Fellow	Hendarmawan
Host Organisation	Research Institute of Sweden
Scientific coordinator	Prof. Shahid Raza

I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

During the ERCIM Fellowship at RISE, my research activities cantered around advancing hardware-assisted cybersecurity technologies for embedded and IoT systems. The scientific focus was structured into three main areas:

1. Enhancing Software Security in Hardware SoC Environments
   I explored heterogeneous System-on-Chip (SoC) platforms to strengthen software security using FPGA-based hardware accelerators. The work emphasized mitigating threats such as MATE attacks, malware injection, and hardware trojans by leveraging reconfigurable logic and performance-efficient co-processors.

2. Developing the FAST Framework: Rapid Prototyping for Secure IoT Deployment
   I led the development of FAST, a Hardware/Software co-design framework aimed at enabling rapid prototyping of secure IoT applications using FPGA accelerators. The framework significantly simplifies the integration of cryptographic functions and memory protection mechanisms for edge devices, especially under constrained computational environments.

3. Designing Lightweight Hardware Security Protocols for Edge Computing with MARS
   I proposed a novel, lightweight hardware security protocol tailored for edge computing environments, based on the MARS (Mutual Authentication and Randomized Security) cryptographic algorithm. This work aims to provide scalable and energy-efficient security primitives directly in SoC architectures.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

1. Article in ERCIM News – November 2024 Special Edition on Cybersecurity

Title: Enhancing Software Security in Hardware SoC Environments: A Heterogeneous Approach

Author: Hendarmawan (RISE)

Summary:

This article presents a heterogeneous FPGA-based approach to software security in embedded SoC systems, including a toolkit that abstracts low-level hardware complexities, enabling rapid hardware accelerator development for software developers. A case study on AES implementation demonstrates superior performance and power efficiency over ARM and CPU platforms.

2. Conference Paper (Submitted)

Title: FAST: Rapid Prototyping Framework for Secure IoT Development and Deployment

Authors: Hendarmawan and Shahid Raza

Status: Submitted to The the 30th European Symposium on Research in Computer Security (ESORICS) 2025.

Abstract:

The paper introduces FAST, an FPGA-based co-design framework aimed at simplifying secure hardware design for IoT applications. It highlights modularity, automation, and up to 8x improvement in cryptographic throughput over traditional processors.

3. Conference Paper (Pending Submission)

Title: Lightweight Hardware Security Protocol for Edge Computing with MARS: Enhancing Security and Efficiency for Resource-Constrained Devices

Authors: Hendarmawan and Shahid Raza

Status: In preparation for submission

Abstract:

This work proposes a lightweight hardware-integrated security protocol using MARS for SoC environments, emphasizing performance, low power usage, and strong cryptographic integrity for edge-based IoT systems.

III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES

1. SWITS 2024 Conference – Swedish IT Security Network, April 22-23, 2024, Lund University, Sweden
2. CySeP Summer School 2024 – ACM Europe Summer School on Cybersecurity and Privacy, June 10-14, 2024, Stockholm, Sweden
3. ERCIM FP Community Event, 8 November 2024 Online via Gather.town
4. Ericsson-RISE Hardware Security Seminar – March 13, 2025, Ericsson HQ, Stockholm, Sweden
5. RISC-V in Space Workshop – April 2-3, 2025, Gothenburg, Sweden
6. RISE Computer Science Day – 10-11 Desember 2025, Stockholm, Sweden

IV – RESEARCH EXCHANGE PROGRAMME (REP)

Host Institute: Foundation for Research and Technology – Hellas (FORTH), Institute of Computer Science (ICS), Greece
Host Researcher: Dr. Sotiris Ioannidis
Date of Visit: May 5–9, 2025

As part of the ERCIM Fellowship, I undertook a Research Exchange Programme (REP) at FORTH–ICS in Heraklion, Greece, hosted by Dr. Sotiris Ioannidis, a principal researcher with internationally recognized expertise in systems and network security. The visit was focused around engaging

with his research group to exchange knowledge and explore collaboration opportunities in memory protection, secure system design, and distributed trust mechanisms.

During the visit, I participated in technical discussions with the Distributed Computing and Cybersecurity group, learned about ongoing projects related to secure operating systems and network policy enforcement, and presented my own research on hardware-based Trusted Execution Environments for IoT devices. The exchange provided valuable insights into threat modelling and secure computing architectures, laying the groundwork for potential future collaboration. I am grateful for the opportunity and the support provided by both ERCIM and FORTH–ICS.

V – SUM UP OF THE FINAL SCIENTIFIC REPORT FOR THE ERCIM NEWSLETTER

Thank You, Dr. Hendarmawan: Marking the End of His ERCIM Fellowship with Prof. Shahid Raza's Team at RISE, Sweden

Dr. Hendarmawan conducted his ERCIM Fellowship at RISE, Sweden, focusing on hardware-assisted cybersecurity for IoT and embedded systems. His research included the development of the FAST prototyping framework for secure IoT applications, and the design of lightweight hardware security protocols based on MARS. He contributed to the ERCIM News Cybersecurity issue and submitted multiple research contributions. Dr. Hendarmawan aims to continue advancing hardware-based security and welcomes future collaborations.

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