

Real Time Co-Simulation of Electromechanical and Electromagnetic Power System Models

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Abstract: The goal of the paper is to demonstrate the feasibility of a real-time co-simulation of electromechanical /root-mean-square (RMS) and electromagnetic transient (EMT) power system models. For this purpose, a co-simulation framework has been developed along with a benchmark system for establishing boundary conditions for RMS-EMT modeling and co-simulation. For the co-simulation, a real-time machine of OPAL-RT has been coupled with another real-time simulator from the manufacturer RTDS Technologies Inc. The OPAL-RT simulator operates in RMS and EMT modes, whilst the RTDS simulator runs in EMT. An optimized low-latency high-speed optical fiber interface is developed to realize the co-simulation of the two modes across the two platforms. The Nordic Test System is used as an exemplary test network to create one part of the co-simulated network. Insights into modeling of discrete-continuous power systems are described and boundary conditions established to ensure accurate modeling for the different timescales and domains. Numerical results from a real-time co-simulation of a high-voltage direct current (HVDC) link running in EMT mode on the RTDS coupled with a model of the Nordic 32 Test System in RMS mode on the OPAL-RT simulator under fault conditions are presented.

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