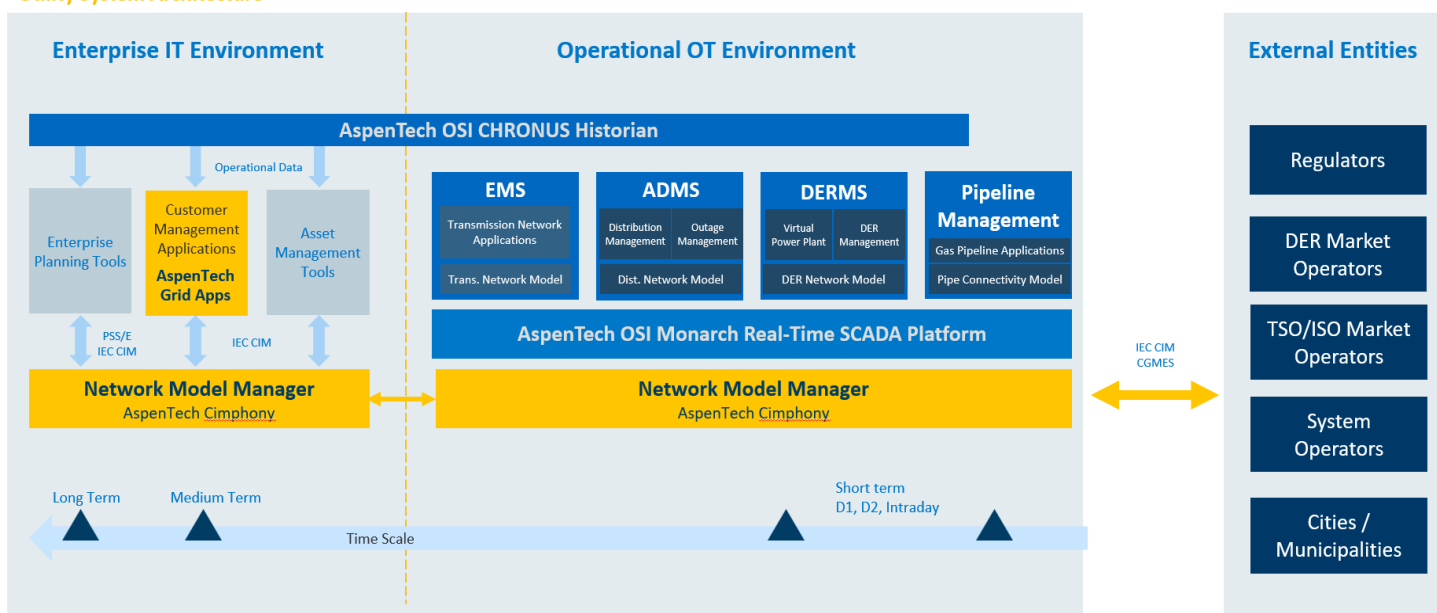# AspenTech Cimphony Network Model Management™ (Cimphony NMM)

AspenTech Cimphony Network Model Management (Cimphony NMM) is a scalable solution designed to model, validate, and synchronize power grid data. By leveraging structured Common Information Model (CIM) data, it enables utilities to maintain accurate, real-time network models, supporting next-generation applications that enhance grid reliability, planning and operations. This advanced platform provides a single-source view of grid network modeling, improving visualization and decision-making for operators.

Figure 1. Indicative Architecture of AspenTech Cimphony Network Model Management within the AspenTech OSI monarch™ product suite

Cimphony NMM moves the utility away from the siloed approach to network data management, to a single repository, working as a system of record and a single source of truth for all network data. It does this while handling the integrations, transforms and validations required to compile all of this data and provide it to subscribing systems, ensuring that operational, planning, modeling and enterprise systems have access to accurate and reliable data.
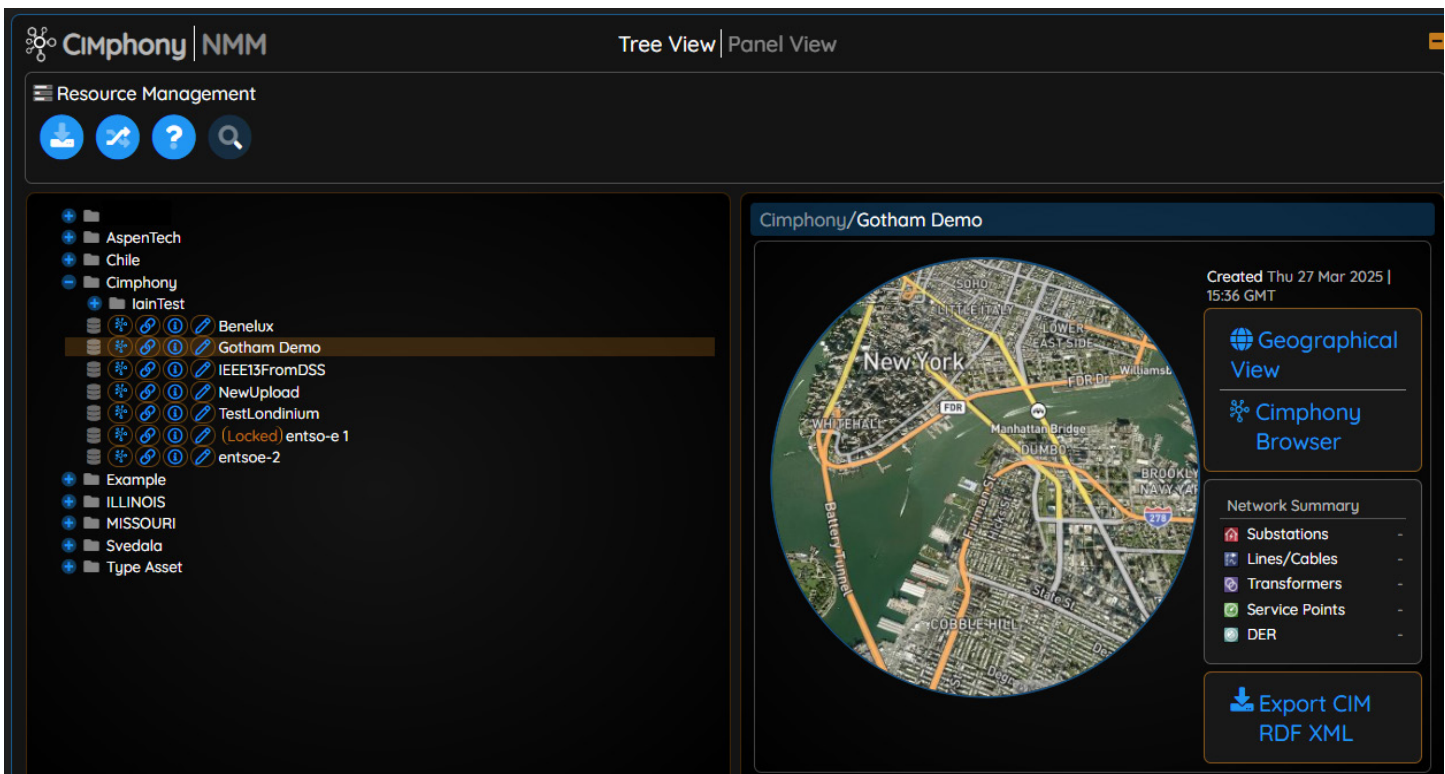
What Cimphony NMM Offers

Figure 2. Cimphony NMM Server UI Homepage

A CIM-based data integration layer.
Cimphony NMM functions as a CIM-based middleware platform that aggregates data from diverse sources and applications across the utility enterprise. It automates the transformation of incoming data into the CIM format, stores it in a centralized repository and manages bidirectional data flows, converting and distributing CIM-compliant data to various systems. This streamlines interoperability, reduces integration complexity and ensures consistency across operational, planning and market-facing platforms.

These functions can be carried out both manually and through automated workflows. Previous projects have integrated with external systems such as AWS S3 or IBM MQ to build out automated process workflows between systems.

The culmination of this is to pull data from a number of disparate sources into a single source of truth for electrical network data, creating a model able to paint a full picture of the electrical network for any given point in time.
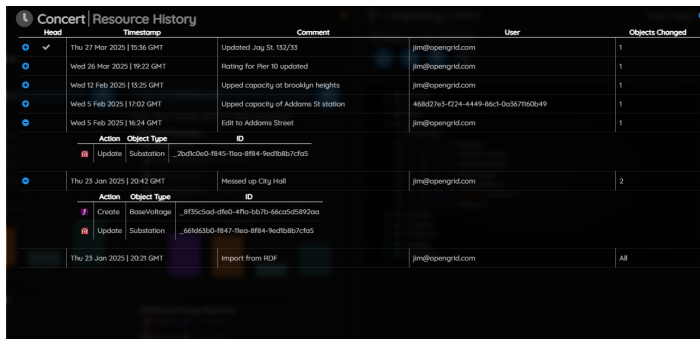
All network data is stored as IEC CIM data, with native support for CIM versions 14, 15, 16, 17/100.

A single source of truth for network data.
Cimphony Network Model Management can be utilized for network modeling as well as model management, with users able to use AspenTech Cimphony NMM Desktop to build new network models or update existing models via tabular and graphical UIs. Additionally, users are supported by AspenTech Cimphony NMM Server's OData RESTful API to update and build modes via scripts.

In addition to building out electrical network models from various sources and for various subscribing systems, Cimphony NMM fully tracks all changes made to the network model at an object level.

Cimphony NMM handles model changes using a branching and commit framework similar to Git-based version control systems. Each modification is tracked with a unique identifier, timestamp, the user or system responsible for the update and a concise summary describing the changes applied, ensuring full traceability and facilitating collaborative model management.


Figure 3. Commit history within Cimphony NMM Server UI

This allows for full historical change tracking within the network model at an object level, with the ability to save changes as difference files and export an historical model as a list of changes—in line with the IEC CIM differencing standard.

How Cimphony NMM Meets Utility Needs

Next-generation network model visualizations.
Cimphony NMM provides robust visualization of network models through both schematic and geographic views, enabling users to seamlessly analyze and interact with network data in their preferred format. The Cimphony NMM Desktop application supports editing capabilities in both visual contexts, allowing for efficient model refinement, validation and scenario planning directly within the interface.
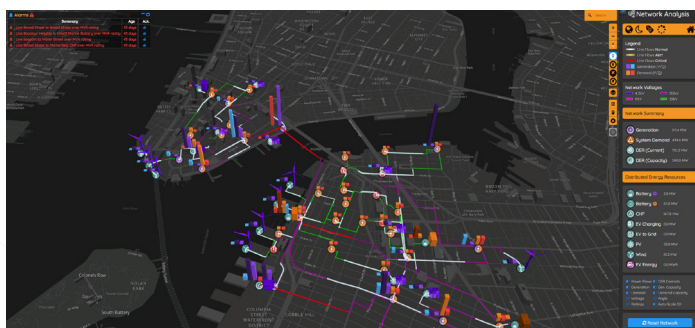

Figure 4. Graphical representation of a network with power flow data visualization

The Network Analysis component of Cimphony NMM Server provides functionality to run power flows and visualize those power flows on the geographical overlay, with functionality to edit load and generation values in real time and see changes to line loading, voltages, angles, etc.

Graphical network modeling.
In addition to providing graphical means of visualizing the network model, Cimphony NMM provides an environment for network modeling with modeling capabilities in tabular and graphical forms—including through single-line diagrams.
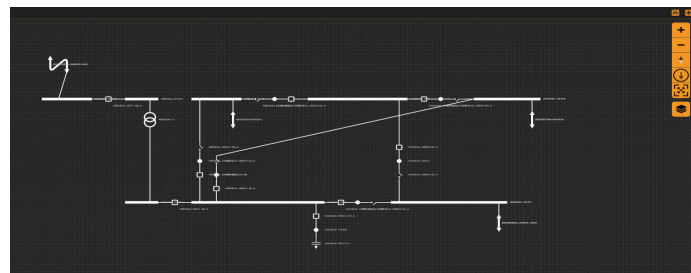
Figure 5. Automatically generated single-line diagram of a substation

Diagrams can be used to edit the underlying electrical model, as well as exported to systems such as SCADA or EMS, and even exported in PDF or SVG formats.

Project-based modeling.
With Cimphony NMM, utilities can make use of the project and branch functionalities to model network expansion projects and even build out "what-if scenarios." These scenarios can be analysed within Cimphony NMM, or exported to the preferred planning tools for further analysis, prior to committing to a new network project.

Flexible deployment options.
AspenTech Cimphony NMM Server can be deployed on-premises, on cloud or in hybrid environments, with support for Red Hat, Debian, Windows and containerized distributions. Users access the system through their web browser using the utility's preferred SSO options.

Strategic Outcomes Cimphony NMM Can Enable.

Cimphony NMM can be leveraged to provide key information to both operational and IT applications. The same model being used to inform operations applications (such as ADMS, EMS and DERMS) can also be used to inform IT and customer-facing applications such as planning software and AspenTech Grid Apps (Grid Reporter, DER Connect, Network Maps and Resilience Portal).

By deploying Cimphony NMM in both these domains, planning applications can be integrated to push information through or pull information from them. Similarly, Grid Apps can take information from Cimphony NMM to display network information to end users or send DER connection data into Cimphony NMM to act as a distributed energy resource system of record. In the operational domain, Cimphony NMM can be leveraged to provide full network models to EMS and ADMS to pair up with SCADA data to build a full network representation for simulation, management and control of the real-world network.

Using a unified network model across both domains ensures that the latest as-built representation of the grid is consistently applied. This allows planning tools and end-user applications to work from the same accurate foundation while simultaneously enhancing the as-operated system with real-world measurements, topologies and configurations.

Key Capabilities

Third-party integrations and OData APIs.
The Cimphony NMM Server product is built on an OData v. 4 RESTful API. For the UI, this means that most of the work a user would carry out through the UI is actually being made as a series of API calls.

As a result, users can also automate their processes via scripts and procedures using the API via applications such as Postman or their preferred scripting language (Python, Java, etc.).

The API allows the user to edit and read network data, built models and assemblies, and expand the meta-model, etc. This functionality facilitates the user in building their own integrations with third-party systems and software.

For more complex integrations, Cimphony NMM can support the building integrations and process workflows to pull data from other systems and push to subscribing systems. This is supported by the inclusion of various built-in transforms between CIM and other formats.

Analysis and validation of grid models.
Cimphony NMM's built-in power flow engine uses a Newton Raphson Taylor Series engine to calculate a single-phase equivalent, balanced power flow. While Cimphony NMM is not designed to be a replacement for your planning tools, power flow calculations are a key part of the validation process for network models.

Power flow analysis serves a dual purpose within the network model: it acts as a validation tool to ensure data and connectivity are accurate ("sanity check"), and it establishes essential state variables such as voltage magnitude, phase angle, and real and reactive power flows that define the electrical behavior of the system under given conditions. This foundation is critical for accurate simulation, planning and operational decision-making.
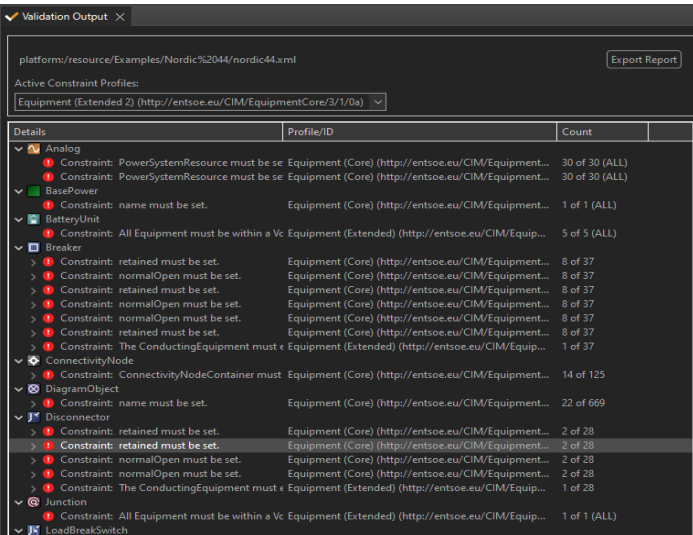

Figure 6. Output of an OCL-driven validation report

The product also comes equipped with a means to validate network models based on Object Constraint Language (OCL) profiles.

This provides utilities with a rapid method to assess whether their network model meets the necessary standards for data exchange with other utilities, regulatory agencies or modeling authorities. There is native support for ENTSO-E CGMES 2.4.15 and 3.0, as well as GB's LTDS profiles. Cimphony NMM Desktop also supports user-defined OCL profiles.

Automated workflows, or hands-on with the GUI—it's up to you!
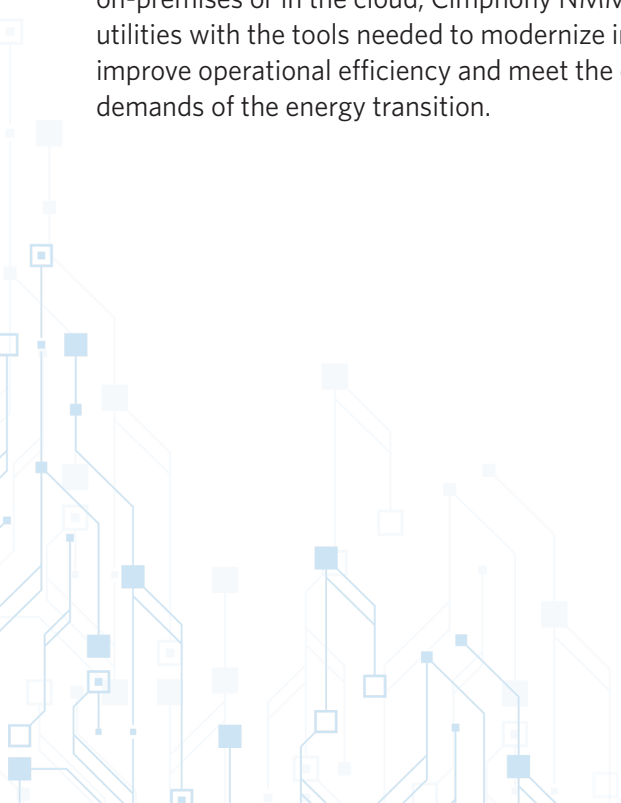Cimphony NMM's OData API and support for process workflows lets you build out automation pathways for data transformation, ingest, editing and tracking, transformation out of CIM and export to other systems. As such, it is possible to build systems that function autonomously to bring Cimphony NMM into your data pipeline. As an example, GIS data can be pulled from an online repository at regular intervals, converted to CIM, checked for errors, stored, passed to ADMS with the requisite conversion and then receive measurement data back to store with the network model.

The GUI within Cimphony NMM also facilitates uploading, visualizing, editing, transformation and export of data (along with other functionalities), providing users with the option to get "hands-on" with the data. The Cimphony NMM GUI for both Server and Desktop products is designed to be intuitive for different users likely to be working with the software.

Conclusion

AspenTech Cimphony NMM delivers a comprehensive, CIM-based platform for modeling, validating and synchronizing power grid data across operational and planning domains. With robust support for industry standards, scalable deployment options and seamless integration via OData APIs, Cimphony NMM empowers utilities to unify their network data into a single source of truth. Its advanced visualization, version control and analytical capabilities enable precise model management, real-time decision support and streamlined interoperability with AspenTech OSI SCADA™, AspenTech OSI ADMS™, AspenTech OSI DERMS™ and third-party systems.

By bridging the gap between IT and OT environments, Cimphony NMM ensures consistent, validated network representations that enhance grid reliability, accelerate planning workflows and support the integration of distributed energy resources. Whether deployed on-premises or in the cloud, Cimphony NMM equips utilities with the tools needed to modernize infrastructure, improve operational efficiency and meet the evolving demands of the energy transition.