ELECTRIC POWER RESEARCH INSTITUTE

GMDM
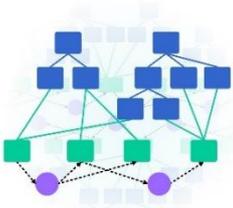**Grid Model Data Management**
Modeling Tomorrow's Grid Today

January 2020 Update

EPRI's collaborative Grid Model Data Management (GMDM) initiatives are developing an information architecture for distribution network model data management. The architecture can serve as a guide for distribution utilities around the world in deploying interoperable, product-based solutions that facilitate effective, enterprise-wide management of network model data.

Using an approach that combines the data organization philosophies of the Common Information Model (CIM), EPRI's previous work on transmission network model management, and the contributions of multiple utility and vendor partners, the GMDM initiatives are defining 'building block' data exchanges that utilities can use to design local grid model data management solutions and vendors can implement as product interfaces. These data exchanges reduce system integration costs and improve enterprise-wide availability of the network models essential to advanced grid simulations and analytics.

Development of the information architecture relies on both utility insight into requirements and vendor insight into feasibility. The GMDM initiatives started in the utility space where real-world understanding informed initial architecture development and are continuing in the vendor space where the architecture is being vetted and demonstrated.

Distribution GIS & Grid Model Data Management project

In 2017, the Distribution GIS & Grid Model Data Management project brought more than 10 utilities together to explore distribution grid model data management. The results provided insight into common patterns of deployment, and into issues, requirements, and visionary solution approaches. EPRI researchers with extensive experience and global thought leadership in data integration, CIM, and power system analysis leveraged those insights to develop an information architecture. Learnings from the application of the architecture in design exercises at utilities will produce an initial version of the information architecture and the identification of areas where CIM development is needed to support it.
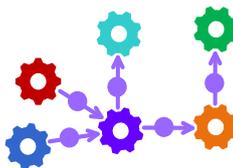
GMDM Vendor Forum project

The GMDM Vendor Forum continues the work of the Distribution GIS & Grid Model Data Management project. Participants include major GIS, OMS, (A)DMS and planning/protection tool vendors. The primary activities of the GMDM Vendor Forum are:

- Review and refinement of the information architecture
- Selection of key 'building block' data exchanges to be interoperability tested
- Extension and enhancement of the CIM, as needed, to support those key data exchanges, and
- Demonstration of multi-vendor interoperability of the key data exchanges at a GMDM Interoperability Event.

To learn more about EPRI's GMDM initiatives or to join either project, contact:
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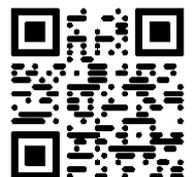
GMDM Information Architecture

Distribution utilities vary. They serve different populations of consumers, they operate in different climates and regulatory landscapes, and they use different approaches and choose different tools in planning, protecting and operating their grids. The information architecture developed by the GMDM initiatives outlines a set of 'building block' data exchanges, and an approach for using them, that can be applied by any utility in its pursuit of improved grid model data management.


Development of the information architecture started with a business function approach as it provided a universal lens through which electric distribution utility activities, and the information flow among them, could be understood. Decomposing business functions exposed data sources and consumers. It provided insight into consumer requirements: all consumers need network model data, but they require models with varying grid extents, varying levels of detail, and for varying points in time. It also provided insight into source characteristics: information sources usually have a physical component, not an electric network, view of data and typically supply a limited range of specific information. Most importantly, examining data flows between business subfunctions clearly exposed the importance of identifying a Network Model Management business function, one that receives master data from sources and uses it to create the network modeling needed by each consumer.
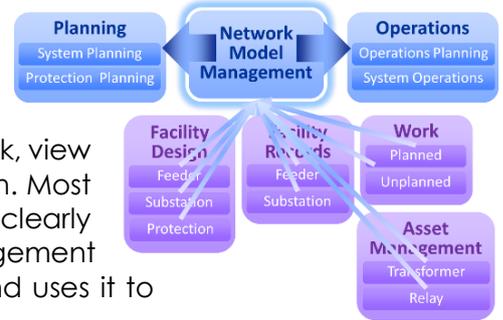
The focus of the Network Model Management business function is managing shared electric utility data, so the constructs of the Common Information Model (CIM), the electric industry's semantic model, are leveraged to describe required functionality. The CIM identifies two categories of network model data constructs: those that describe the power system (the equipment, its behavior, and its connectivity) and those that enable the management and sharing of power system data (Models, Change Models and Assemblies, which are essentially 'containers' of power system data).
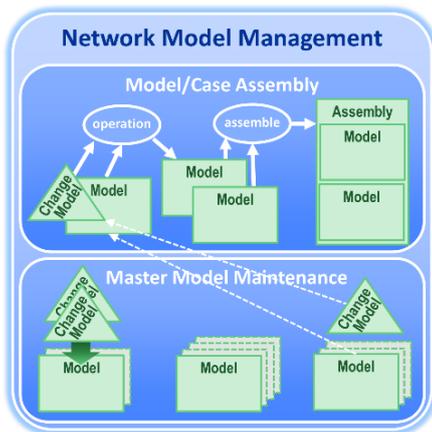
The latter category of constructs provides a means of expressing the responsibilities of the two Network Model Management business subfunctions, which operate simultaneously and asynchronously: Master Data Maintenance is driven by changes to the grid and Model/Case Assembly is driven by the need to do studies. The Master Data Maintenance subfunction maintains detailed grid modeling in parts using Models, manages changes to those parts using Change Models and keeps a history of those parts over time by creating new as-built Models when Change Models are commissioned. The Model/Case Assembly subfunction uses Models and Change Models as inputs to a variety of operations (like simplification or operating limits calculation) that create new Models which are assembled with other Models to create what is required by consumers.

Significant use cases are being developed to illustrate how the capabilities of a tool implementing the Network Model Management business function could be used to meet the requirements of systems supporting the other business functions of a utility enterprise.

The GMDM information architecture is being vetted by participating GMDM utilities and vendors as it is being developed. Publication of the following formal documentation is planned:

- Available to GMDM participants
  Implementing NMM at the Distribution Utility and *Applying NMM in Distribution* Q4, 2020

- Publicly available
  A CIM-Based Approach to Network Model Management Q4, 2021
  An overview of the CIM's network model data organization constructs and how they can be employed to manage utility network model data.

  Network Model Manager Technical Market Requirements, Edition 2 Q4, 2021
  The functional components of a Network Model Manager solution and the functional requirements a Network Model Manager tool serving transmission or distribution should meet.

  Grid Model Data Management Interoperability Event Report Q1, 2022
  Summary of the interoperability testing accomplished at the GMDM Interoperability Event, including a list of participating vendor products and the RFP-ready descriptions of the interfaces tested.