Cyber sécurité et adoption du CIM dans les centres de contrôle

1ère partie: Exemples d’implémentation CIM

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06/03/2012
CIM overview

- CIM is a family of standards for interoperability among the applications contained in the major business systems that are used to plan and operate the electric grid.

- All these systems, in one way or another, analyse something 'about the power system'.

- They all require descriptions (models) of the power system in order to perform their function. When they interoperate with one another, they are exchanging information 'about the power system'.

- Many of them deal with the power system holistically, as opposed to as independent components, and the real centre of the CIM world is on holistic grid issues like reliability and economics.

- What binds CIM together as a family of standards is the idea that the semantic structures of all of the standardized information payloads that define interoperation are derived from a single shared semantic model of a power system.

- The CIM canonical model is currently expressed as a UML structure.
CIM today

A rapidly growing family of standards governing various forms of data exchange.

The CIM ‘canonical model’ is also being adopted by progressive utilities implementing enterprise integration architectures.

- There are no alternatives to CIM for this purpose.

ENTSO-E recently adopted CIM for model and solution exchange in Europe.

China has implemented control center coordination based on CIM.

Smart Grid!

- NIST SGIP has included CIM in its short list of key standards for Smart Grid.

- ETSI-CEN-CENELEC is on track to do the same for Europe.
- Semantic WG in SGAC will push for semantic consistency based on CIM harmonized with other standard semantic models.
Model exchange needs

In large interconnected systems such as ENSTO-E:

- Need to model larger and larger portions of external networks for:
  - Network security
  - Network congestion
- Need to exchange models among TSOs
- Need to keep external models frequently updated

Data exchange model based on

→ Evolution towards CIM-based exchange profiles

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Common Power System Modeling Principles

Each region maintains the official, detailed model of its own territory.
- Regularly makes all updates available to its neighbours.

Each region receives its neighbours’ models,
- Combines them together into a full detailed interconnection model.
- Reduces the result to a security model for their region via a repeatable automatic process.

Business value:
- Improve external model quality,
- Guarantee consistency among the regions where their models overlap,
- Reduce the labour involved in maintenance of external system models.
Each object is in one and only one set

Regional Sets:
- No associations with other regional sets.
- External associations to boundary sets only.
- A regional set may be referentially validated independent of other sets.

Boundary Sets:
- External associations from regional sets.
Example 1: Management of model submission and assembling for planning

- Model submission
- Model consultation
- Scenario management
- Web services
- CIM-based model repository (e-terra source)
- Management
- Super-user
- Storage
- Validation
- Assembling
- Reviewing
- Maintenance

TSO 1

TSO 2

TSO N

Regional Coordinators
Example 2: CIM-based interfaces for application interoperability in EMS environments

Third-party applications
- Simulation
- Dynamic analysis
- Voltage collapse
- other …

Network solution
- ENTSO-E CIM
  - State Variables
  - CIM difference file
  - Topology
  - Extensions

CIM Export

CIM-based model repository (e-terra source)

Equipment model
- Equipment model
- Extensions

CIM Export

EMS Network Analysis
- real-time and study
  - State Estimator
  - Power flow
  - SCADA

Online databases

Selected SCADA data

Network solution

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| ✓ | ENTSO-E CIM profile based on IEC standards facilitate model exchange, assembling and maintenance |
| ✓ | Each TSO is responsible of its own data |
| ✓ | Models can be exchanged in full or incremental form |
| ✓ | CIM/XML facilitates SOA integration |
| ✓ | CIM is now a reality |