Managing Large Scale Network Model for
Energy Management Systems & Business Management Systems

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Managing Large Scale Market Network Model

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Abstract:

Background: Prior to the start up of the Standard Market Design (SMD-2), the New York Independent System Operator (NYISO) used various tools to maintain and update three network models used to support the Energy Management System (EMS) and Business Management Systems (BMS) applications. The process of maintaining and updating the network models for EMS & BMS applications became more challenged and cumbersome for our engineers to support. These challenges are becoming more relevant as the NYISO grids are becoming more congested with rapidly changing power flow patterns responding to market conditions. The NYISO’s network models cover the entire New York state with about 3100 buses, 30/70 split between internal/external and 40 AGC tie lines to other ISOs such as PJM, ISONE, IMO & HQ and all the 69KV and above systems. Currently, there are eight Transmission Owners and 400 plus Market Participants that participate in our markets. As part of the SMD-2’s requirements, which were successfully implemented in December 2005, the NYISO consolidated all the SCADA, EMS & BMS applications to run under one single platform and that is ABB’s Ranger Systems. To maximize the convergence and improve the solutions between the SCADA, EMS and BMS applications, network models for various applications on different platforms were also consolidated into a single model and that in turn drives all the applications including the Dispatcher Training Simulator.

CIM Data Engineering Toolkit: ABB’s Ranger System that utilized the CIM DE Toolkit, an Oracle based program, was selected and used to maintain and update the network model. The CIM Toolkit features a graphical editing environment to manage data in a CIM-based format, including automatic diagram generation, and multi-user, versioned editing. The CIM DE Toolkit includes tools for the import and export of CPSM-compliant full and incremental CIM/XML data as well as the comparison of existing models to CIM/XML data. The CIM database contains not only the network model data.
such as breakers, generators, lines, transformers, shunts, SVCs, Statcom, loads and others but also contains the SCADA data as well as Seasonal and Dynamic equipment ratings. The CIM database also contains PI data definition, and other data that are required to drive the Control Center Map board. In addition to standard data requirements for EMS applications, there are a few special data that are required for BMS applications such as Equipment Outage Priority, Load Pocket Definition, Facility Monitored and Secured flags and others.

Network Model Update: The network model update is being initiated by the Market Participants, Transmission Owners, and internally. Various processes were implemented to ensure that appropriate upgrade and newly added equipments and associated measurements were notified in a timely manner by the Transmission Owners so that they can be reflected in the CIM database for all applications. Currently, network data updates are being reported to the NYISO through the one-line station diagrams, and text files, since most of the TOs do not have the tools to generate either full or incremental CIM-XML files from their EMS systems. The External Control Area network updates are being requested on a needed basis. The NYISO has been providing the full network model in the standard CIM-XML file to other neighboring ISOs and Transmission Owners. Currently, the CIM-XML Extension, which was created directly from the DE Toolkit, is being used to generate the Ranger Run-Time for BMS applications on a monthly basis.

Data Exchanged between EMS, BMS and others applications: In addition to the Load Forecast and generator bid data, which was provided from other applications based on different platforms, BMS applications also acquire other data directly from the EMS system such as Contingency Definition, Contingency Group, Security Monitor Flags, Branch Group flags, Incremental Limit Change Table flags, EMS load patterns, EMS external generator schedules, Equipment Outage Priority, Regulation and reserve requirement. The data is being exchanged between SCADA, EMS and BMS applications in real time and on exception. The key that allows all data being exchanged among applications is the PTID number, a unique ID that was assigned to each piece of the network equipments and other Control Area related definitions.

Network Model Validation: Unlike other ISO’s where different groups within the organization handle the physical and financial models, the NYISO designates just one department to handle all the network modeling and validation processes. All the network model data unit validation is being performed on the development servers, where the live-data is fed directly from the Production System. Benchmark tests can be performed in parallel against the Production Systems. The following applications are be validated once the new run-time database is created: SCADA system, EMS - State Estimator, Contingency Analysis, Dispatcher Load Flow, Security Monitor, AGC and BMS - Real Time Commitment, Real-Time Dispatch, and Security Constrained Unit Commitment (Day Ahead Evaluation software). Once the unit tests are completed, then the final model is further validated in the QA department for System Integration bid-to-bill testing. The network model is being updated to the Production System on a one to two month basis.

Biography: De Tran holds a Bachelor and Master of Science degree in Electric Power Engineering from Rensselaer Polytechnic Institute and a Masters of Business Administration degree from Union College, as well as completing the GE Power Systems Engineering course work. De has been with the NYISO and the New York Power Pool since 1989 where he has held engineering positions in the NYPP Computer Applications, Operations Engineering and NYISO Commitment Analysis sections. Currently, De is supervisor of the Power System Applications Engineering department in the Operations and Reliability Department at the NYISO.