PRIVACY SECURITY TRUST 2018

16th International Conference on Privacy, Security and Trust

28–30 August 2018
Titanic Belfast

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#PST2018

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Welcome

On behalf of the Organising Committee, we would like to welcome you to the 16th International Conference on Privacy, Security and Trust (PST) here in Belfast.

It is our pleasure and privilege to be the host of the PST's inaugural European event in Belfast, Northern Ireland. Over its 16 year history, the PST Conference has been the premier forum for sharing advances in cybersecurity research, security applications and showcasing and demonstrating the latest security technologies.

The conference will cover both industry and academic discussions with a balanced programme covering a variety of topics. The industry themes include; 'Trust @70MPH – Securing the Connected Car', 'The Human Factor', and 'The Future of Privacy, Security & Trust'. The academic conference will consider Socio-technical Aspects of User Privacy Protection, Virtually Sleepwalking and Security in a Post-Privacy World, and The Security of Machine Learning.

This year we are particularly pleased to have Mia Boom-Ibes, Vice President, Security Innovation, Strategy and Analytics of Allstate as our Industrial Chair, Brandon Niemczyk, Security Architect – Trend Micro US, Professor Piotr Cofta – UTP University of Science and Technology Poland, Professor Shujun Li – Kent University UK and Dr. Luis Muñoz-González – Imperial College London UK as our distinguished keynote speakers, who will provide a global perspective on Privacy, Security and Trust related challenges and research trends.

This year we received 98 high quality submissions from around the world and accepted 27 full and 15 short papers. We also accepted 20 posters. These cover the spectrum of Privacy, Security and Trust, examining topics as diverse as network security, malware analysis, authentication, user behaviour, security analytics, privacy-preserving computing, user's trust, online social network privacy, cryptography and crypto-mining.

We are especially grateful to IEEE for their continued support and sponsorship. We thank all of our event sponsors and acknowledge in particular the assistance from Proofpoint, Invest NI, NCSC, CSIT, Allstate, Titan IC, Carson McDowell, RITICS, RISE and Hays Recruitment.

We would like to thank all of our distinguished speakers, technical paper authors and reviewers for their vital contribution, their time and knowledge to make this conference a success.

Finally, we wish to thank our technical organising committee Kieran McLaughlin, Rongxing Lu , Liqun Chen, Robert H. Deng, Paul Miller, Stephen Marsh and Jason Nurse, and the local organising committee Godfrey Gaston, Judith Millar, Philip Mills, David Crozier, Hamidreza Hanafi, Arash Habibi, Jill Doherty, Gill Graham, Helen McCrory, Sandra Scott Hayward and Ciara Rafferty for their considerable efforts on all organisational aspects of the conference.

The PST organising committee are delighted to be able to deliver an interesting programme which explores both the academic and industry challenges. I hope that you will find the conference educational and the social gatherings in Belfast enjoyable. Thank you for your participation and support.

Sakir Sezer – PST2018 General Chair
Ali Ghorbani – PST2018 Technical Programme Chair
Belfast, Northern Ireland, UK

Industry Day Agenda
28 August 2018

Our exciting industry day will consider how Privacy, Security and Trust is reshaping both traditional and emerging industry sectors, with people at the centre. @70MPH – Securing the Connected Car', 'The Human Factor', and 'The Future of Privacy & Trust'.

28 August 2018	
09.30–10.00	Registration & Networking
10.00–10.05	Conference Opening
10.05–10.15	Welcome: Steve Harper, Executive Director International Business, Invest NI
10.15–10.25	Opening Address: Mia Boom-Ibes, VP of Security Innovation, Strategy & Analytics, Allstate
10.25–10.45	Opening Keynote: Darryl Burns, representing NCSC
10.45–12.15	**Security & Trust @70mph – Securing Connected Vehicles** Session Chair: Richard Morris, Innovation Lead – Autonomous & Connected Vehicles, Innovate UK Dr Madeline Cheah, Cyber Security Innovation Lead, Horiba MIRA David Galbraith, R&D Technical Lead, Sensata Adrian Condon, CTO, B-Secur Prof Chris Hankin, Director, RITICS – Research Institute in Trustworthy Inter-connected Cyber-physical Systems
12.15–13.15	Lunch
13.15–14.30	**The Human Factor – Making Security Useable for Everyone** Session Chair: Dr Sandra Scott-Hayward, Assistant Professor, CSIT Jermain Njemanze, Sales Engineer EMEA, Anomali Tom Keating, VP of Engineering & Belfast Site Leader, Proofpoint Neill Cooper, Chief Commercial Officer, Zonefox Dr Josh Hailpern, VP of Engineering/Design, Broadbridge Networks Gina Dollard, Head of Threat Intelligence, AIB
14.30–14.40	**A Legal Perspective on Cyber Security** Clare Bates, Director of Legal Operations and Compliance, Carson McDowell
14.45–15.15	Coffee Break
15.15–16.15	**The Future of Privacy, Security & Trust – Innovation in PST** Session Chair: Dr Anita Sands, Director, Symantec, ThoughtWorks, Pure Storage, ServiceNow Prof Máire O'Neill, Director, RISE – Research Institute of Hardware Security & Embedded Systems Mike Thomas, SVP Cyber & Defence, Kx Fergal Downey, VP of Engineering, Rakuten Damian Horner, Engineering Manager, SaltDNA Mathieu Gorge, CEO & Founder, VigiTrust
16.20–16.40	Closing Remarks: Mia Boom-Ibes
16.40–16.45	Close
16.45–19.00	Summer Cyber Mixer event hosted by NI Cyber, BCS, ISACA and OWASP, and kindly supported by Carson McDowell

Industry Day Chairperson
Mia Boom-Ibes

We are delighted to welcome Mia Boom-Ibes to chair the industry event.

Mia is Vice President, Security Innovation, Strategy and Analytics for Allstate Insurance Company. In this role, she is responsible for Allstate's cybersecurity strategy and priorities. She manages relationships with key business and technology stakeholders to ensure alignment and enable consistency across the enterprise.

In addition, Mia leads an Innovation and Analytics team to develop new capabilities and services in cybersecurity. Her team collaborates with research groups within Allstate as well as international academic groups and organisations to address global challenges such as digital identity, security and privacy in big data and security analytics.

Prior to becoming a vice president at Allstate in July of 2017, Mia was a director in Allstate Information Security with responsibility for setting the strategy and direction for information security governance, risk and compliance efforts across the corporation.

She spearheaded the creation of the company's first Enterprise Information Security Policy and Information Security Risk Management program aligned with industry best practices and frameworks. In addition, Mia has designed and built security governance programs to obtain or retain PCI compliance status at multiple institutions.

Mia began her Allstate career in 2012 as an information security compliance and consulting manager, quickly progressing to roles of increasing leadership. She previously served in information security roles at John Deere Financial, PwC Consulting and Discover Financial Services.

Mia holds CISSP and CISM certifications and bachelor's degree from the College of Saint Benedict. As the proud mother of four sons, Mia leads an active lifestyle balancing her work responsibilities, learning new skills in mixed martial arts and enjoying time with her husband and children.

Academic Day Agenda
29–30 August 2018

Our academic days will consist of a variety of keynotes covering topics including: Socio-technical Aspects of User Privacy Protection, Virtually Sleepwalking, Security in a Post-Privacy World and The Security of Machine Learning. A banquet dinner will be served to delegates on 29th August in Belfast City Hall.

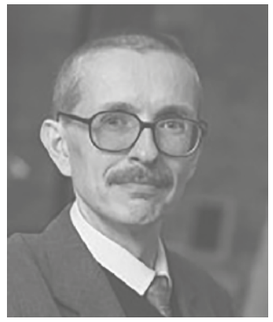
29 August 2018	
08.00–08.30	Conference On-Site Registration
08.30–08.45	Welcome Speeches: Sakir Sezer, John McCanny, Ali Ghorbani
08.45–09.30	Invited Talk: Brandom Niemczyk, Trend Micro. Chair: Sakir Sezer
09.30–10.15	Invited Talk: Professor Shujun Li, Kent University, UK. Chair: Ali Ghorbani
10.15–10.35	Morning Break
10.35–12.05 (2 x 25 min 2 x 20 min)	**Security 1: Network Security (Room: Olympic Suite. Chair: Paul Miller)** *Covert Data Exfiltration from Air-Gapped Networks via Switch and Router LEDs* Mordechai Guri, Boris Zadov, Andrey Daidakulov and Yuval Elovici *Timing is Almost Everything: Realistic Evaluation of the Very Short Intermittent DDoS Attacks* Jeman Park and Aziz Mohaisen *GIDS: GAN based Intrusion detection System for in-vehicle network* Eunbi Seo, Hyunmin Song and Huy Kang Kim *Mitigating CSRF attacks on OAuth 2.0 and OpenID Connect* Wanpeng Li, Chris Mitchell and Thomas Chen
10.30–12.05 (2 x 25 min 2 x 20 min)	**Privacy 1: Privacy-Preserving Computing I (Room: Britannic Suite. Chair: Ken Barker)** *Privacy-Preserving Architectures with Probabilistic* Kai Bavendiek, Robin Adams and Sibylle Schupp *Approximating Robust Linear Regression with An Integral Privacy Guarantee* Navoda Senavirathne and Vicenc Torra *Privacy-Preserving Subgraph Checking* Stefan Wueller, Benjamin Assadsolimani, Ulrike Meyer and Susanne Wetzel *Parallel Linear Regression on Encrypted Parkinson's Disease Data* Toufique Morshed, Dima Alhadidi and Noman Mohammed
12.05–13.00	Lunch
13.00–14.15 (3 x 25 min)	**Trust 1: User's Trust (Room: Titanic Suite. Chair: Piotr Cofta)** *Trust-driven, Decentralized Data Access Control for Open Network of Autonomous Data Providers* Łukasz Opioła, Łukasz Dutka, Renata G. Słota and Jacek Kitowski *Digitized Trust in Human-in-the-Loop Health Research* Andrew Sutton, Reza Samavi, Thomas Doyle and David Koff *The continued risks of unsecured public Wi-Fi and why users keep using it: Evidence from Japan* Nissy Sombatruang, Youki Kadobayashi, Angela Sasse, Michelle Baddeley and Daisuke Miyamoto
13.00–14.15 (3 x 25 min)	**Privacy 2: Online Social Network Privacy (Room: Olympic Suite. Chair: Esma Aimeur)** *At Your Own Risk: Shaping Privacy Heuristics for Online Self-disclosure* Nicolás Emilio Díaz Ferreyra, Rene Meis and Maritta Heisel
13.00–14.15	*Enabling Users to Balance Social Benefit and Privacy in Online Social Networks* Sourya Joyee De and Abdessamad Imine *On Sybil Classification in Online Social Networks Using Only OSN Structural Features* Dieudonne Mulamba Kadimbadimbd, Indrajit Ray and Indrakshi Ray
13.00–14.30 (1 x 25 min 3 x 20 min)	**Security 2: Cryptomining and Malware Analysis (Room: Britannic Suite. Chair: Tao Ben)** *Detecting Cryptomining Using Dynamic Analysis* Domhnall Carlin, Phillip O'Kane, Sakir Sezer and Jonah Burgess *A Power Analysis of Cryptocurrency Mining: A Mobile Device Perspective* James Clay, Alexander Hargrave and Ramalingam Sridhar *Peer Based Tracking using Multi-Tuple Indexing for Network Traffic Analysis and Malware Detection* Matthew Hagan, Boojoong Kang, Kieran McLaughlin and Sakir Sezer *A Family of Droids – Android Malware Detection via Behavioral Modeling: Static vs Dynamic Analysis* Lucky Onwuzurike, Mario Almeida, Enrico Mariconti, Jeremy Blackburn, Gianluca Stringhini and Emiliano De Cristofaro
14.30–14.:50	Afternoon Break
14.50–17.10 (4 x 25 min 1 x 20 min)	**Security 3: Cryptography (Room: Britannic Suite. Chair: Máire O'Neill)** *Automated Proofs of Signatures using Bilinear Pairings* Guruprasad Eswaraiah, Douglas Nedza and Roopa Vishwanathan *On the Relationship Between Weak and Strong Deniable Authenticated Encryption* Paolo Gasti and Kasper Rasmussen *Secure Compression and Pattern Matching Based on Burrows-Wheeler Transform* Gongxian Zeng, Meiqi He, Linru Zhang, Jun Zhang, Yuechen Chen and Siu Ming Yiu *Mining Sequential Patterns from Outsourced Data via Encryption Switching* Gamze Tillem, Zekeriya Erkin and Reginald Lagendijk *Enforcing Privacy and Security over Public Cloud Storage* João S. Resende, Rolando Martins and Luis Antunes
14.40–17.00	Posters Session (Room: Titanic Suite. Chair: Sakir Sezer, Ali Ghorbani
18.30–21.00	Banquet – Belfast City Hall
30 August 2018	
08.30–09.15	Invited Talk: Dr. Luis Munoz-Gonzalez, Imperial College London, UK. Chair: Paul Miller
09.15–10.00	Invited Talk: Professor Piotr Cofta, University of Science and Technology, Poland. Chair: Sakir Sezer
10.00–10.20	Morning Break
10.20–12.00 (4 x 25 min)	**Security 4: Security Vulnerabilities and Malware (Room: Olympic Suite. Chair: Philip O'Kane)** *Managing Publicly Known Security Vulnerabilities in Software Systems* Baljeet Malhotra and Hesham Mahrous *Andro-Simnet: Android Malware Family Classification using Social Network Analysis* Hye Min Kim, Huy Kang Kim, Hyun Min Song and Jae Woo Seo *Industry-Wide Analysis of Security Vulnerabilities in Open Source Software* Yiming Zhang, Baljeet Malhotra and Cheng Chen *Demonstrating Cyber-Physical Attacks and Defense for Synchrophasor Technology in Smart Grid* Rafiullah Khan, Kieran McLaughlin, John Hastings, David Laverty and Sakir Sezer
10.20–11.50 (2 x 25 min 2 x 20 min)	**Privacy 3: Privacy-Preserving Computing II (Room: Britannic Suite. Chair: Sakir Sezer)** *The Possibility of Matrix Decomposition as Anonymization and Evaluation for Time-sequence Data* Tomoaki Mimoto, Shinsaku Kiyomoto, Seira Hidano, Anirban Basu and Atsuko Miyaji *Privacy Preserving Probabilistic Record Linkage Without Trusted Third Party* Ibrahim Lazrig, Toan Ong, Indrakshi Ray, Indrajit Ray, Xiaoqian Jiang and Jaideep Vaidya

10.20–11.50	*CHARIOT: Cloud-Assisted Access Control for the Internet of Things* Clementine Gritti, Melek Onen and Refik Molva *How-to Express Explicit and Auditable Consent* Ana Carvalho, Rolando Martins and Luís Antunes
12.00–13.00	Lunch
13.00–14.30 (2 x 25 min 2 x 20 min)	**Privacy 4: Location and Web Privacy (Room: Britannic Suite. Chair: Hiroaki Kikuchi)** *Location Privacy and Utility in Geo-social Networks: Survey and Research Challenges* Zohaib Riaz, Frank Duerr and Kurt Rothermel *Exploring User Behavior and Cybersecurity Knowledge – An experimental study in online shopping* Ghada El-Haddad, Amin Shahab and Esma Aimeur *Crossing Cross-Domain Paths in the Current Web* Jukka Ruohonen, Joonas Salovaara and Ville Leppänen *Hide-and-Seek with Website Identity Information* Milica Stojmenovic and Robert Biddle
13.00–14.30 (2 x 25 min 2 x 20 min)	**Trust 2: Confidentiality and Access Control; Security 5: Security Analytics** *Coalition-Resistant Peer Rating for Long-Term Confidentiality* Giulia Traverso, Denis Butin, Alex Palesandro and Johannes Buchmann *Problem-based Derivation of Trustworthiness Requirements from Users' Trust Concerns* Nazila Gol Mohammadi, Nelufar Ulfat-Bunyadi and Maritta Heisel *Using AP-TED to Detect Phishing Attack Variations* Sophie Le Page, Qian Cui, Guy-Vincent Jourdan, Gregor V. Bochmann, Jason Flood and Iosif-Viorel Onut *Smart4Gap: Factors that Influence Smartphone Security Decisions in Developing and Developed Countries* Jema David Ndibwile, Youki Kadobayashi and Doudou Fall
13.00–14.30 (2 x 25 min 2 x 20 min)	**Security 6: Authetication, User Behaviour and Security Analysis (Room: Titanic Suite. Chair: Ali Ghorbani)** *Exploring the Impact of Password Dataset Distribution on Guessing* Hazel Murray and David Malone *Unmasking Android Obfuscation Tools Using Spatial Analysis* Ratinder Kaur, Ye Ning, Hugo Gonzalez and Natalia Stakhanova *An Implementation and Evaluation of Progressive Authentication Using Multiple Level Pattern Locks* William Aiken, Jungwoo Ryoo, Hyoungshick Kim and Mary Beth Rosson *EagleEye: A Novel Visual Anomaly Detection Method* Iman Sharafaldin and Ali Ghorbani
14.30–15.00	Closing

Academic Keynote Speakers

Professor Shujun Li, Kent University, UK
Title: Socio-technical Aspects of User Privacy Protection

This talk will focus on socio-technical aspects of user privacy protection. Starting from the origin and definitions of privacy as a concept more in social sciences, and then move on to discuss some complicated socio-technical challenges facing researchers and practitioners when designing and developing user privacy protection solutions. Particularly, he will introduce his recent work on mobile privacy, his thoughts on the subtle interactions between digital forensics and privacy, and a recently granted project on protecting privacy of leisure travellers in the context of data economy. He will conclude his talk with his ongoing research on the new challenges arising from the widely acknowledged tension between legal requirements of privacy / data protection (e.g. by EU GDPR) and applications based on distributed ledger technologies (e.g., blockchain), which is inter-disciplinary work being conducted jointly with his collaborators from social science disciplines including Law and Behavioural Economics.



Professor Piotr Cofta
Title: Virtually Sleepwalking

Mundus vult decipi, ergo decipiatur – the world wants to be deceived, so let it be deceived. Privacy, security and trust are the cornerstones of what can be considered 'the reasonable, rational Internet' with little place for mass surveillance, breach or deception. However, the question remains what is the place for the PST in the changing world where the concentration of risk made us virtually sleepwalking into the possibility of such events at the epic scale. By critically analysing some of the defining events of the last 12 months, and comparing it with recent directions in PST research, this presentation highlights discrepancies between what the PST community concentrates on and what may be needed. While no silver bullet is being offered, some comments on what can be done are provided, at least to stimulate the discussion.

Brandon Niemczyk
Title: Security in a post-privacy world

In a world where we trade privacy for convenience and services, what exactly does security mean? Why is securing our data still important in a world where we don't control our data and do we have the technological means to enforce recent legislation surrounding these issues?

Luis Muñoz-González
Title: The Security of Machine Learning

This talk will explore the mechanisms that can allow attackers to compromise a machine learning system by injecting malicious data into the training set or by exploiting the weaknesses of the system at test time. I will also present some mechanisms that can help to mitigate the effect of such attacks and discuss the challenges in the design of more secure machine learning systems.

UK Research Institutes

NCSC and EPSRC have funded four multi-institution Research Institutes in Cyber Security with the aim of developing the UK's cyber security capability in this strategically important area. We are particularly pleased to have RITICS and RISE participate in the PST2018 conference.

Research Institute in Trustworthy Industrial Control Systems (RITICS)

RITICS is a portal to cutting-edge UK research into the cyber security of cyber-physical, critical systems. It was founded in 2014 as one of three cyber security Institutes set up by the UK Government in conjunction with EPRSC. Its early focus was to improve cyber security of Industrial Control Systems.

RITICS was renewed and relaunched in spring 2018, with funding for a further 5 years, now sponsored by the NCSC in partnership with EPSRC.

Research Institute in Science of Cyber Security (RISCS)

The Research Institute for the Science of Cyber Security (RISCS) takes an evidence based and inter-disciplinary approach to addressing cyber security challenges. RISCS provides a platform for the exchange of ideas, problems and research between academia, industry, and government. It promotes and supports the development of scientific approaches to cyber security. Central to RISCS agenda is the application of research to stimulate a transition from 'common practice' to 'evidence-based best practice'.

Research Institute for Secure Hardware and Embedded Systems (RISE)

The Research Institute for Secure Hardware and Embedded Systems (RISE), which was launched in November 2017 under the directorship of Professor Máire O'Neill, Queen's University Belfast, seeks to identify and address key issues that underpin our understanding of Hardware Security.

The vision for RISE over the next 5 years is to create a global centre for research and innovation in hardware security encouraging close engagement with leading UK-based industry partners and stakeholders. A particular focus will be to accelerate the industrial uptake of the Institute's research output and its translation into new products, services and business opportunities for the wider benefit of the UK economy.

Research Institute on Verified Trustworthy Software Systems (VeTSS)

The main purpose of VeTSS is to support program analysis, testing and verification, bringing together academics, industrialists and government employees to achieve guarantees of software correctness, safety, and security. VeTSS stands at the forefront of research developments in fundamental theories and industrial-strength tools, targeting real-world applications.

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For more information contact Jason Brownlee
at jason.brownlee@hays.com or call 028 9044 6905

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