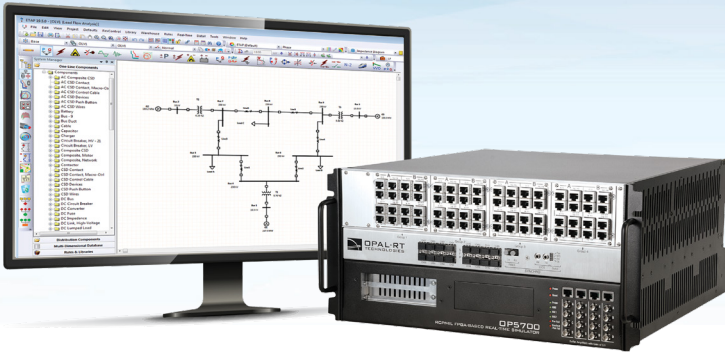


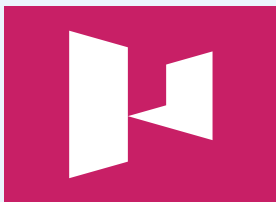
Bringing HIL Capabilities to ETAP

A COMPLETE WORKFLOW SOLUTION LINKING ETAP & ePHASORSIM FOR HARDWARE IN THE LOOP (HIL) & REAL-TIME TRANSIENT STABILITY STUDIES



The ETAP & ePHASORSIM hybrid power system solution is ideally suited for:

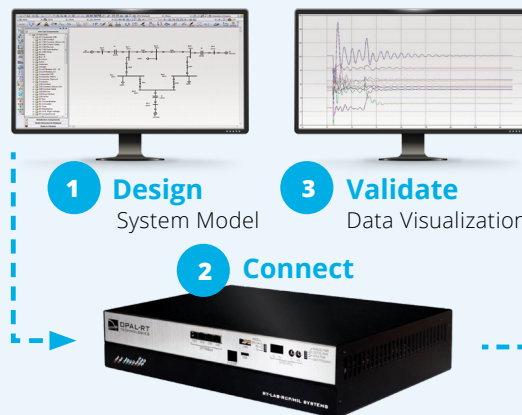
- **Installing and certifying any new device on the grid** for protection, monitoring and control, thus reducing risk and costly commissioning time.
- **Validation of reliability and security of any transmission, distribution and generation grid** before implementation. Simulate HIL scenarios in real time, greatly reducing commissioning risk and cost.



ePHASORSIM

ePHASORSIM simulates in real time a power grid at a time-step of a few milliseconds to provide transient stability simulation results, such as voltage/current magnitude and angle, power transfer, and speed of machines. This electromechanical transient solver is designed to simulate large-scale grids with real-time performance.

1. **Design** complex power grids with ETAP's intelligent one-line diagram editor, now compatible with ePHASORSIM
2. **Connect** I/O & communications buses (DNP3, C37.118, Modbus, OPC, IEC 61850 (GOOSE & Sampled Values)) & run real-time simulation, adding new equipment under test
3. Reproduce power grid conditions & anomalies to **validate** grid reliability, in all its complexity and detail



- Distributed Generation
- Wide-area Monitoring, Protection & Controls
- Power System Controls
- Protection System

LARGE-SCALE POWER SYSTEM SIMULATION IN REAL TIME

Simulate power grids in real time with 100,000+ node transmission and distribution systems, including thousands of generators, transmission lines, cables, loads and transformers. Simulate synchronous generators with power system stabilizers, excitation systems and turbine governors.

RICH & EXPANDABLE LIBRARY OF MODELS

A built-in library includes generators, voltage sources, loads, transmission lines, power system stabilizers, reactors, external Simulink™ blocks, etc. A Modelica-based library of models including various types of generators and controllers is also available, allowing users to create their own User-Defined Models (UDMs) to supplement the library.

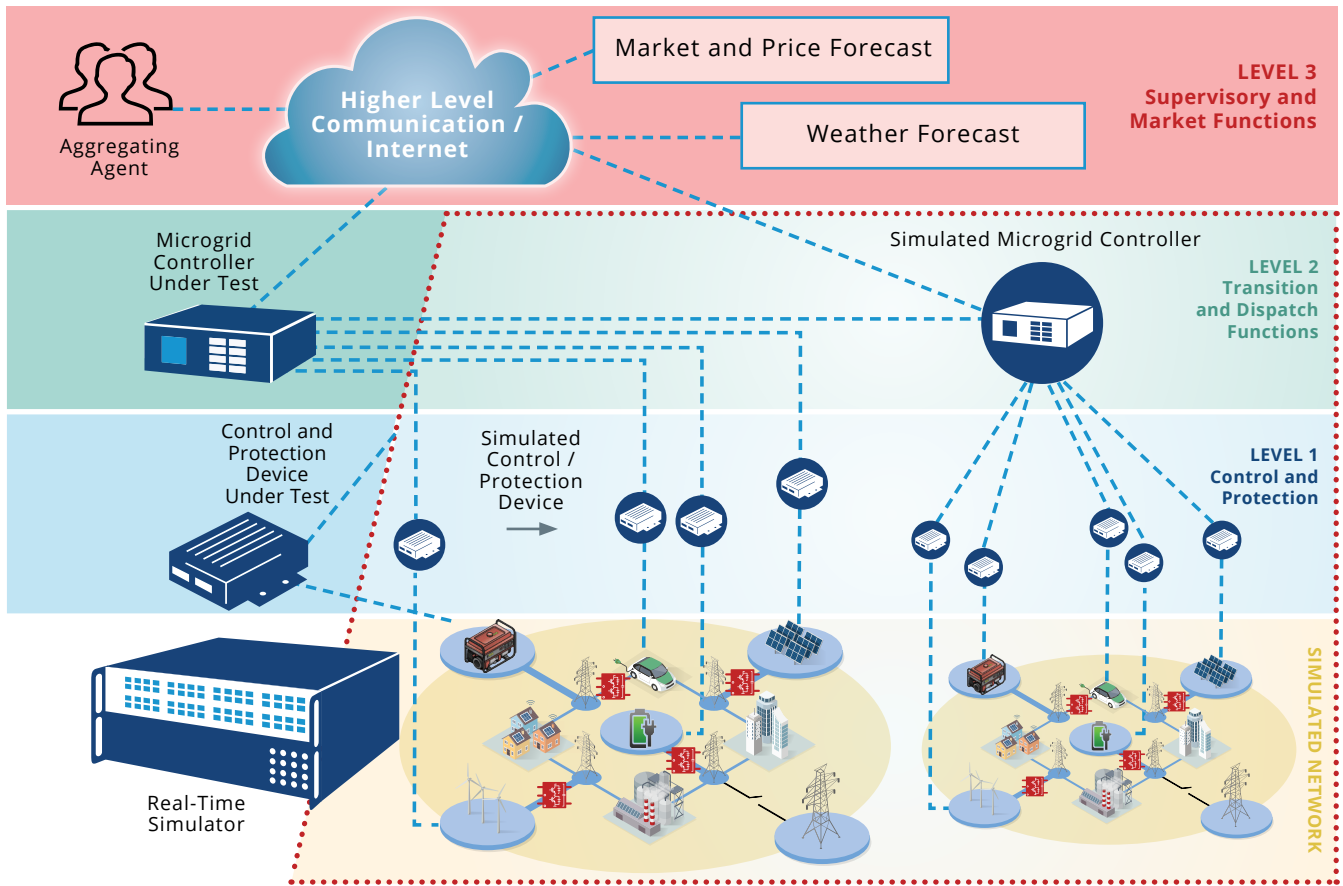
TEST AUTOMATION PLATFORM & LOGGING

Perform test automation using Python™ scripts and modify parameters while the simulation is running, while using ScopeView—our data acquisition and signal processing tool—to record, display and analyze the results.

INTEGRATION THROUGH ETHERNET PROTOCOLS & I/O MODULES

ePHASORSIM's support for multiple communications protocols and various I/O modules allows the user to connect the simulation with the SCADA system, EMS tools and wide area control algorithms. Some users have included integration with ETAP's AGC toolbox for load-frequency control, and the RTDMS package from EPG for PMU/PDC streams and visualization applications

TYPICAL MICROGRID APPLICATION



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ABOUT OPAL-RT TECHNOLOGIES

OPAL-RT is the world leader in the development of PC/FPGA Based Real-Time Digital Simulator, Hardware-In-the-Loop (HIL) testing equipment and Rapid Control Prototyping (RCP) systems to design, test and optimize control and protection systems used in power grids, power electronics, motor drives, automotive industry, trains, aircraft and various industries, as well as R&D centers and universities.



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