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# A Power Flow Description Language for Production Grade Power Flow Solvers

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**Abstract;**
Power systems are supervised and monitored from control rooms with the aid of SCADA and Energy Management Systems (EMS). This involves making decisions to maintain the power system in a secure and optimal state. To do this an important component of SCADA/EMS is the power flow calculation, which is required for providing the information needed for these decisions. With the increasing utilization of the power systems and the increasing complexity, e.g. with distributed energy resources, new demands on power flow solvers (PFS) emerge. Current industrial grade PFS were typically developed in 1970's and 1980's using FORTRAN. To maintain and upgrade these solvers to meet the new demands is time consuming, error prone and difficult. Especially difficult are updates to support new control functions (e.g. phase shift transformers, HVDC) and studies needing large number of changes in grid topology (e.g. congestion forecasting). Therefore, the development of an advanced industrial grade PFS that meets these requirements is needed.

A PFS framework is proposed that eases the upgradability and maintenance while also supporting grid topology changes using the common information model exchange format (CIMXML). The PFS development encompasses three tasks: ***power flow problem formulatio***n, ***network data integration*** and ***linking a solver***. A PFS language is proposed that formulates the power flow problem at higher abstraction level similar to the mathematical formulations found in school books. The PFS language will minimize the programming effort when implementing new PFS functions. The integration of power system models using the CIMXML exchange format is natively built into the new PFS prototype, that has been developed based on the above proposed framework. This provides a proof of concept for the proposed idea and also identifies future challenges. The presentation discusses the proposed framework and the associated research findings.