Real-Time Simulation

Powerful Advanced N-Level Digital Architecture
for models of electrified vehicles and their components

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Agenda

- Real-Time Simulation
- HIL Simulation
  - P-HIL Simulation
- Model adaptation for P-HIL Simulation

Real-Time Simulation

- **Real-time simulation** refers to a computer model of a physical system that can execute at the exact same rate as actual "wall clock" time.
- Ex 10 minutes of simulation time lasts 10 minutes of our actual time.
- Ussually, real-time simulations are executed on dedicated (Real-Time) computers (real-time simulators/platforms).
- When is real-time simulation need?
  - **When a real phisical device is connected with the simulated enviroment! -> Hardware-in-the-Loop**

Key Parameters of Real-Time Simulation

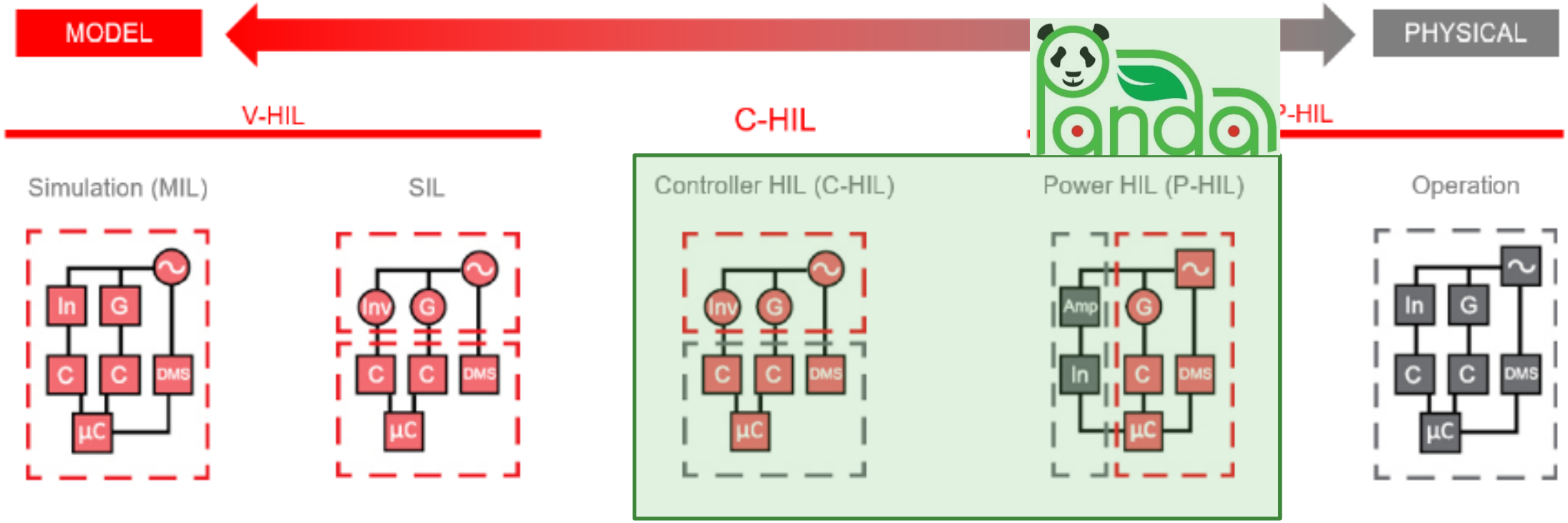
- **Simulation step** and Loop-Back Latency

- **Interfacing capabilities** (Analog/Digital IOs, communication protocols, Customization capabilities)

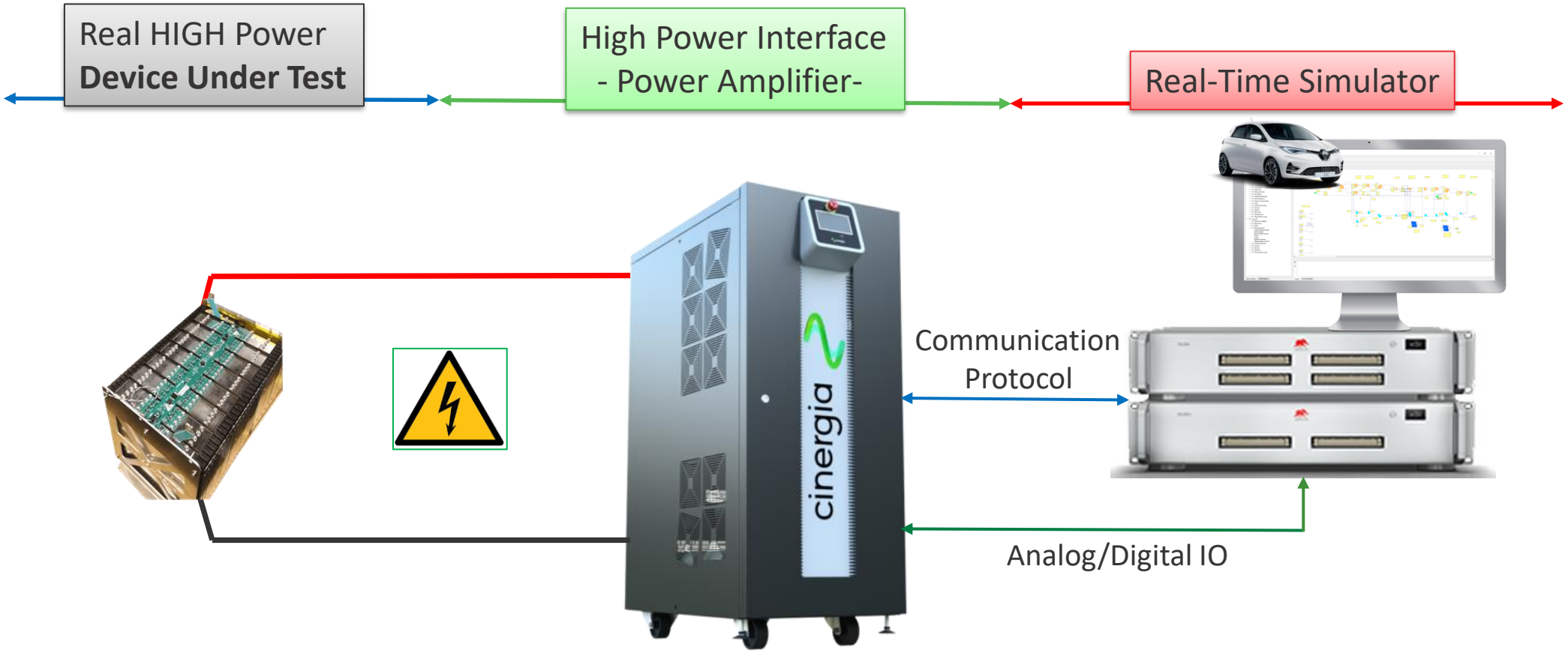
- **Software Package** (Modeling Tools with Models, Scada and Visualization, Scripting and Test Automation)

Hardware In The Loop

- **C-HIL (S-HIL) –> Controller (Signal) Hardware in the Loop**
- **P-HIL –> Power Hardware in the Loop**

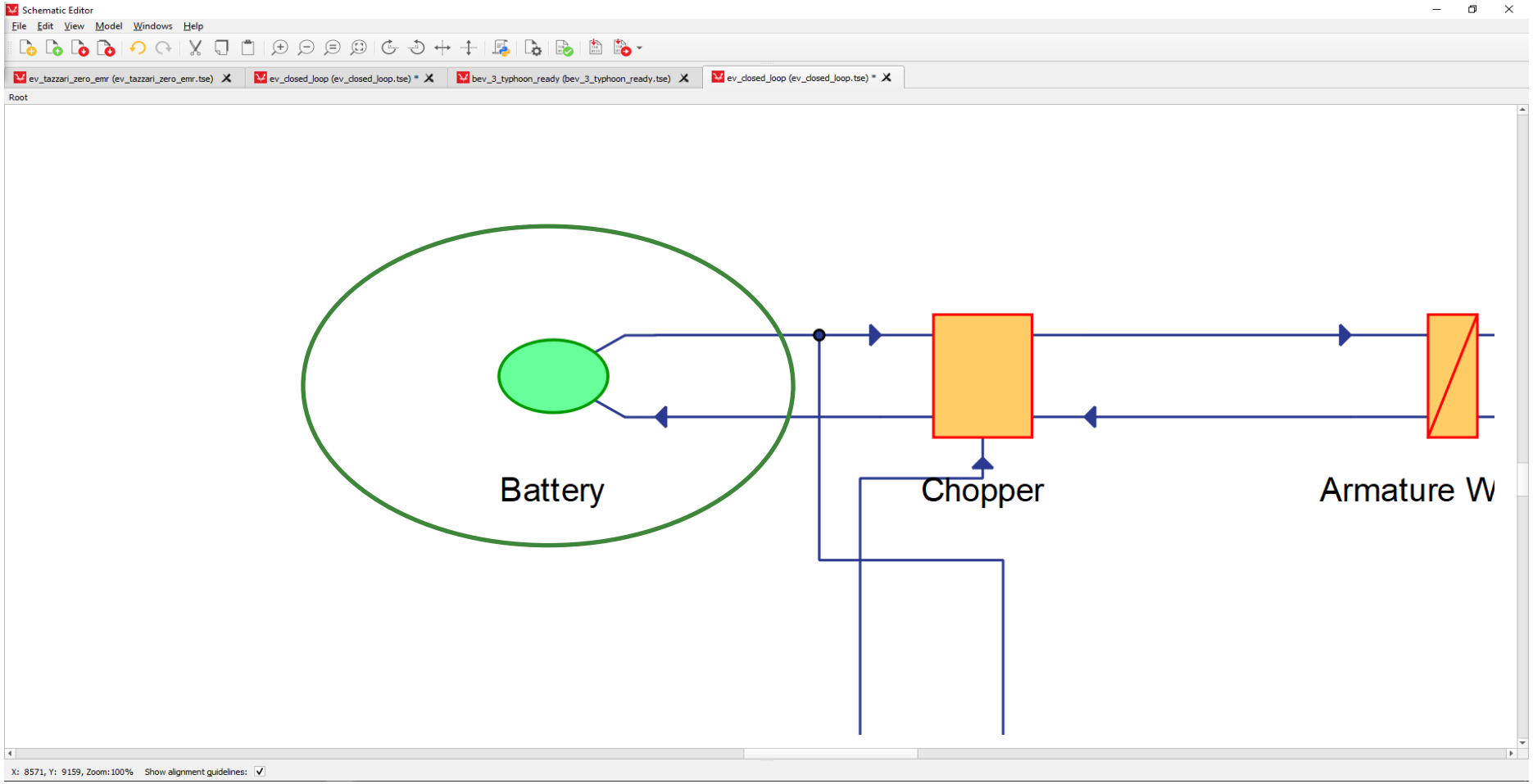


Power Hardware in the Loop



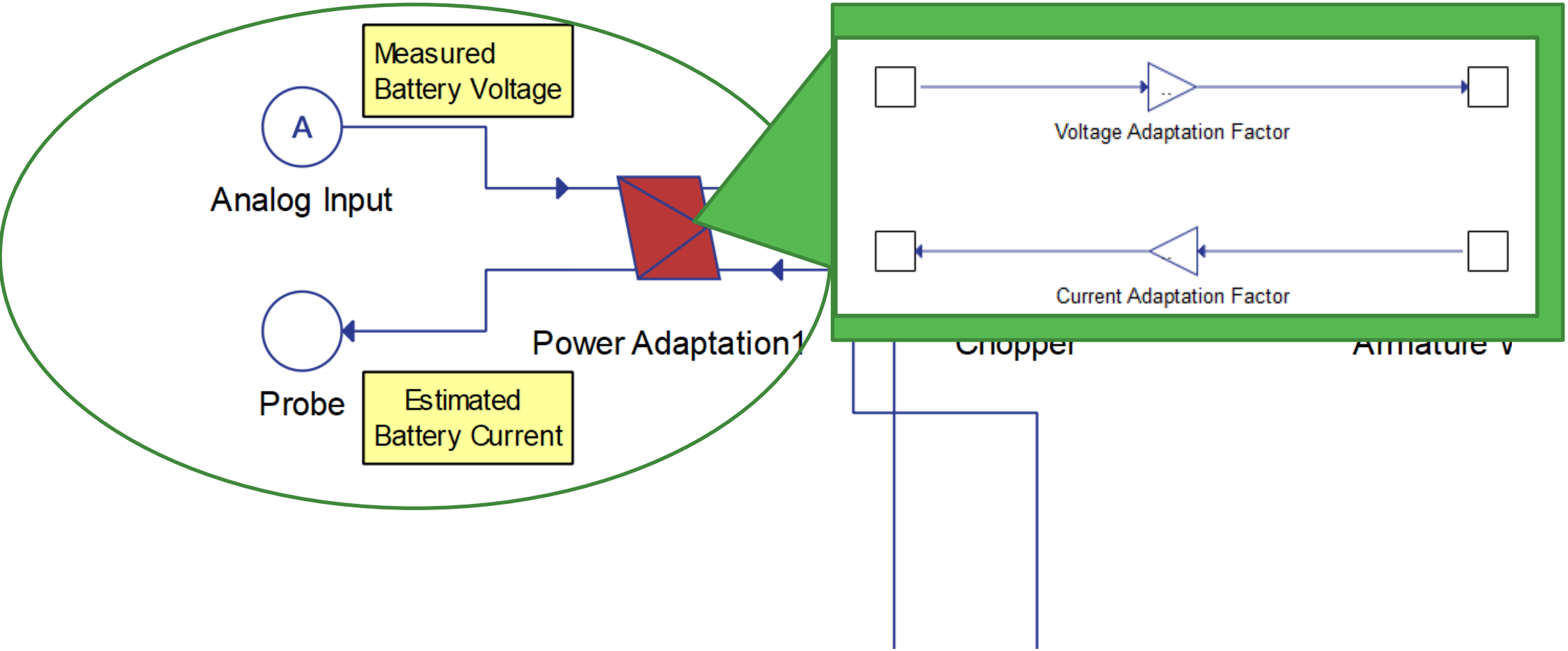
Model adaptation for P-HIL Simulation

- We aim to replace the Battery model with a REAL battery in the loop with the simulation



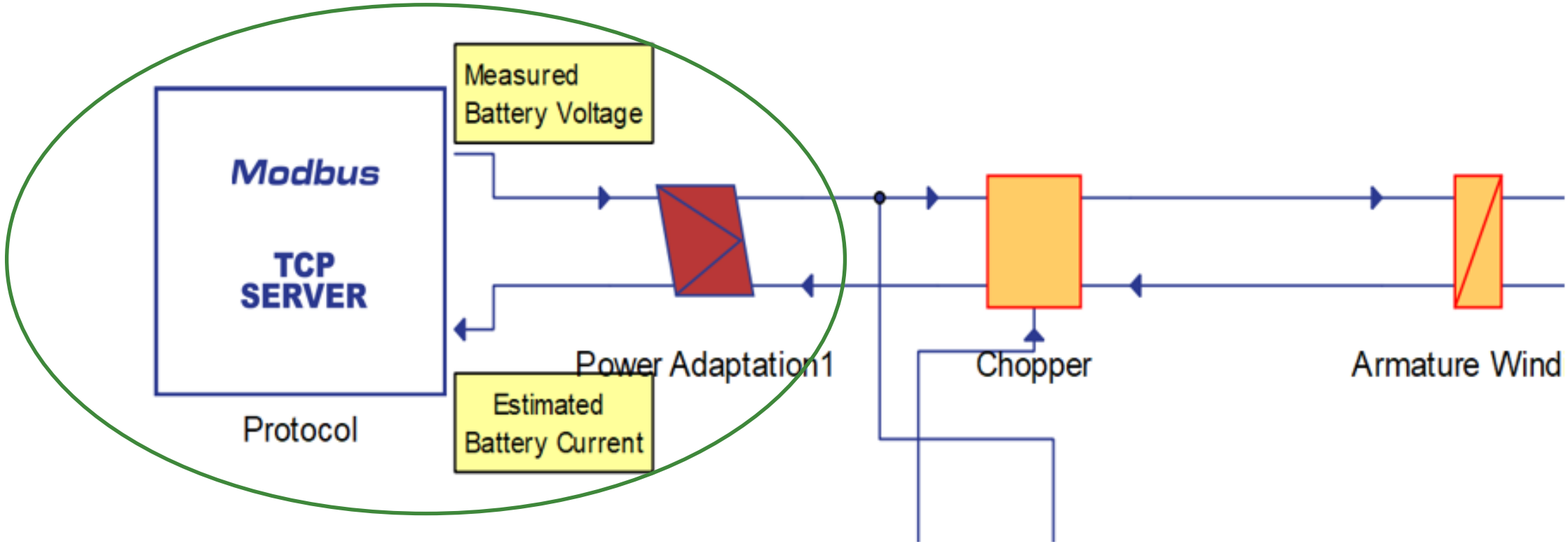
Model adaptation for P-HIL Simulation

- Adaptation using analog signal inputs and outputs between Simulator and Power Amplifier



Model adaptation for P-HIL Simulation

- Adaptation using communication protocol between Simulator and Power Amplifier



Links

- EMR Library: https://github.com/typhoon-hil/emr-typhoon-hil-library
- HIL Academy: https://hil.academy/

Thank you for your attention!

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