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PSS®E-PSCAD Co-Simulation Module

Hybrid simulation between PSCAD and PSS®E transient stability

At a glance

The PSS®E-PSCAD Co-Simulation Module is a hybrid simulation interface between PSCAD and PSS®E transient stability programs. It allows network equivalents in PSCAD to communicate with a PSS®E transient stability simulation during runtime. During the simulation, the PSCAD system equivalent gets updated from the PSS®E voltage, angle and frequency, and the PSS®E system gets updated from what happens in PSCAD. Once the hybrid simulation is setup, both programs run in parallel, communicating and updating each other.

This sophisticated hybrid simulation interface allows:

- Automatic creation of dynamic system equivalents in PSCAD
- Accurate and detailed EMT models running within a large PSS®E system
- Different instances and versions of PSS®E running simultaneously (including systems of different base frequency).

The challenge

PSS®E and PSCAD are powerful, well-established tools that are optimized for related, yet different, simulation domains. There are important reasons we need PSS®E and PSCAD in modern power system analysis and simulation. The strengths of each of these platforms can be summarized as:

Strengths of PSS®E

- Best for large system models, such as entire interconnects with tens of thousands of buses and thousands of machines
- Solid, validated dynamics models for loads, generators, and other system devices.
- PSS®E device models are available from nearly all manufacturers
- Already used by many utilities and regional model development groups

Strengths of PSCAD

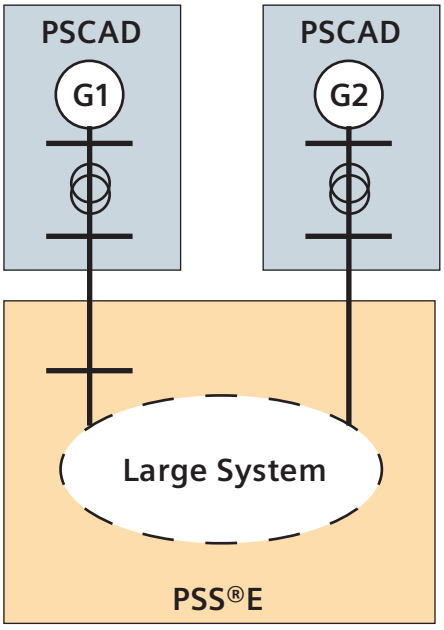
- Accurate device models (many use the actual source C code from the real hardware) for wind farms, HVDC, SVC, STATCOM, Solar, machine drives, etc.
- PSCAD device models are available from nearly all manufacturers
- Useful for unbalanced faults, prediction of commutation failures, saturation, TOVs, protection ride-through behavior, etc.
- Well-suited for SSR, SSCI, SSTI analysis and other specialized applications

Given the complex nature of the modern grid and tight operational margins, the need is to combine the best of both worlds – to allow PSS®E and PSCAD to work together to simulate the interactions between the wide-area network and detailed machine, HVDC, PV, and other device models.

Our solution

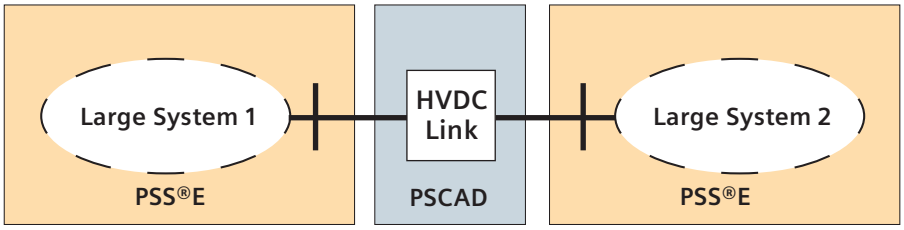
The PSS®E-PSCAD Co-Simulation Module enables the hybrid simulation of PSS®E and PSCAD and manages the complex interfaces between sub-systems. This is achieved by embedding PSCAD models into PSS®E simulations using the PSS®E dynamics modeling interface. Some of the features of this Co-Simulation process are:

- Automatically builds the Interfaces and boundary conditions on both sides for exchange of runtime information.
- Management of the PSCAD models and simulations (for example, to represent offshore VSC multi-terminal grid and wind turbine models)
- Management of the PSS®E simulations (typically to represent the full, wide-area AC system, including all modes of oscillation from system machines)
- Provides a communication library (for fault-tolerant and fast communication between CPUs or computers on a LAN)
- Plotting and control by a central PSCAD operator, auto-started via PSS®E automation.



PSS®E and PSCAD Co-Simulation Example with Multiple PSCAD Systems

Various Co-Simulation topologies are possible, depending on the simulation objectives and unique characteristics of the systems under study. For example, multiple PSCAD subsystems interfacing with one large PSS®E network is possible, as well as multiple PSS®E networks tied together via interfaces with a common PSCAD subsystem (such as an HDVC link between two asynchronous AC systems, possible with different base frequencies). Multi-threading of various instances of PSCAD and PSS®E is also provided to optimize performance.



PSS®E and PSCAD Co-Simulation Example with Multiple PSS®E Systems

Prerequisites and compatibility

The PSS®E-PSCAD Co-Simulation Module works with PSS®E version 33, 32, 31, 30, and some older versions. PSS®E version 34 support is coming soon.

The module is based on proven technology from our partner Electranix and their "E-TRAN Plus for PSS®E" product.

The PSS®E-PSCAD Network Data Conversion Module creates models in the PSCAD version 4 format. In order to make use of the generated PSCAD models, PSCAD version 4 is required. PSCAD is separately licensed, and is available from Manitoba HVDC Research Center.

This module also requires the user to have the PSS®E-PSCAD Network Data Conversion Module, which is also available from Siemens PTI.

How to get started

For further information or to purchase the PSS®E-PSCAD Co-Simulation Module, please contact Siemens PTI software sales at ***pti-software-sales.ptd@siemens.com*** or +1 518 395 5000.

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