Joining Analytics Units for Network Trustworthiness (JAUNT)

An Analytics Framework for h-CPS

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FOUNDATIONS OF RESILIENT CYBER-PHYSICAL SYSTEMS

(Un-)trustworthiness of h-CPS data

"(In-)ability to be relied on to do or provide what is needed or right"

Utility for CPS operators

- System monitoring
- State estimation and control
- Performance evaluation and contingency planning

Types of uncertainty

- Measurement error: noise, false data
- Transmission error: network losses, DoS
- Model error: incorrect model

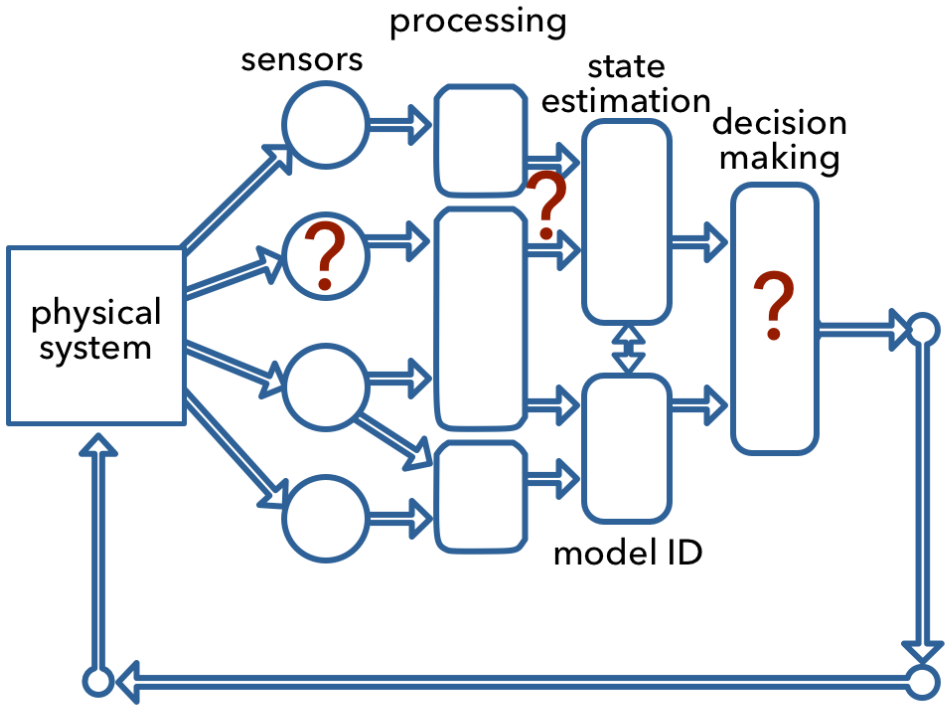
Causes

- Random noise
- Component faults
- Malicious attacks

An analytics framework for h-CPS decisions

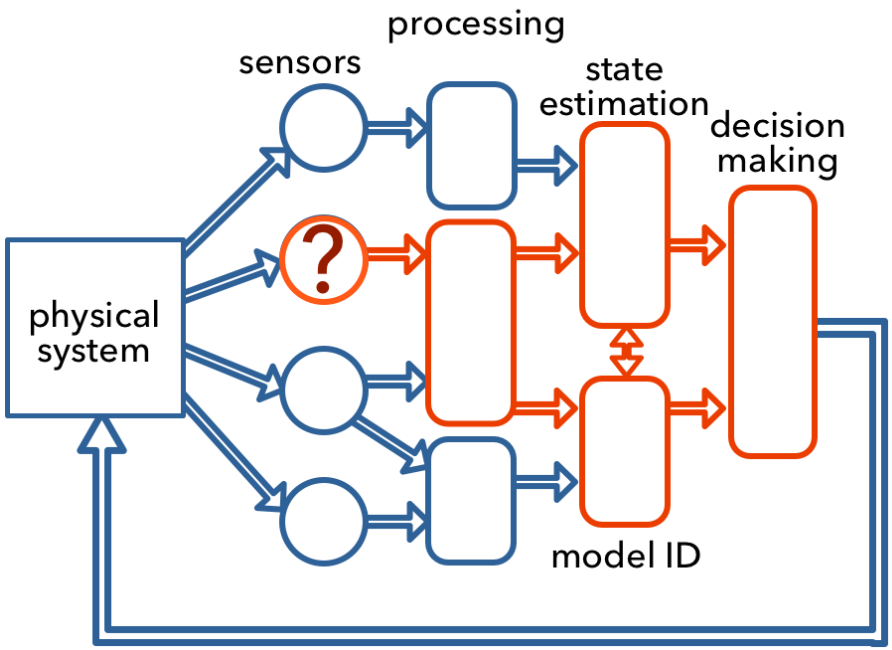
Decision making process

- Receive raw, untrustworthy data from sensors (real or virtual);
- Preprocess, aggregate, segment data;
- Build statistical models based on assumptions of uncertainty;
- Make decisions based on estimated state.



Data and sub-processes in the decision-making process may be untrustworthy.

Challenges & Solutions



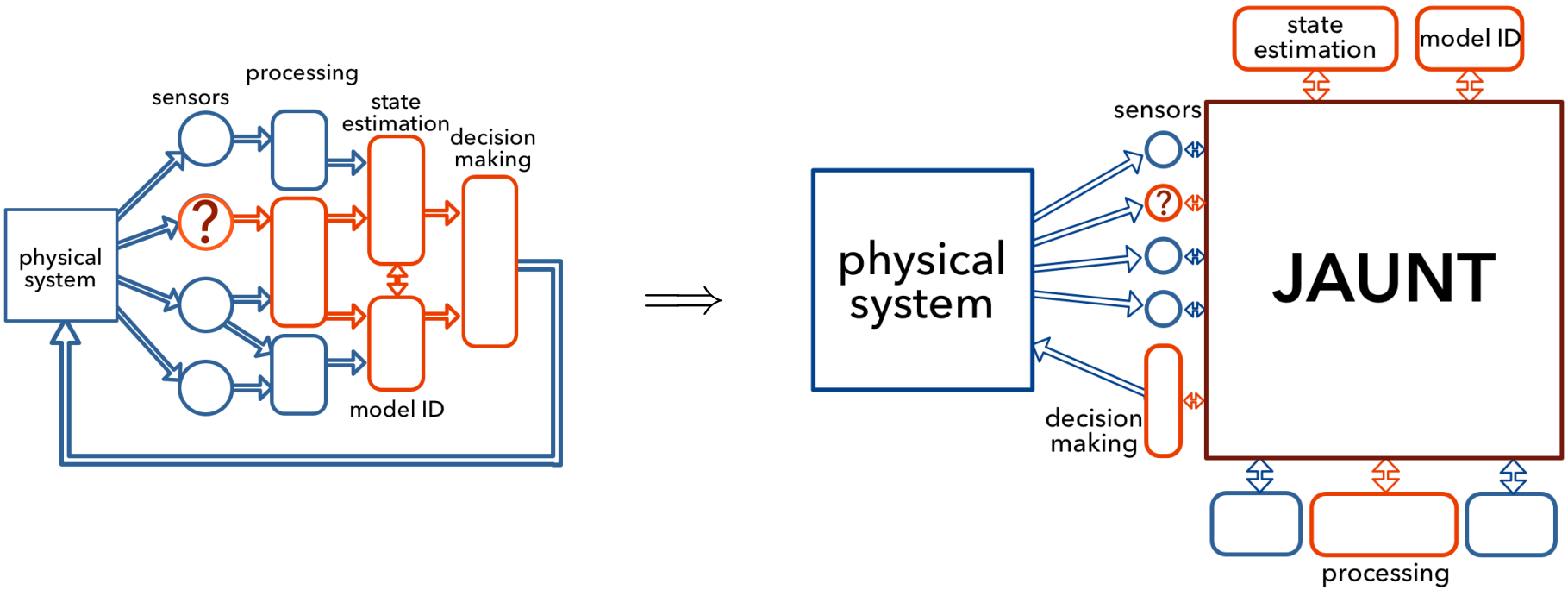
JAUNT solution

- Automatically track dependencies
- Propagate state updates
- Change data sources and relationships
- Interface between different computational and sensing processes
- Identify the impact of an untrustworthy process

Our contribution

JAUNT simplifies trustworthiness analysis by supporting:

- abstraction and automatic maintenance of interdependencies
- automated propogation of updated data
- a unified interface for inter-process communication
- modularity of analytics units



JAUNT vs. RTI (e.g. Portico)

RTI

- Synchronizes simulations/federates so that they can coordinate simulation clocks to run in parallel
- Provides common interface for federates to communicate relevant simulation data

JAUNT

- Does not handle real-time synchronization, updates state estimates, both past and present, as information becomes available
- Provides common interface for analytics units to exchange and request data