iTrust Times

A Quarterly Newsletter

Issue Highlights:

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From Centre Director's Desk

Dear readers,

Greetings from iTrust!

While SUTD has been transforming to a Design and AI university, iTrust is also entering to a new stage and is geared towards aiTrust by leveraging AI for securing Cyber-Physical Systems (CPS) in the protection of critical infrastructure.

iTrust is jointly co-organising the 3rd International Conference on the Design of Cyber Secure Critical Infrastructures (DCS-CI) 2026 with The Water Tower (TWT) in Sep 2026. DCS-CI is a joint academic-industrial forum bringing together researchers, practitioners, regulators, and industry leaders to explore system-level, secure-by-design approaches for securing critical infrastructure. The programme committee of DCS-CI'26 is led by Prof. Saman Zonouz from Georgia Tech and Prof. Daisuke Mashima from SUTD. The conference is now open for paper submissions. This will be a premium Operational Technology (OT) security annual event, and iTrust's world-class OT testbeds will be used for hands-on training during the event.

Maritime is the latest CI sector that is propelling iTrust's growth. With the commissioning of MariOT, the world's first industrial-grade shipboard OT testbed during the Singapore Maritime Week (SMW) in March 2025, iTrust has been actively exploring maritime cybersecurity R&D, education, professional training, and cyber exercises. iTrust is working with MPA and KPMG to offer maritime cybersecurity training to MPA's vessel traffic management officers. More professional training programmes will be announced during SMW'26. MariOT has also been used by MSSD and PhD students for their lab exercises in my Secure CPS class. Our researchers are actively using MariOT to demonstrate new cyber-attacks and validate new defence mechanisms for shipboard OT systems.

iTrust seeks close collaborations with local and international partners. We welcome and host many visitors, from academia, industry, and government agencies, to introduce our unique OT testbeds for water, energy, and maritime sectors, and demonstrate our new cybersecurity technologies. iTrust researchers visited our collaborators in Aalto University and TalTech on maritime cybersecurity. iTrust also jointly organised a forum on maritime AI and cybersecurity with Innovation Norway and the Norwegian Embassy Singapore. Most recently, iTrust launched an MoU with UK's National Edge Artificial Intelligence Hub to address cyber security concerns around the edge AI devices in OT environments.

I would also like to take this opportunity to thank Siddhant Shrivastava, who was iTrust Cyber Tech Lead before leaving for PhD study. He made significant contributions in support of NATO's annual Locked Shields exercise and our annual red teaming cyber exercise, the Critical Infrastructure Security Showdown (CISS), as well as leading several overseas training in OT cyber security. All the best in your PhD study, Siddhant!

Jianying Zhou
Centre Director, iTrust, SUTD
Professor of Cyber Security, SUTD

CSA SINGAPORE

SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

iTrust Centre for Research in Cyber Security

DCS-CI 2026

Design of Cyber-Secure Critical Infrastructure (DCS-CI) 2026 Call for Submissions

Jointly organized by iTrust and The Water Tower, DCS-CI 2026 is a Joint Academic-Industrial Forum bringing together researchers, practitioners, regulators, and industry leaders to explore system-level, secure-by-design approaches that address the unique challenges of protecting water systems, energy grids, transportation networks, and other critical infrastructure sectors.

The conference is now open for paper submissions, inviting researchers, practitioners, and industry experts to contribute to advancing cybersecurity in critical infrastructure systems. We welcome submissions from diverse disciplinary perspectives, including computer science, control systems engineering, security studies, public policy, and operations management. Interdisciplinary contributions that bridge theoretical innovation with practical application are particularly encouraged.

The conference seeks work that is rigorous, relevant, and actionable research that not only advances academic knowledge but also informs the practices of infrastructure operators, system integrators, and regulatory bodies. There will also be a Best Paper Award to recognize outstanding research contributions.

Authors are encouraged to submit original, unpublished work by 13 April 2026. For more details on submission guidelines and topics of interest, please visit the official DCS-CI 26 call for submissions page: https://dcs-ci.github.io/call-for-submissions

Visits

Aalto & TalTech Engagement

By: Dr Awais Yousaf, Research Fellow, iTrust

As part of the ongoing collaborations between iTrust, Aalto University, Tallinn University of Technology (TalTech), I arrived in Helsinki, Finland on 7 Sept 2025 along with my colleague, Senior Research Manager Jillian Chin.

At Aalto University, we were warmly welcomed by Dr Victor Bolbot and Dr Sunil Basnet. We engaged in a productive discussion on our joint research topic, maritime cybersecurity risk analysis. Dr Bolbot then gave us a tour of various academic facilities and laboratories across the campus. One of the highlights was the Aalto Ice and Wave Tank, an impressive facility where he showcased some of his earlier projects on autonomous ships – truly fascinating work at the intersection of maritime engineering and emerging technologies.

Fig.1: Dr. Awais Yousaf (left) and Prof Jianying Zhou (right) at the entrance of Estonian Maritime Academy of Tallinn University of Technology

Over lunch with Dr Bolbot and Basnet, we also had the pleasure of meeting Prof Osiris Valdez Banda, a distinguished expert in Marine and Arctic Technology, and he shared insights and his ongoing research directions that enriched our discussion further. The visit to Aalto University concluded with a tour of the Nokia Design Archive, an inspiring glimpse into decades of innovation.

The next leg of the collaboration tour was Tallinn, Estonia, where we were scheduled to visit TalTech from 10 to 12 September 2025. Together with Prof Jianying Zhou, iTrust Centre Director, Jillian and I were warmly hosted by Roomet Leiger, Director of the TalTech Estonian Maritime Academy. Roomet was joined by his colleagues Professor Sanja Bauk, Dr Ricardo Lugo, Dan Heering, and Vanessa Roberts. Here, as part of the TalTech–iTrust MoU, we conducted a detailed review of the progress on various ongoing joint research topics. These discussions helped align expectations, refine

research directions, and strengthen the collaborative roadmap between our institutions.

Fig. 2: A group photo with the hosts from Tallinn University of Technology (TalTech) (from left to right: Dr Ricardo Lugo, Prof Sanja Bauk, Jillian Chin, Dr Awais Yousaf, Prof Jianying Zhou, Roomet Leiger)

At Taltech, Jillian and I delivered a presentation on "Introduction to iTrust and the MariOT Testbed" to faculty members and students in a hybrid presentation format. I also delivered an online lecture titled "Maritime Cybersecurity Risk Assessment Frameworks" to Dr. Ricardo's students the following day.

Fig.3: iTrust team in one of Estonian Maritime Academy, TalTech's simulator. (from left to right: Jillian Chin, Dr Awais Yousaf, Prof Jianying Zhou)

Across the three days in TalTech, we explored potential avenues for new collaborations, training activities, and joint research projects. The TalTech team also guided us through their research and training infrastructure, including maritime simulators and educational facilities, an insightful experience into Estonia's maritime innovation ecosystem.

Maritime Conference

Maritime Conference with Norwegian Embassy Singapore

In collaboration with Innovation Norway and the Norwegian Embassy Singapore, a forum on "Cyber Security, AI and Digital Twins for the Maritime Sector" was held on 4 Nov 2025 at SUTD. The forum was part of the Norway-Singapore Science Week 2025. Attended by more than 40 participants, the conference was divided into 2 parts, where the morning session covered topics related to cyber security and the afternoon session focussed on digital twin and AI.

Fig.4: Welcome Remarks by Prof Ricky Ang, Associate Provost (International Relations), SUTD

Fig.5: Presentation on the Maritime Testbed of Shipboard Opertional Technology (MariOT) by Dr Awais Yousaf, Research Fellow, SUTD

Fig.6: Panel Discussion - Morning Session (Panellists from left to right: Dr Chen Xinwei, Deputy Executive Director, Singapore Maritime Institute, Mr Ong Chin Beng, Chief Information Security Officer, Maritime and Port Authority of Singapore, Lars Benjamin Vold, Managing Director, NORMA Cyber, and Prof Jianying Zhou, Centre Director, iTrust)

Fig.7: Panel Discussion - Afternoon Session (Panellists from left to right: Prof Mehdi Zadeh, Norwegian University of Science and Technology, Dr Li Haobin, National University of Singapore, Fu Xiuju, Director (Maritime AI Research Programme) and Senior Principal Scientist, Institute of High Performance Computing, Svein Peder Berge, Senior Business Developer, SINTEF, and Prof Ole Andreas Alsos, Norwegian University of Science and Technology)

Launch Event

Launch of MoU between iTrust and The National Edge Artificial Intelligence Hub

Even as OT environments play catch-up to the wave of security concerns around the deployment of IIoT devices, they now have to contend with the next wave of AIoT (Artificial Intelligence of Things) stacking on top of them. And it is on this backdrop that iTrust and UK's National Edge Artificial Intelligence Hub launched their partnership on 2 Mar 2026 to address cyber security concerns around the edge AI devices in OT environments.

Fig.8: Prof Saavas delivering the introductory address to the programme during the launch event.

Guests from industry, government and academia attended the launch event at SUTD, and listened to Professors Phil James (Newcastle University), Savvas Papagiannidis (Newcastle University), Daisuke Mashima (SUTD), Rajiv Ranjan (Newcastle University), Jun Sun (SMU), and Jianying Zhou (SUTD) from Singapore and UK as they shared their expertise, challenge statements and the path forward to better secure OT environments while tapping the vast benefits that edge AI devices will bring.

Fig.9: Sharing by invited speakers during the presentation segment. (Clockwise from top left: Prof Phil James, Newcastle University, Prof Sun Jun, SMU, Assoc Prof Mashima Daisuke, SUTD, Prof Savvas Papagiannidis, Newcastle University.)

Fig.10: Respective Directors of iTrust and The National Edge AI Hub (centre) with the signed MoU

Visit to NICE

Visit to the National Integrated Centre for Evaluation (NiCE)

As part of the CyberSG Labs, three research centres in cyber security – iTrust, the National Cybersecurity R&D Laboratories, NUS and NiCE - got together for a brainstorming session with the Cyber Security Agency of Singapore hosted by NiCE in NTU on 12 Mar 26. While distinct in strengths and capabilities, the three labs managed to outline draft areas for collaboration in their next phase of R&D. By presenting each other's capabilities and focus areas, several key areas for collaboration emerged. A deep dive session will follow to flesh out the details into a proposal to be submitted to CSA for consideration.

Fig.11: iTrust, NCL, and CSA visitors hosted by NiCE Director Assoc Prof Gwee Bah Hwee (fourth from left) and Programme PI Prof Gan Chee Lip (photo credit: NiCE, NTU)

CIDeX Engagement

CIDeX Youth Engagement: Introducing Students to OT Cybersecurity

By: Aanand R, Cybersecurity Technology Engineer, iTrust

As part of the Critical Infrastructure Defence Exercise (CIDeX) 2025, iTrust participated in the Youth Engagement Programme (YEP) to introduce students to the fundamentals of Operational Technology (OT) cybersecurity. CIDeX, co-organised by the Digital and Intelligence Service (DIS) and the Cyber Security Agency of Singapore (CSA), was held from 11 to 14 November 2025 at the Singapore Institute of Technology (SIT) campus in Punggol, with the one-day YEP taking place on 13 November.

During the YEP, approximately 80 students aged between 13 and 19 visited the iTrust station to learn about OT cyber security. I had the opportunity to deliver a short presentation introducing students to OT cyber-physical systems (CPS) through a hands-on demonstration using the training skid equipped with Allen-Bradley PLCs.

A training skid is a miniaturised and mobile skid that

Fig.12: Aanand introducing students to OT cyber-physical systems using a training skid

provides the essential components of a CPS and is primarily used to familiarise students with CPS before they migrate to the industrial-grade testbeds in iTrust. Working together with Andy Tay, iTrust's Education Lead, we developed the scenarios for the demonstration, including a traffic-light control system that illustrated how PLCs execute control logic in industrial systems. Students were also able to interact with simple structured text logic blocks, allowing them to observe how programming changes influence system behaviour.

The presentation proved highly engaging, as students showed strong enthusiasm in their participation and eagerness to understand the concepts presented, and is proof that training skid is an excellent tool for introducing students to OT cybersecurity, and broader cybersecurity concepts.

Outreach Workshop

Building Cyber Vigilance: iTrust engages ITE Students in Smart Facilities Security

On 24 November 2025, iTrust hosted a half-day workshop for Facility Management students from ITE College East. The session was designed to introduce students to the growing importance of cybersecurity in modern smart facilities, as well as to equip them with practical knowledge to stay cyber vigilant.

As buildings become smart through the integration of IoT devices, automated systems, and digital building management platforms, facility management professionals are now at the frontline of both physical and cyber risks. Recognising this shift, iTrust developed this workshop as part of a broader effort to bridge the gap between traditional facility operations and cybersecurity

awareness through hands-on experiential learning at our testbeds.

Fig.13: Sharing by iTrust Engineers and Researchers (clockwise from top left: Aanand R, Cybersecurity Technology Engineer, Dr. Harishma Boyapally, Research Fellow, Caven Chew, Intern from NUS, Sitora Salaeva, Visiting Reseracher from University of Padova)

The workshop began with an introduction to iTrust and our role in the cyber protection of critical infrastructure. Our engineers and researchers also gave the students a glimpse their work in iTrust and their career journey in the cybersecurity field.

A key highlight of the workshop was the guided tour of iTrust's testbeds. This immersive experience allowed the students to observe how cyberattacks can impact real-world systems including water and building operations.

Fig.14: Students were shown how cyber-attacks were simulated on iTrust's testbeds.

The session also featured an engaging talk "Can Smart Building be hacked?" by Research Fellow Dr Anand Agrawal. Through relatable examples, students learned how interconnected systems such as water pumps, HVAC systems, and sensors can be targeted by cyber threats. The talk emphasised the practical steps that can be taken to prevent such incidents, reinforcing the role that facility managers play in maintaining both operational and cybersecurity resilience.

To round off the event, students participated in a cyber hygiene segment where they were introduced effective habits to protect digital systems in both personal and profession settings. They were tasked to complete an interactive mobile game that reinforced the key learning points of the workshop.

Overall, the workshop provided students with valuable insights into the intersection of facility management and cybersecurity. By combining technical exposure with practical guidance, iTrust hopes to inspire and prepare the next generation of facility management professionals to operate confidently and securely in smart connected environments.

Farewell Siddhant

Wishing Siddhant All the Best on the Next Chapter

By: Prof Aditya P. Mathur, Founding Centre Director, iTrust

Approximately eight years ago, Siddhant joined iTrust as an intern from India and spent a semester working with our premier water and power testbeds. His contributions during that period are aptly captured in the following paragraph, excerpted from a report dated October 5, 2015, submitted to MINDEF: "Studied modern-day attacks on critical infrastructure and developed orthogonal defence mechanisms for industrial CPS. Developed and implemented a local Intelligent Checker for PLC1 in SWaT. Investigated and prepared a BlackEnergy analysis report." Siddhant's work has had a significant and enduring impact. During a 2025 visit to iTrust, a member of the US delegation observed, "This is how cybersecurity ought to be implemented in a critical infrastructure."

Siddhant is a co-inventor on US patent 11431733, titled "Defense system and method against cyber-physical attacks," granted on August 30, 2022. In addition, he has authored multiple peer-reviewed research publications and presented his work at conferences during his time at iTrust.

Siddhant's most consequential contribution to iTrust may have begun as an impromptu suggestion—one that ultimately enabled MINDEF and iTrust to participate in Locked Shields, the world's largest cyber exercise, conducted by the NATO CCDCOE[1] in Estonia. In late 2020, I delivered an online demonstration of the SWaT digital twin that I had recently developed; officers from MINDEF were also in attendance. The purpose of the demonstration was to

encourage CCDCOE to integrate SWaT into the Locked Shields exercise. At the conclusion of the session, the lead engineer dismissed the digital twin as a toy and stated that it was not suitable for Locked Shields. I was surprised; although I considered the twin well suited for a cybersecurity exercise, I was momentarily at a loss for how to respond. At that point, Siddhant—standing beside me—quietly suggested, "Tell them we will create a professional interface to the twin." I adopted his recommendation and replied to the CCDCOE lead, "Please give us one month, and we will demonstrate SWaT again." The CCDCOE team agreed to defer its decision, providing us valuable time.

Following that meeting, Siddhant worked with fellow iTrust researcher Marcel Praseto. Within one month, they developed an HMI for the SWaT twin. With this interface in place, the twin became closely comparable—in look and operation—to the physical SWaT testbed. We subsequently arranged a second online demonstration with the same CCDCOE group in attendance. At the conclusion of the session, the lead officer remarked, "This twin is too complex." I was taken aback, as no substantive changes had been made to the underlying SWaT twin beyond the addition of the HMI. Once again, Siddhant advised, "Tell them we will simplify the twin by removing the last three stages." I followed his recommendation, and CCDCOE accepted the simplified SWaT digital twin for use in Locked Shields. In 2021, MINDEF and iTrust participated for the first time in a NATO cyber exercise.

Since 2021, NATO has continued to use the SWaT and gas digital twins, and the Locked Shields exercise has remained a valued collaborative engagement for MINDEF and iTrust. Siddhant's pivotal role in establishing and strengthening this partnership is not widely known.

Given the space limitations, I am unable to include several other contributions Siddhant has made to iTrust. As he progresses toward his PhD, Siddhant has begun research in robotics with Professor Malika at SUTD. We at iTrust extend our sincere best wishes for his continued success and look forward to welcoming him back in the years ahead.

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