MODELLING LARGE SYSTEMS: ALTERNATIVES FOR NETWORK EQUIVALENTS

RTDS Technologies

TWO ALL-NEW FACILITIES ALLOW RTDS® SIMULATOR USERS TO STUDY LARGER NETWORKS WITH LESS HARDWARE

For some users, a large area of interest means that their power system must be reduced in order to run in real time on available RTDS Simulator hardware. Typically, this reduction is achieved by representing large portions of the system using equivalent machines or sources. This can significantly affect the behavior of the system. The RTDS Simulator now features two new tools that offer alternatives to the simple network equivalent.
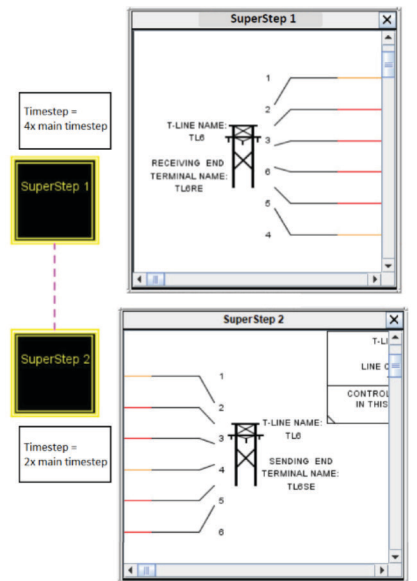
SUPERSTEP

Superstep is a new tool allowing users to simulate a large portion of the network with a larger timestep, running together with the main simulation. Superstep offers an alternative approach to using a system equivalent to model a large portion of the network. Superstep provides significantly more detail than a system equivalent: it retains the detail of EMT simulation, allows the user to model the system's control elements, and represents system frequency deviations. Rather than a multi-domain or hybrid simulation, Superstep is a robust, numerically-stable EMT simulation based on the Dommel Algorithm.

HOW SUPERSTEP WORKS

Use of a larger simulation timestep significantly increases the modelling capabilities of the RTDS Simulator hardware. The user defines the portion of the network they want to run using Superstep by placing those components in a hierarchy box.

- The Superstep hierarchy box runs at a timestep which is an integer multiple of the main simulation timestep — it can be 2x, 3x, 4x, or 5x the main timestep.
- The Superstep network portion runs together with the main simulation on its own core of the NovaCor hardware. The Superstep network solution, power system components, and controls are all simulated together on the same core.
- Multiple Superstep boxes can be run on different cores of a chassis and can be interconnected to one another, or to the main timestep network, using travelling wave transmission lines.
- Each hierarchy box contains hundreds of nodes.

LEARN MORE AT RTDS.COM/SUPERSTEP

PROVIDING DETAIL

Maintains EMT simulation for the entire network, providing the user with critical detail such as high-frequency transients.

SAVING TIME

Eliminates the complex process of determining where equivalents are appropriate and accurately reducing the network.

REDUCING INVESTMENT

Simulates a larger network with fewer hardware resources, reducing the cost required to represent a large-scale network.

YOUR WORLD IN REAL TIME.
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LIMITATIONS AND COMPATIBILITY

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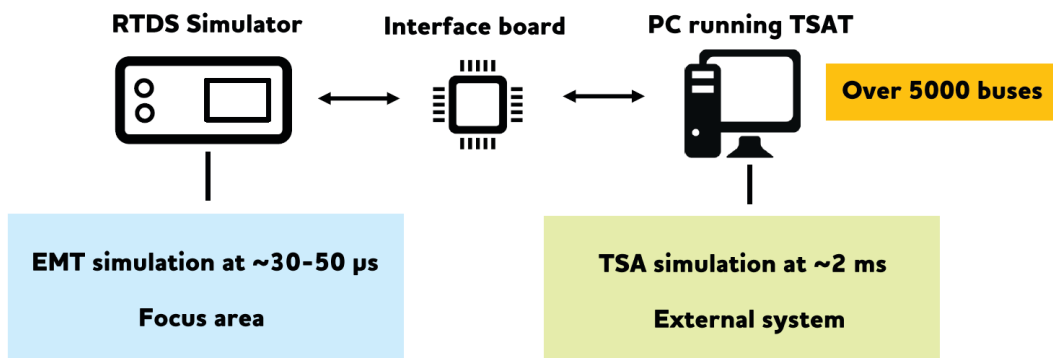
TSAT-RTDS™ INTERFACE

The TSAT-RTDS Interface (TRI), developed exclusively with Powertech Labs Inc., creates a powerful synchronized EMT-TSA co-simulation platform using the RTDS Simulator and TSAT software. TSAT, part of the DSATools™ suite of power system analysis tools, is a powerful industry-standard software used for Transient Stability Assessment (TSA) of bulk power systems. TSAT includes a rich model library, state-of-the-art solvers, useful analysis features, and a highly intuitive user interface.

HOW TRI WORKS

- **Divide the network.** Define the focus area to be modelled via EMT simulation on the RTDS Simulator and the external system to be modelled via TSA simulation in TSAT (supplied by Powertech Labs).
- **Interface via special hardware.** An FPGA interface board sits in the PCI/E slot of the PC running TSAT. This board is connected to the RTDS Simulator via optical fibre, forming a bidirectional interface.
- **Synchronize and exchange.** The RTDS Simulator exchanges results with TSAT at the end of each TSAT timestep.

LEARN MORE AT RTDS.COM/TSAT

RTDS Simulator — Interface board — PC running TSAT — Over 5000 buses

EMT simulation at ~30-50 µs — Focus area

TSA simulation at ~2 ms — External system

USE CASE EXAMPLES

- Fault analysis in HVDC systems.
- Sub-synchronous resonance studies.
- DER impact studies.

- Low-frequency oscillation impact studies.
- HIL testing with large-scale system represented.
- Unbalanced fault studies.

LIMITATIONS AND COMPATIBILITY

In addition to the RTDS Simulator, TRI requires Powertech Laboratories Inc. to supply a TSAT license (runs on MS Windows 7/10/Server 2012). A Xilinx VC707 general-purpose FPGA board is also required for interfacing.

TSAT may be interfaced with RTDS Simulators containing NovaCor-, PB5-, or GPC-based hardware.