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Secure Optimal Architectures for Autonomous Transportation Cyber-Physical Systems (CPS)

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1. CONTEXT

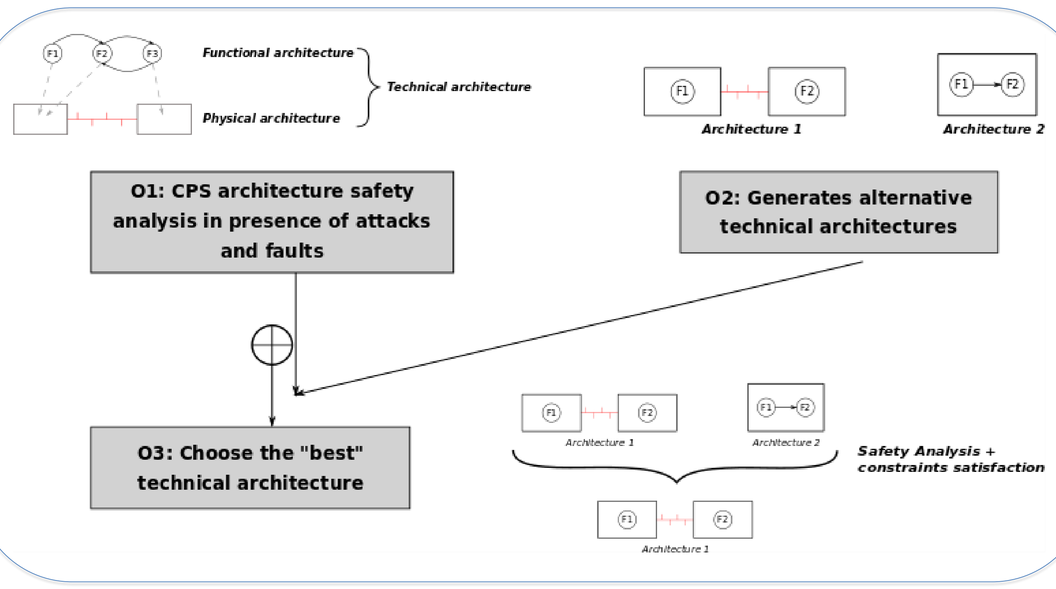
Transportation CPS are:

- *Safety-critical:* a failure is life-threatning.
- *Highly interconnected:* GPS, Internet, V2X …
- *Highly automatized:* autonomous cars, trains …

Hackers can remotely threaten tranportation CPS's safety!

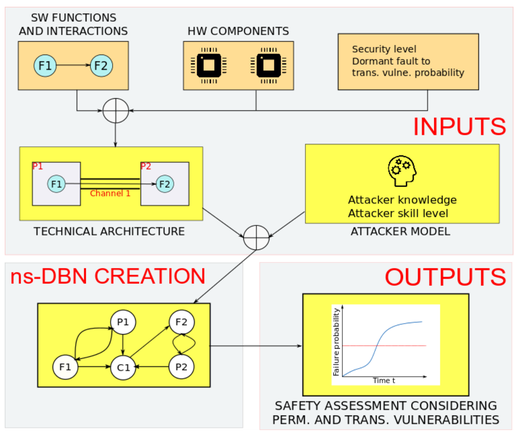
→ Secured architectures are needed to ensure users safety![1]

2. OBJECTIVES



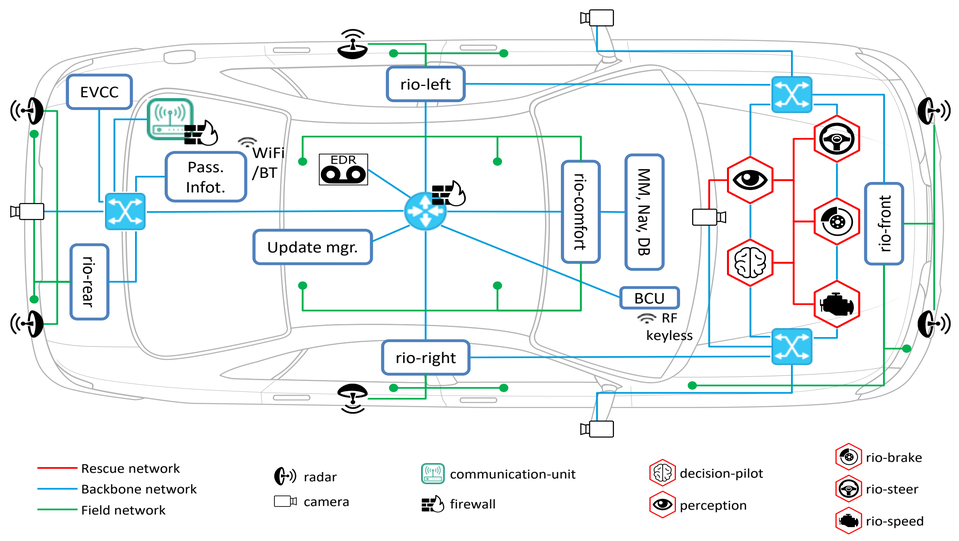
3. CONTRIBUTION

Evaluation of an attack impact on a CPS's safety with Dynamic Bayesian Networks



- Automated **Probabilistic Risk Assessment**.
- Formal model of a **CPS** and **attacker**.
- Formal model of **transient vulnerabilities**[2].
- **Standard-based** parametrization.
- **Exhaustive analysis** of attacks.

4. CASE STUDY: AUTONOMOUS CAR

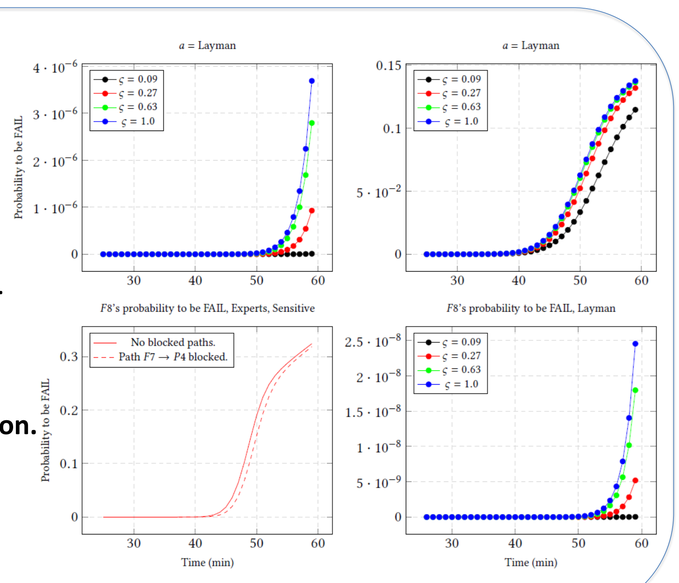


Safety evaluation of the car's formal model

5. RESULTS

We show that:

- Transient vulnerabilities are **important**.
- Architecture's design has a **huge impact**.
- Choosing the right attacker is **crucial**.
- There is a clear **safety/security interaction.**



6. FUTURE WORK

- Evaluation of safety *modes* impact on security.
- Analysis of countermeasures impact on a system.
- Improvement of DBN scalability and efficiency.[3]
- Framework for *design space exploration.*

REFERENCES

[1] Kriaa, S. *et al.* (2015). A survey of approaches combining safety and security for industrial control systems.
[2] Kim, Y. *et al.* (2014). Flipping bits in memory without accessing them: An experimental study of DRAM disturbance error.
[3] Cooper, G. F. (1990). The computational complexity of probabilistic inference using Bayesian belief networks.

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