



Securing Critical Infrastructures

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1.Context

The growing threat of advanced cyber-attacks is a major cause of concerns for Information-Technology (IT) systems. Industrial Control Systems (ICS) and Critical Infrastructures, such as power plants, water supply systems, healthcare structures, and transportation infrastructures, are particular types of Cyber-Physical Systems (CPS). CPS are critical targets potentially vulnerable to cyber-attacks.



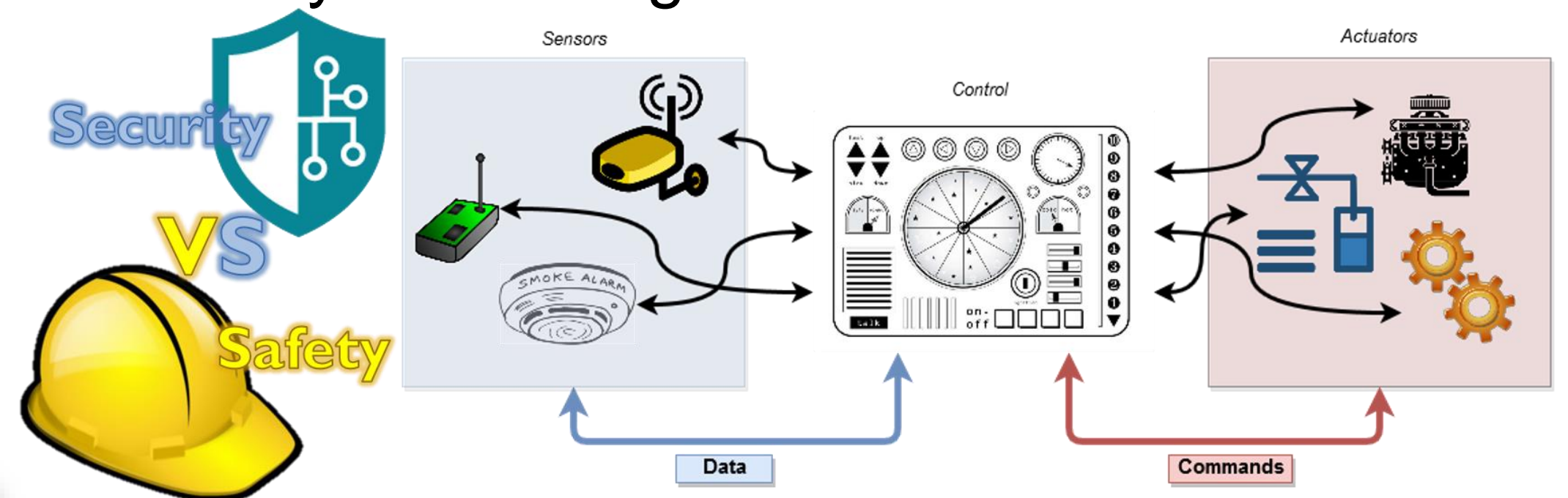
2.Goal

The goal of this research is the design of new architectures to build secure CPS resilient against new cyberattacks threats, focusing on security solutions able to protect exploitable weaknesses at different layers of a CPS, starting from hardware security leaks up to the application software domain.

The solutions aid the design of new architectures to build secure systems to be integrated into Critical Infrastructure as well as in ICS.

3.Methods

Considering the high-level structure of a CPS, it arises the close connection between safety and security domain, thus the necessity to consider both design aspects mutually interacting.



Among the emerging trends in CPS, there is the integration of reconfigurable hardware platforms in existing systems. However, security issues, such as confidentiality, integrity and authenticity, arise during the phase of software applications deployment.

4.Results

A study on the interplay between safety and security domain has been carried out in the context of distributed communicating nodes belonging to a CPS and exploiting micro-architectural features available in the majority of microprocessors [2-3]. It has also been provided the design of a protocol for secure application deployment flow in the context of heterogeneous systems [1].

5. References

1. A. Carelli, C. A. Cristofanini, A. Vallero, C. Basile, P. Prinetto, S. Di Carlo. "Securing bitstream integrity, confidentiality and authenticity in reconfigurable mobile heterogeneous systems". IEEE AQTR 2018, Cluj-Napoca, Romania, May 24-26, 2018.
2. A. Carelli, A. Vallero, S. Di Carlo. "Shielding Performance Monitor Counters: a double edged weapon for safety and security". IEEE IOLTS 2018, Platja d'Aro, Spain, July 2-4, 2018.
3. A. Carelli, A. Vallero, S. Di Carlo. "Performance Monitor Counters: Interplay Between Safety and Security in Complex Cyber-Physical Systems". IEEE TDMR, vol. 19, no. 1, pp. 73-83, March 2019.

