AEP’s Experience with CIM

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EMS Advanced Applications, AEP
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AEP Currently operates in 11 States
Agenda

• CIM-based Approach for External Model Update

• CIM-based Grid Models Exchange
External Model Update Requirements

• Update all first tier companies and some 2\textsuperscript{nd} tier companies depending on sensitivity analysis
• Update on company level
• Update more frequently
• Get real time telemetry
• Meet the internal business process requirements
  – e-terrasource
  – T-Nexus
Step 1: Model Split

- EMS Modeling Environment
Step 2: External Model Extraction

- Extract external model from RTO model
Step 2: External Model Extraction – cont.

- Extracting AEP’s neighboring companies’ model from the PJM CIM model
- Company level
a) CIM Model Extension

*External CIM model does not contain some classes specifically designed in GE/Alstom EMS system, such as, EquipmentGroup.*
b) CIM Model Reconfiguration

A restructuration on the external model is inevitable to meet AEP EMS standards. For instance, Breaker class and Disconnector class are changed to the subclass of the VoltageLevel class instead of the Bay class.
c) CIM Model Translation

To import the CIM\XML based external model from into the EMS modeling tool used in AEP, a Resource Description Framework Schema (RDFS) profile has to be used to facilitate the process.

The RDFS file serves as a translator between the CIM\XML model file and the targeting modeling tool for AEP’s EMS system.
Step 3: CIM-Based Adapter

d) Measurements and Operating Limit

PJM provides AEP csv formatted files containing Limits and ICCP object ID

- PJM_Only_2017_Winter_CIM.xml
- Wintr17_PJMRC.ISN.csv
- Wintr17_PJMRC.LM.csv
- Wintr17_PJMRC.UN.csv
- Wintr17_PJMRC.LD.csv

CIMSpy

Python scripts
Step 4: Merge the model

• Merge the model into AEP EMS model
Current Status

• This CIM based external model update process has been successfully implemented in PJM and ERCOT footprints.

• We are working on the MISO, TVA and SPP areas.
Future

• Future:
  – Work with PJM to get limits to be included in PJM CIM model
  – Work with PJM to get Analog/Status/ICCPName to be included in PJM CIM model
  – Dummy Switch Status through ICCP
  – Incremental Update
Agenda

• CIM-based Approach for External Model Update

• CIM-based Grid Models Exchange
Model Exchange Issues and Challenges

- Duplicate Modeling efforts
- Different EMS vendors
- Different CIM versions and different CIM extensions
Single Source of Model – Authority and Responsibility
Single Source of Model – Authority and Responsibility

RTO CIM Model

Adapter

EMS

Other Company’s CIM Model

Adapter
Grid Interoperation
How to get there?

1. Define the Standard
2. Baseline with the source mode
3. Maintain the Boundary
4. Incremental Update
Define the Standards

• Can we have the same CIM standard for model exchange?
  – For each RTO?
  – For North America?
The Common Grid Model Exchange Specification (CGMES) is an IEC technical specification (TS) based on the IEC Common Information Model (CIM) family of standards. It was developed to meet necessary requirements for TSO data exchanges in the areas of system development and system operation (e.g. TYNDP and network codes).

The CGMES is used as a baseline exchange specification for the implementation of the Common Grid Model (CGM) methodologies. The CGMES will be applied by applications dealing with power system data management, as well as applications supporting the following analyses:

- load flow and contingency analyses,
- short circuit calculations,
- market information and transparency,
- capacity calculation for capacity allocation and congestion management, and
- dynamic security assessment.
IEC standards

- IEC 61970-552: CIM XML Model Exchange Format
- IEC 61970-301: Common Information Model (CIM) Base
- IEC 61970-302: Common Information Model (CIM) for Dynamics Specification
- IEC 61970-452: CIM Static Transmission Network Model Profiles
- IEC 61970-453: Diagram Layout Profile
- IEC 61970-456: Solved Power System State Profiles
- IEC 61970-457: Common Information Model (CIM) for Dynamics Profile
- IEC 61968-4: Application integration at electric utilities – System interfaces for distribution management - Part 4: Interfaces for records and asset management.
Baseline with the Source Model

• Do not try to model the same thing twice; Just take it from the source
• Keep the CIM MRID the same as the source
Maintain the Boundary
Incremental Update
Summary

• Authority and Responsibility
  – Each party is the only “modeling authority” only for its own territory and is responsible for sharing its own CIM model
  – Define the boundary
  – Each party will use other parties’ internal models to create their external model.

• Define the CIM based model exchange standard
  – RTO?
  – North America?

• Goal
  – an external model can be updated within an hour of a change to a neighbor’s internal
Tools

- e-terrasource ([www.ge.com](http://www.ge.com))
- CIMSpy ([http://www.powerinfo.us/CIMSpyEE.html](http://www.powerinfo.us/CIMSpyEE.html))
QUESTIONS??

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