

**Publication: The Engineering and Physical Sciences Research Council**

**Date: 16 December 2015**

**Headline: UK and Singapore collaborating to address cyber threats**

## **UK and Singapore collaborating to address cyber threats**

**PUBLISHED ON DECEMBER 16, 2015**

Six new joint research projects will see UK and Singapore-based researchers collaborating to develop new solutions that will enhance the resilience of systems and infrastructure to cyber attacks.

The UK's Engineering and Physical Sciences Research Council (EPSRC) and Singapore's National Research Foundation today announced the results of a joint £2.4 million (\$5.1 million) research call, which will fund the projects over the next three years.

As connected global hubs and open economies, cybersecurity is of great importance to the UK and Singapore. Recognising the importance of collaboration in this area, a Memorandum of Understanding (MoU) on Cybersecurity was signed by the UK's Cabinet Office and Singapore's Cybersecurity Agency during Prime Minister David Cameron's visit to Singapore in July 2015. This joint research programme implements the joint R&D collaboration element of the MoU and has been welcomed by both governments.

Minister for the Cabinet Office and Paymaster General Matt Hancock, said: The research partnership between British and Singaporean universities will help both of our countries keep pace with the evolving cyber threat. I have no doubt that these projects will produce ground-breaking cyber security research and help protect us from threats online.

The Singapore-UK joint grant call, launched in May 2015, seeks to strengthen knowledge and capabilities in cybersecurity and foster closer collaboration in cybersecurity research between the researchers of both countries. The grant call closed in July 2015 with a total of 22 proposals received. All submitted proposals were evaluated jointly by cybersecurity experts of both countries. Six projects are awarded covering research areas in Intrusions, Data Analytics, Human Factors and Sector & Applications.

The projects that will be funded under this programme are:

- The University of Oxford and the National University of Singapore will work on Security and Privacy in Smart Grid Systems: Countermeasure and Formal Verification
- The University of Kent will work with the National University of Singapore on Vulnerability Discovery using Abduction and Interpolation
- The University of Surrey and Singapore Management University will work on Computational Modelling and Automatic Non-intrusive Detection Of Human Behavior-based Insecurity
- Imperial College and the National University of Singapore will work on Machine Learning, Robust Optimisation, and Verification: Creating Synergistic Capabilities in Cybersecurity Research
- Imperial College and Singapore University of Technology and Design will work on Security by Design for Interconnected Critical Infrastructures
- The University of Southampton and Nanyang Technological University will develop cybersecurity solutions for smart traffic control systems.

### **Notes for Editors**

The UK recently announced a doubling of investment to protect Britain from cyber-attack and develop sovereign capabilities in cyberspace, totalling £1.9 billion over five years. Combined with spending on core cyber capabilities, this will bring the UK government's total cyber spending to more than £3.2 billion.

Singapore launched a new Cyber Security Agency (CSA) in April 2015 and plans to double its current staff of 100.

**The Engineering and Physical Sciences Research Council (EPSRC)**

As the main funding agency for engineering and physical sciences research, **our vision is for the UK to be the best place in the world to Research, Discover and Innovate.**

By investing £800 million a year in research and postgraduate training, we are building the knowledge and skills base needed to address the scientific and technological challenges facing the nation. Our portfolio covers a vast range of fields from healthcare technologies to structural engineering, manufacturing to mathematics, advanced materials to chemistry. The research we fund has impact across all sectors. It provides a platform for future economic development in the UK and improvements for everyone's health, lifestyle and culture.

We work collectively with our partners and other Research Councils on issues of common concern via Research Councils UK.

## Annex A

### Awarded Projects under the National Cybersecurity Singapore-UK Joint Grant Call

S/N	Project Title	Project Brief
1.	Machine Learning, Robust Optimisation, and Verification: Creating Synergistic Capabilities in Cybersecurity Research	<p>This project brings together research leaders in machine learning, robust optimisation, verification and cybersecurity to explore new modelling and analysis capabilities in cybersecurity. The project will investigate new approaches for modelling and optimisation by which cybersecurity of systems, processes, and infrastructures can be more robustly assessed, monitored, and controlled in the face of stochastic and strict uncertainty. The project will also focus on the areas of privacy as new forms of privacy-preserving data analytics will be created and new approaches to decision support that respect privacy considerations are being developed.</p> <p>Assistant Professor Xu Huan of Department of Mechanical Engineering in National University of Singapore (NUS) and Professor Michael Huth, Professor of Computer Science in Imperial College are coordinating partners for this project.</p>
2.	COMMANDO-HUMANS: COMputational Modelling and Automatic Non-intrusive Detection Of HUMAN behAviour based iNSecurity	<p>This project aims to prove the feasibility of automated detection of human behaviour related insecurity at the human-computer interface (HCI) level and to support automated detection by developing general-purpose computational framework with supporting software tools. The project will demonstrate the usefulness of the proposed framework that will be applied to selected human user authentication systems (for example, used case of human-involved security systems) to automatically discover/rediscover known and unknown human behaviour related attacks.</p> <p>Professor Robert Deng, Director of Secure Mobile Centre and Professor for School of Information Systems at Singapore Management University (SMU) and Dr Shujun Li, Deputy Director of Surrey Centre for Cyber Security (SCCS) in University of Surrey are coordinating partners for this project.</p>
3.	Security by Design for Interconnected Critical Infrastructures	<p>The objective of the project is to advance the state of the art in the design of secure interconnected public infrastructures which focuses on Security-by-Design. The project will focus on security analysis through modelling based on the abstraction of system design, impact and response analysis across interconnected infrastructures</p>

		<p>and upgrading of initial design to improve system resilience to cyber-attacks.</p> <p>Professor Aditya Mathur, Head of Pillar and Professor of Information Systems Technology and Design from Singapore University of Technology and Design (SUTD) and Dr Deeph Chana, Deputy Director of Institute for Security Science in Imperial College are coordinating partners for this project.</p>
4.	Security and Privacy in Smart Grid Systems: Countermeasure and Formal Verification	<p>The project aims to analyse and enhance the security and privacy in smart grid systems. The project will focus on the interactive strategies and systems in smart grid. It aims to design and implement a high-assurance, security and privacy enhancing communication architecture from the field of trusted computing technologies.</p> <p>Professor Dong Jin Song of Computer Science Depart, School of Computing in NUS and Professor Andrew Martin, Professor of Systems Security in University of Oxford are coordinating partners for this project.</p>
5.	Vulnerability Discovery using Abduction and Interpolation	<p>This project seeks to develop theoretical foundations as well as practical techniques for providing security engineers with automatic tools, which will help to detect security vulnerabilities in binary code. Program analysis techniques such as bit-vector interpolation and abduction will be developed from the project.</p> <p>Dr Joxan Jaffar, Professor of Computer Science in NUS and Professor Andy King, Professor of Program Analysis in University of Kent are coordinating partners for this project.</p>
6.	Cyber Security Solutions for Smart Traffic Control Systems	<p>The project aims to develop a solution framework that can efficiently tackle the cyber security vulnerabilities of smart traffic control systems. The project will study on: (i) human-agent collectives based framework to deal with heterogeneity between different participating agents and humans; (ii) game theory to discover and analyse major attack scenarios; and (iii) resource-constrained online machine learning to develop and real-time defence mechanisms.</p> <p>Assistant Professor Bo An from School of Computer Engineering, Nanyang Technological University (NTU) and Professor Nicholas R Jennings, Head of Electronics &amp; Computer Science in University of Southampton are coordinating partners for this project.</p>