Switzerland: "BUSINESS UNUSUAL: Strategic insight in creating the future. Leveraging the value of the Hyper-connected world."
– Wayne Kearney, Risk & Assurance Manager at Water Corporation, Australia: "Why are management shocked with all the "PHISH" caught? A case study in perspective."
– Prof. Dr. Sylvia Osborn, Associate Professor of Computer Science, The University of Western Ontario, Canada: "Role-based access control: is it still relevant?"
– Prof. Dr. Steve Marsh, Associate Professor at University of Ontario, Canada: "Trust and Security - Links, Relationships, and Family Feuds."
– Alice Sturgeon manages the area that is accountable for identifying and architecting horizontal requirements across the Government of Canada: "An Identity Management Architecture for the Government of Canada."
– Dr. Alf Zugenmaier, DoCoMo Lab, Germany: "Security and Privacy."
– William List, WM List and Co., UK: "Beyond the Seventh Layer live the users."

- Prof. Dennis Longley, Queensland University of Technology, Australia: "IS Governance: Will it be effective?"
- Prof. TC Ting, University of Connecticut and Fellow of the Computing Research Association, USA.
- Prof. Dr. Stephanie Teufel, Director of the International Institute of Management in Telecommunications (iimt) at Fribourg University, Switzerland.
- Rich Schiesser, Senior Technical Planner at Option One Mortgage, USA, and Rick Cudworth, Partner at KPMG LLP, International Service Leader, Security and Business Continuity – Europe, Middle East and Africa.
- Dario Forte, CISM, CFE, Founder, DFLabs, and University of Milan, Italy.
- Reijo Savola, Network and Information Security Research Coordinator, VTT Technical Research Centre of Finland, Finland.
- Mark Pollitt, Ex Special Agent of the Federal Bureau of Investigation (FBI) and Professor at the Daytona State College, Daytona Beach, Florida, USA.
- Prof. Joachim Biskup, Professor of Computer Science, Technische Universität Dortmund, Germany.
- Dr. Andreas Schaad, Research Program Manager, SAP Research Security & Trust Group, Germany.
- Prof. Steven Furnell, Head of the School of Computing and Mathematics (Faculty of Science and Technology), University of Plymouth, UK.
- Prof. Matt Warren, School of Information and Business Analytics, Deakin University, Australia.
- Christian Damsgaard Jensen, Associate Professor, Institute for Mathematics and Computer Science, Technical University of Denmark, Denmark.
- Prof. Rebecca Wright, Director of DIMACS, Rutgers University, USA.

The purpose of the conference was to provide information security practitioners and researchers worldwide with the opportunity to share their knowledge and research results with their peers. The objectives of the conference were defined as follows:

- Sharing of knowledge, experience, and best practice
- Promoting networking and business opportunities
- Encouraging the research and study of information security
- Supporting the development of a professional information security community
- Assisting self-development
- Providing a forum for education, knowledge transfer, professional development, and development of new skills
- Promoting best practice in information security and its application in Southern Africa
- Facilitating the meeting of diverse cultures to share and learn from each other in the quest for safer information system

Organization

Conference General Chairs

Hein Venter	University of Pretoria, South Africa
Marijke Coetzee	University of Johannesburg, South Africa
Marianne Loock	University of South Africa, South Africa
Mariki Eloff	University of South Africa, South Africa
Jan Eloff	University of Pretoria, South Africa

Organizing Committee

Mariki Eloff	University of South Africa, South Africa
Marijke Coetzee	University of Johannesburg, South Africa
Marianne Loock	University of South Africa, South Africa
Hein Venter	University of Pretoria, South Africa
Jan Eloff	University of Pretoria, South Africa

Program Committee

Reinhardt Botha	Nelson Mandela University, South Africa
Marianne Loock	University of South Africa, South Africa
Mariki Eloff	University of South Africa, South Africa

Publication Chair

Hein Venter	University of Pretoria, South Africa

Honorary Committee

The following member is an Honorary Committee member of the ISSA conference. This committee member is honored for his effort as one of the founding members of the ISSA conference in 2001. The current conference committee feels obliged to honor him as such.

Les Labuschagne	University of South Africa, South Africa

On behalf of the general conference chairs, we would like to extend our heartfelt appreciation to all the Conference Committee members and chairs for their hard work in organizing ISSA 2019! Without your continuous hard work and efforts, ISSA 2019 would not have been possible. Again, we thank you!

Review Committee

A rigorous double-blind refereeing process was undertaken by an international panel of referees to ensure the quality of submissions before acceptance. Authors initially submit abstracts to determine if the paper meets the goals and fits into the theme of the conference. The ISSA Program Committee assesses each submission for relevance and fit. Authors are then notified whether their abstracts were accepted, and if so, invited to submit a full paper for peer review. The task of a reviewer is often a thankless task, however, without them this conference would not be possible. The ISSA Organizing Committee would like to extend their heartfelt thanks to the list of reviewers below whom include leading information security experts from around the world.

On the due date, authors submit full papers, anonymized by the authors for the double blind review process. Each paper goes through an administrative review and is assigned to at least three reviewers selected from an international panel of reviewers, in order to confirm that the paper conforms to the specifications and quality for the conference. If a paper does not meet the requirements, the author is asked to make the required changes as indicated by reviewers and asked to resubmit the paper, or to consider submitting the paper to another conference.

A Review Committee is invited to participate, consisting of both local and international experts in the field of information security. A process is followed by the Program Committee to allocate papers to reviewers based on their area of expertise. Reviewers are subject matter experts, of which over 50% are international. Reviewers usually have five or six categories that they are willing to review against. Each reviewer will establish the number of papers they can review in a specific time period and are allowed to bid on the papers they want to review. An automated process allocated papers to each reviewer according to their preferences.

Each paper is reviewed by a minimum of two reviewers (but mostly by three reviewers) in a double blind review process. Papers are reviewed and rated on a 5 point system with 1 being poor and 5 being excellent as follows:

- Originality (1 to 5)
- Contribution (1 to 5)
- Overall quality (1 to 5)
- Reviewer's confidence (1 to 5)
- Overall evaluation (calculated by an algorithm as a number in the range −5 to 5, where a negative score of −5 would indicate an extremely strong reject, 0 would indicate a borderline paper, and 5 would indicate an extremely strong accept)

Reviewer's confidence in their own rating is also taken into account by the algorithm that calculates the overall evaluation. Reviewers are also encouraged to make anonymous suggestions to the author(s) of the paper.

Based on the overall evaluation (−5 to 5), a paper with 0 or below points can be recommended for a poster/research-in-progress session and a 3 to 5 point paper can be put in the "best paper" category. An acceptance rate of between 25% and 35% is maintained for the conference. In 2019 the acceptance rate was 35%.

Authors are notified of the outcome of the review process which includes the anonymous suggestions and recommendations of the reviewers. Authors then have to submit the final version of the paper that will then be included in the formal conference proceedings. This proceedings is the official version of the proceedings. An unofficial version of the proceedings was distributed on USB flash drives during the conference. All USB proceedings from all previous ISSA conferences are also available at www.infosecsa.co.za/past.

Name	Company/Affiliation	Country	
Hanifa Abdullah	University of South Africa	South Africa	
Ikuesan Adeyemi	University of Pretoria	South Africa	
Alapan Arnab	Private	South Africa	
Sampson Asare	University of Botswana	Botswana	
Frans Blauw	University of Johannesburg	South Africa	
Hettie Booysen	Private	South Africa	
KP Chow	University of Hong Kong	Hong Kong	
Evan Dembsky	University of South Africa	South Africa	
Vasiliki Diamantopoulou	University of the Aegean	Greece	
Moses Dlamini	University of Pretoria	South Africa	
Lynette Drevin	North-West University	South Africa	
Jaco du Toit	University of Johannesburg	South Africa	
Eduardo Fernandez	Florida Atlantic University	USA	
Stephen Flowerday	University of Fort Hare	South Africa	
Evangelos Frangopoulos	University of South Africa	Greece	

Steven Furnell	University of Plymouth	UK	
Lynn Futcher	Nelson Mandela Metropolitan University	South Africa	
Stefanos Gritzalis	University of the Aegean	Greece	
Marthie Grobler	CSIRO Data61	Australia	
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