IFA
Institut für Arbeitsschutz der
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Focus on IFA's work

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Security in safety-relevant control systems

Problem

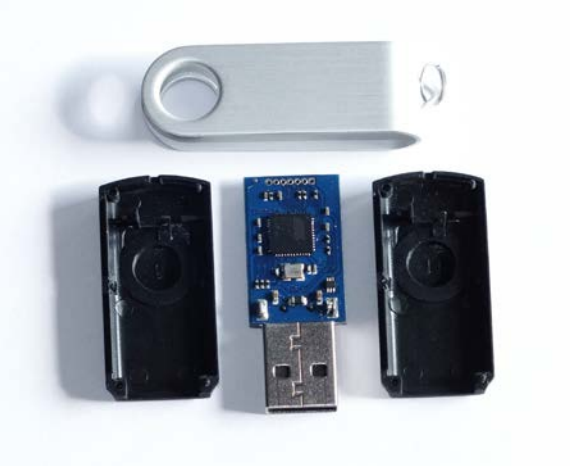
Programmable logic controllers (PLCs) with safety-relevant tasks (safety PLCs) once used to be compact stand-alone solutions. They were often installed on the machine itself, and interventions were only possible at the machine. On the way to a highly networked industry with ever more complex plants, safety-relevant control systems have been increasingly linked up to computer networks. It has therefore become possible to undertake dangerous interventions from the network in principle at any time.

However, this development, among others, opened the door to the successful and globally reported attacks on industrial controllers by the computer worm Stuxnet in 2011. This was followed by many other dangerous attacks on networked controllers in a wide variety of areas. In 2014, an attack on a German steel plant prevented a blast furnace from being shut down in a controlled manner and caused massive damage.

At a chemical plant in the Middle East, attackers installed their own software in a safety PLC and programmed a sequence to destroy the plant.

Fortunately, they made a mistake that caused the sequence to be aborted, and no one was injured.

The examples given illustrate the importance of the security of networkable controllers in different areas.



The chip in this harmless-looking USB stick was modified to execute commands to attack a system. (Image: Stein, IFA)

Activities

IFA assists social accident insurance institutions and product manufacturers with the implementation of security requirements. In doing so, IFA sensitises manufacturers of components with integrated functional security to the subject of security in order to improve awareness and the handling of security issues in the long term.

The IFA is also involved at the national and international level in various standardisation activities aimed at combining functional safety and security, e.g. drafting the standard "Safety of machinery – Security aspects related to functional safety of safety-related control systems" (IEC/TR 63074). With topical publications and demonstrations, the institute also endeavours to sharpen the awareness of acute safety problems and to promote safety culture in companies.

Results and Application

As a response to the reported security incidents, a DGUV informative publication was issued, with IFA's assistance, by DGUV's department devoted to machines, robotics and production automation. The publication draws attention to not only to dangers, but also to possible courses of action.

A demonstrator tool is currently being developed at IFA to train security awareness. It illustrates how modified hardware provides full access to a company network and permits subsequent sabotage.

Area of Application

Users, operators and manufacturers of programmable logic controllers and networked machines

Safety experts, social accident insurance institutions, industrial inspectorates

Additional Information

- Zetter, K.: How Digital Detectives Deciphered Stuxnet, the Most Menacing Malware in History. WIRED 2011
- APT-Angriff auf Industrieanlagen in Deutschland. In: Die Lage der IT-Sicherheit in Deutschland 2014. Ed. Bundesamt für Sicherheit in der Informationstechnik (BSI), Bonn, p. 31
- TRISIS Malware, Analysis of Safety System Targeted Malware. Ed. Dragos, Hanover, USA https://dragos.com/blog/trisis/TRISIS-01.pdf
- Johnson, B.; Caban, D.; Krotofil, M.; Scali, D.; Brubaker, N.; Glyer, C.: Attackers Deploy New ICS Attack Framework "TRITON" and Cause Operational Disruption to Critical Infrastructure. Ed. FireEye, Milpitas, USA https://www.fireeye.com/blog/threat-research/2017/12/attackers-deploy-new-ics-attack-framework-triton.html
- DGUV Information 102: Safety und Security in der vernetzten Produktion. Sachgebiet Maschinen, Robotik und Fertigungsautomation/Themenfeld Sicherheitssteuerungen und -komponenten https://www.dguv.de/webcode/d544722

Expert Assistance

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Literature Requests

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