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**Development of General Purpose Power System Transient Simulator**

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**Abstract;**

Electromagnetic Transients (EMT) simulation is an effective tool to study the dynamic behavior of complex AC/DC power grids. However, due to the complexity of EMT models and small time step, EMT tools are facing significant challenges with regard to simulation speed and scale.

A time domain transformation methodology is proposed to transform the fundamental frequency AC quantities into slowly varying DC quantities. This allows EMT simulation use larger time steps without losing accuracy. Tests show that time step can reach millisecond level while preserving good accuracy.

Parallel EMT simulation is also employed to improve the performance. A new partitioning method is developed to achieve fully automated parallel simulation. Opportunities for parallelism can be automatically found with or without the presence of distributed transmission lines.

The above approaches significantly improve the performance of EMT simulation, which inspires the creation of a powerful EMT simulator named Power System General Transient Simulator (PS-GTS). It achieves full EMT simulation of large scale power system with speed comparable to traditional TS simulator. PS-GTS simultaneously provide instantaneous waveform information usually provided by EMT simulators as well as phasor information usually provided by TS simulators, and therefore bridges the gap between the EMT simulator and a unified power system analysis tool. Based on PS-GTS, a general testing platform is under development. The upcoming platform will enable the direct interfacing of diverse devices and control systems ranging from line protection relay to stability control and EMS.