# Collaborative Research: CPS: Medium: Timeliness vs. Trustworthiness: Balancing Predictability and Security in Time-Sensitive CPS Design

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Challenges

- The lack of a single system-level security metric to optimize for
- The difficulty in securing
  - The scheduling infrastructure
  - The real-time tasks
- Unknown/imprecise threat models at design time and/or unknown/unforeseen vulnerabilities
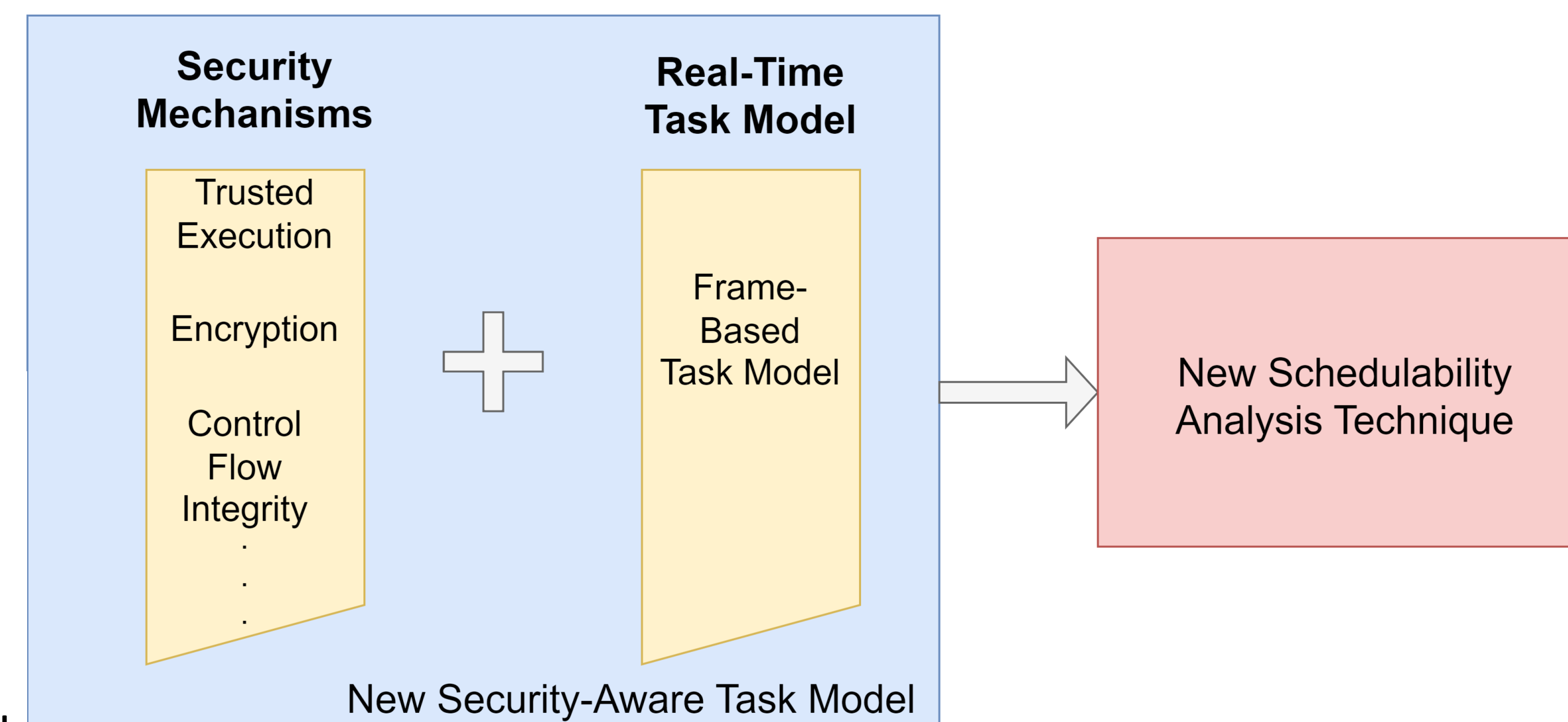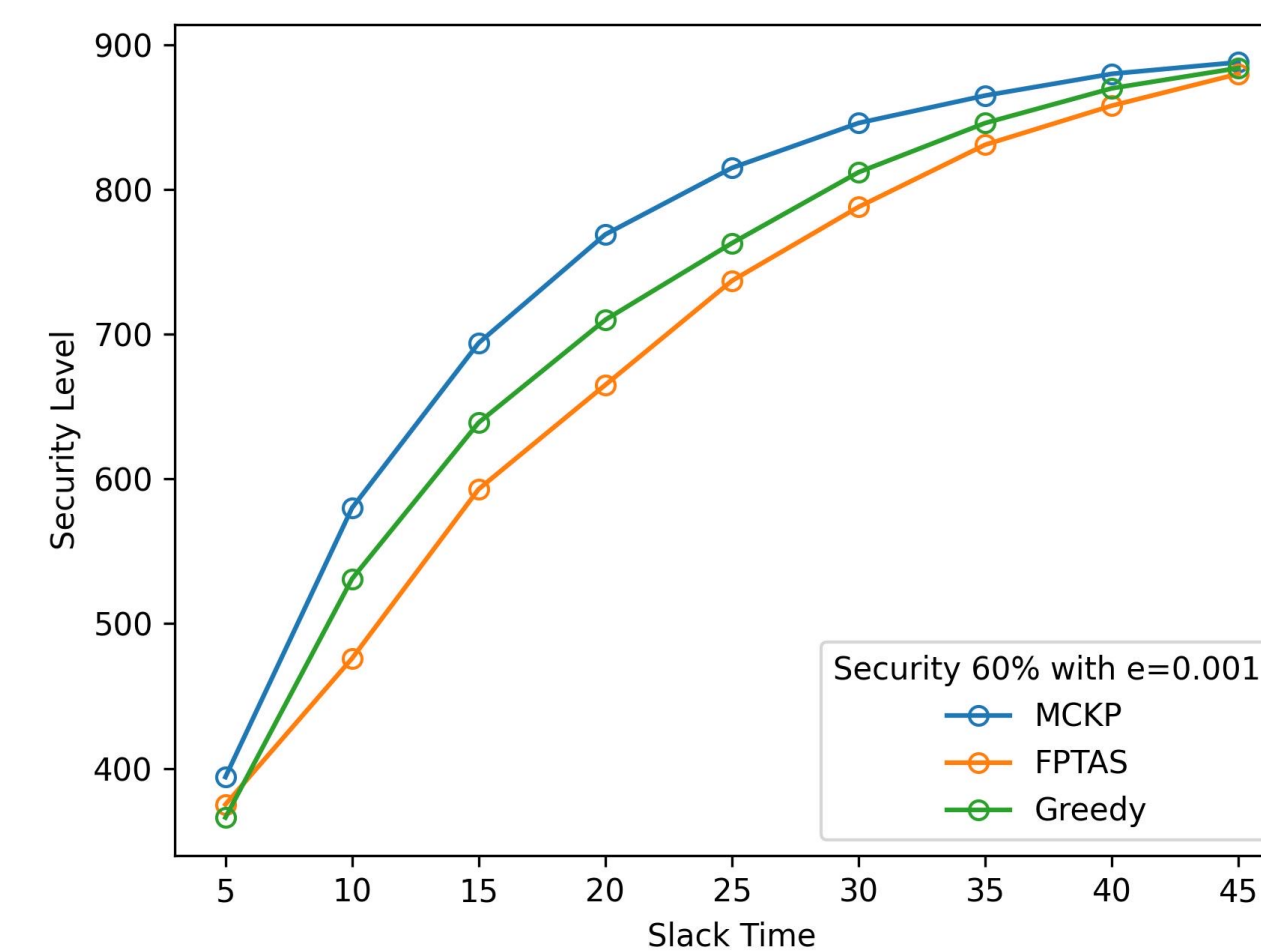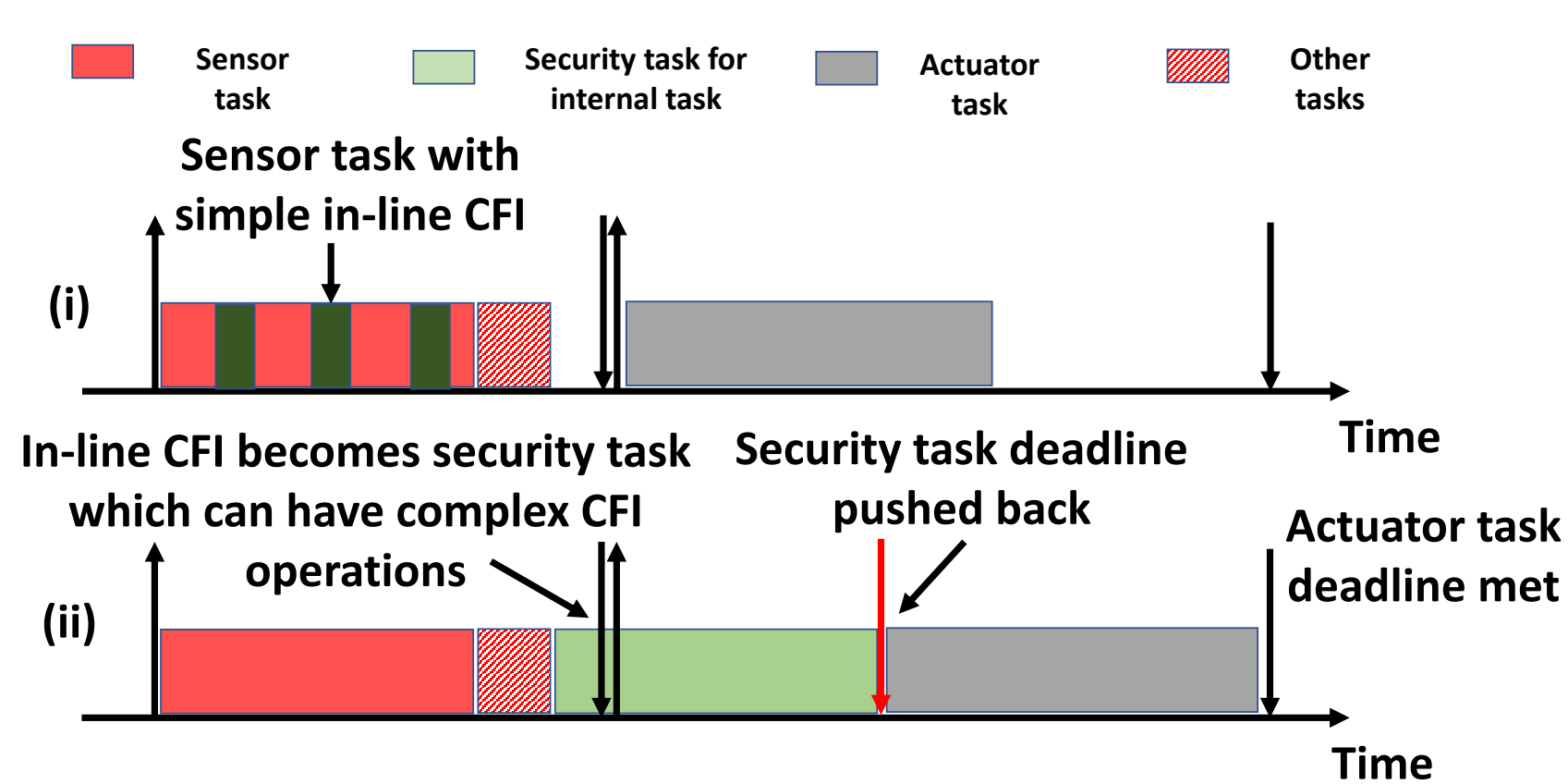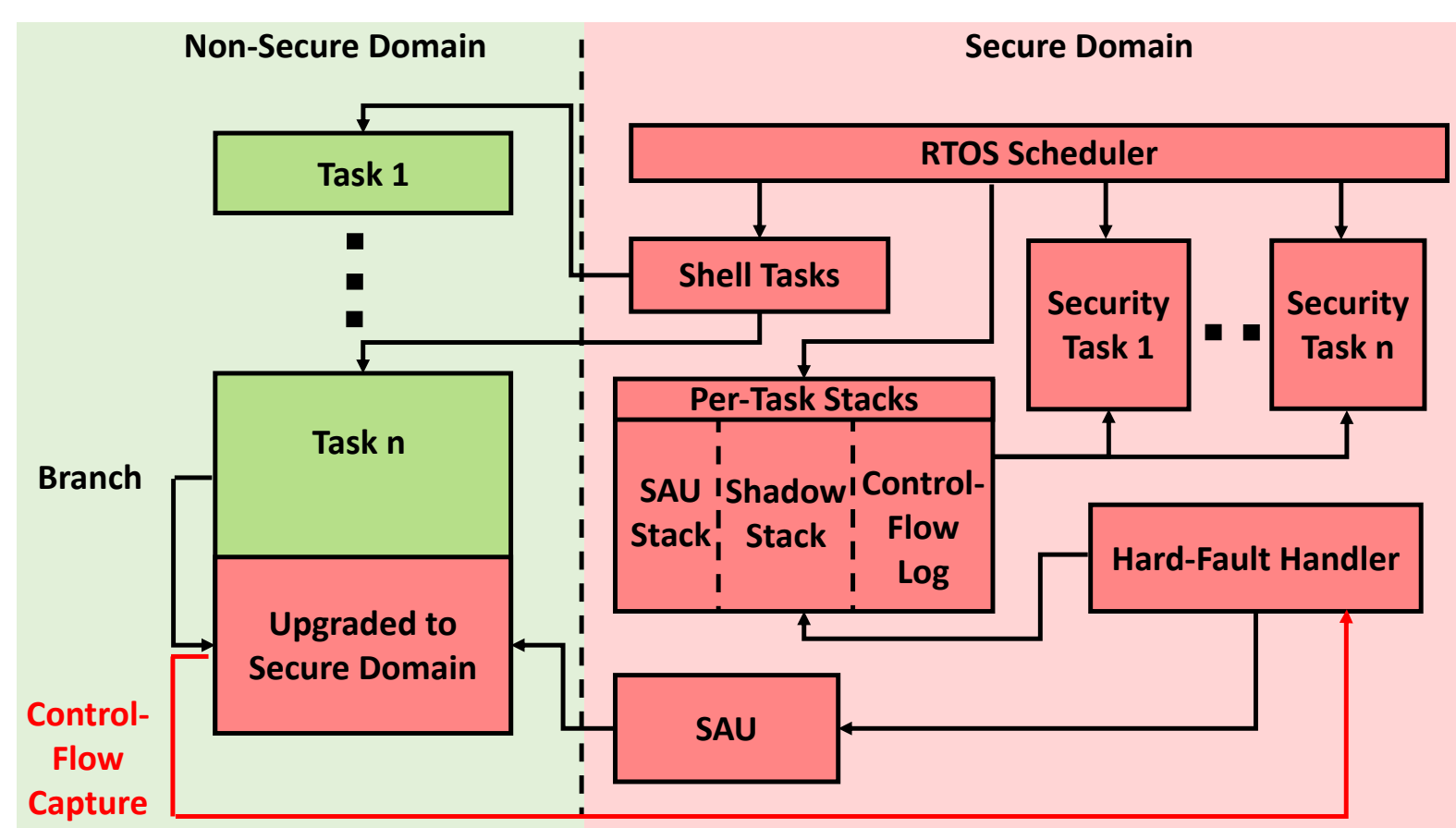
Scientific Impacts

- Enable secure CPS that is
  - Less complex
  - Easier to analyze
  - Resilient in face of external and/or uncontrolled changes to the system and/or physical environment
- Proactively prevent attacks using moving target defense, as well as detect and recover from attacks that cannot be avoided.
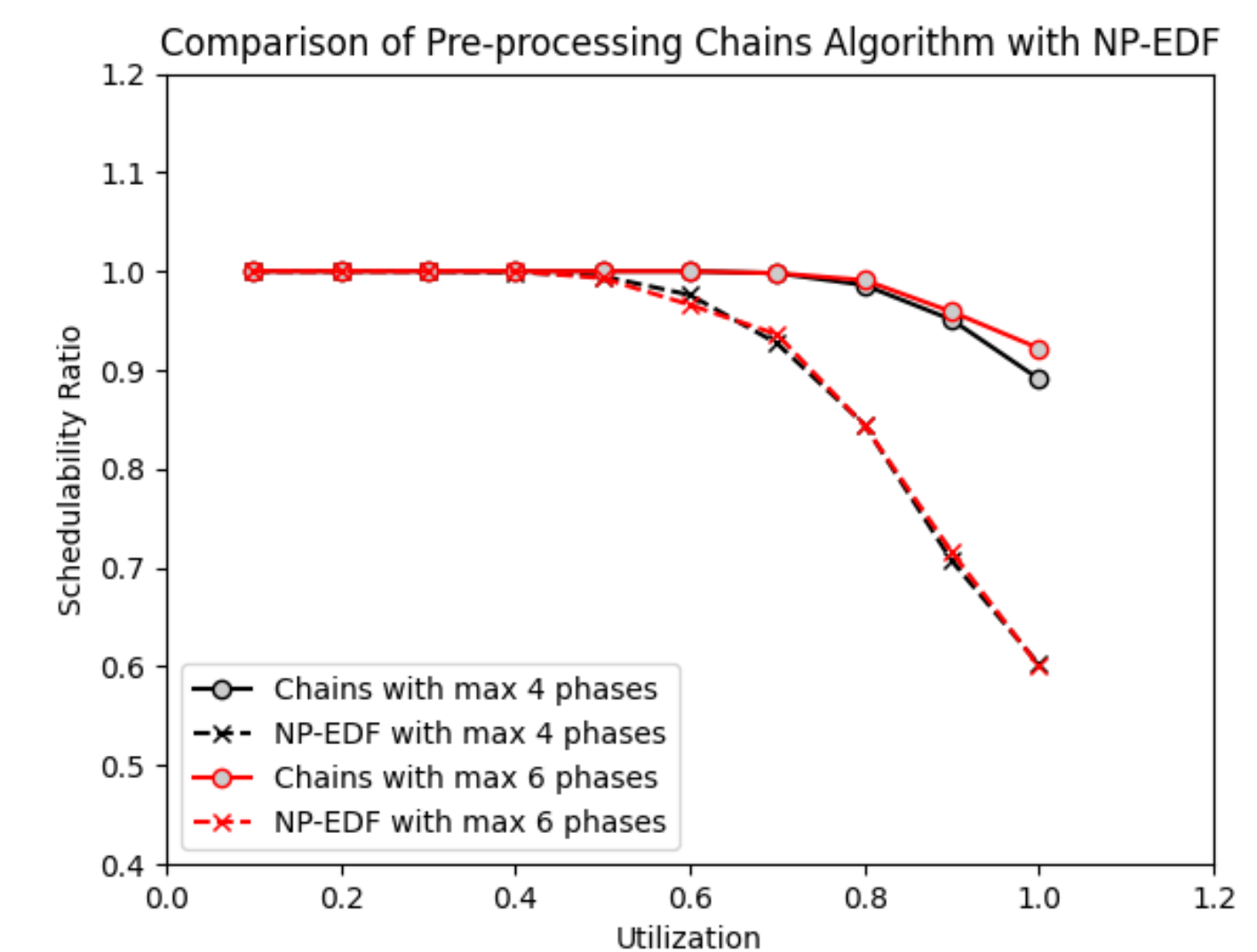
Solution

- Secure the fundamental real-time components from the ground up and to the extent possible on resource-constrained RT·CPS

- Quantify the cost of security and create a real-time scheduling/security co- design framework that determines, on-the-fly, when and how to use the secure real-time components Enable incremental system recovery

Broader Impacts

- Research applicable to defense, medicine, transportation, manufacturing, agriculture domains, etc.
- Improved trust in automated systems by, and quality of life of, users

Broader Impacts on Education and Outreach

- Course modules and red-teaming exercises for undergraduate students in all engineering disciplines
- Interactive learning modules and internship experience for K-12

Potential Impacts

- Integrated security/ real-time scheduling framework
- RT-TEE, real-time trusted execution environment