Cyber-secure Systems by Design

Request

TNO considers investing in a four-year research project on Cyber-secure Systems by Design. To confirm the validity and value of this research, we seek endorsement from national industry. No commitment is requested, just an appreciation that research on this topic is relevant and can deliver value to industry.

Background

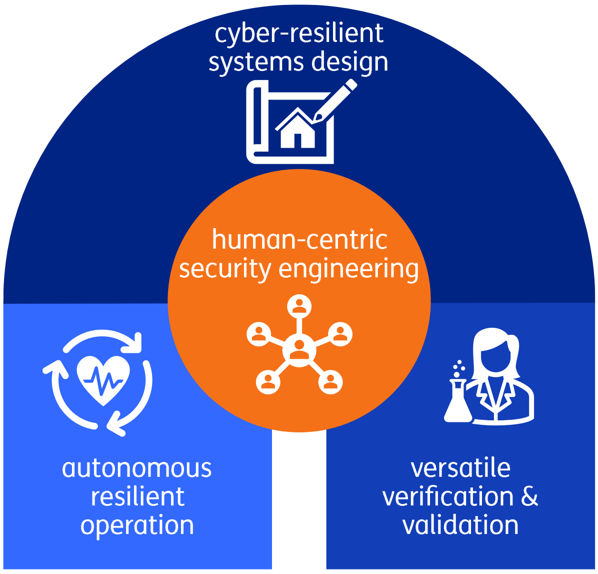
Cybersecurity has transformed into an essential precondition for a secure digitalizing society as there arose an increased dependence on digital systems and processes as well as a growing number of cyber incidents and cyber threats.

Meanwhile, the systems we need to protect become increasingly complex, dynamic, and exposed. The same applies to the environments in which they operate. In this dynamic ecosystem, a reactive approach to cybersecurity, reacting to vulnerability exposures and cyber incidents as they happen, is no longer feasible and sufficient. We need inherently cyber-resilient systems: systems with the ability to prevent, withstand, and recover from cybersecurity incidents[1]. This will benefit mission continuity in many sectors, and reduce the cost of damages, product updates and recalls, thereby lowering the overall life-cycle costs.

Yet, industry parties involved in systems design and engineering have difficulty crafting a business case. Incorporating cybersecurity still requires a substantial, costly effort by scarce experts. A better return-on-investment will become feasible by 1) leveraging the promising benefits of upcoming technology, and 2) reducing the costs of adopting such technology.

Research scope

TNO aims to address these challenges through a multi-disciplinary Early Research Program (ERP). This will address four essential and interconnected research areas:


cyber-resilient systems design
human-centric security engineering
autonomous resilient operation
versatile verification & validation

We develop a methodology for **cyber-resilient systems design**, ensuring the integral consideration of cyber-resilience and security in systems engineering. Furthermore, we research how resilience management can be achieved across further stages of the systems lifecycle, extending from system operation to disposal.

In the **autonomous resilient operation** research we explore functionality for self-healing and self-protection. This should lead to systems capable of autonomously detecting and coping with operational abnormalities. The research scope covers both novel technology and design principles for manufacturers aiming to adopt the technology.

[1] https://www.ibm.com/topics/cyber-resilience

Research on **versatile verification & validation** aims to enhance system reliability. To this end, testing methodologies are developed and enhanced to support software engineers in identifying and addressing software flaws and vulnerabilities at an early stage. By applying smart automation, we aim to minimize the human effort and required expertise.

Finally, an integral condition for cyber-resilience applications is **human-centric security engineering**. We leverage social studies and behavioral science research to determine how the human (roles) in design and engineering can be motivated to prioritize security and how security engineering should be made both usable and acceptable.

Output, outcome and impact

The proposed research will deliver a methodology and technology concepts for cyber-resilient design and engineering, taking into account the perspective of human roles involved in these processes.

The results contribute to

- supporting manufacturers in adopting design principles for producing inherently cyber-resilient systems,
- boosting end-user trust in the cybersecurity of products and systems,
- reducing the cost of product and systems updates, including recalls after shipping, and
- preventing damages from cybersecurity incidents, on the level of both individual products as well as system-of-systems infrastructures.

Signing

If you would like to endorse this research effort, please place your signature below.

Name Company Signature

______________________ ______________________ ______________________