Graphical Model Builder (GMB)

PSS® Product Suite

At a glance

Accurate power system planning requires that precise models be used in the simulation software. The software tools of the PSS® product suite (PSS®E, PSS®SINCAL, PSS®NETOMAC) are designed for dynamic modeling of complex systems. The Graphical Model Builder (GMB) is a powerful and easy-to-use dynamics model development tool based on graphic representations of control block diagrams. GMB allows specialized modeling by supporting both standard and non-standard dynamic models.

Advantages of the GMB include:

- supports a wide range of dynamic models
- uses common CAD functions plus large symbol library
- model flexibility using 100+ control blocks

The challenge

The successful operation of a power system depends largely on the engineer's ability to design a system that provides safe, reliable and economic service to the customer. Advanced simulation technologies provide the means for the engineer to design and analyze power systems, and assist in making key decisions.

With powerful simulation software like the tools of the PSS® product suite, it is possible to simulate the dynamic behavior of large power systems and to verify the performance of these complex systems in a fast and accurate manner.

However, as new technologies become available for application in the power system, it is necessary to develop dynamic models to accurately represent their behavior. New models must be developed quickly and accurately and be fully tested prior to use in the power system simulation.

Our solution

GMB is a stand-alone model builder and testing environment that can generate dynamic models for use in tools of the PSS® product suite (figure 1).
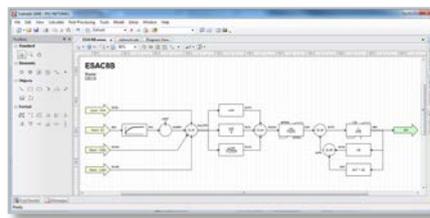

Figure 1: Graphical Model Builder (GMB)

GMB uses PSS®SINCAL platform's PSS®NETOMAC software user-interface to easily create dynamic models. GMB becomes a drawing tool that is simple and quick for implementing, editing and documenting dynamic models including:

- excitation systems (AVRs)
- power system stabilizers (PSS)
- turbine governors (GOVs)
- HVDC models
- FACTS models
- load models
- transformer models
- source models (e.g. generic wind)
- storage models

Using GMB, the user can develop a wide variety of dynamic models (i.e., AVR, exciter, FACTS, wind models, etc.) using coupled graphical function blocks. The models can be easily included as macro files without the need for compiling and linking.

In addition to the familiar CAD functions, like copying, shifting, rotating, zooming, etc., the GMB system has a large symbol library which contains more than 100 basic control blocks in the form of symbols.

During model development, GMB presents a stand-alone model simulation package that allows testing of the independent model. The simulation can be driven using built-in signal generators and test points which allow simulating the response of the model over a full range of inputs.

The user develops the model based on the control block diagram which is constructed by graphically interconnecting the basic library symbols.

The data is entered via masks that are object-related and have abbreviated balloon help in addition to detailed help texts. Using hierarchical structuring, GMB allows the user to determine the level of complexity for a model.

Individual components can be activated and deactivated and can be connected to any desired part of the system.

The symbol library "BOSL" (Block-Oriented Simulation Language) (figure 2) contains more than 100 different function blocks. These blocks can be combined to generate any open or closed-loop control structures or logic devices by means of the graphic interface.
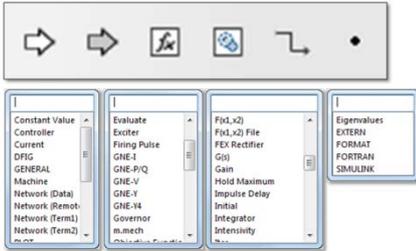

Figure 2: Symbol library (BOSL)

Besides simple blocks, such as PID elements, complex "blocks", such as FFT (Fast Fourier Trans-formation) are also available. Parameter values can be entered and edited individually, or the default values can be used (figure 3).

Complex open and closed-loop control and protective functions can be implemented with GMB. In addition to the open and closed loop control structure, signal processing structures can be user-defined. External, user-defined subroutines can be coupled (open-loop) and there is an interface to real-time applications (closed-loop).
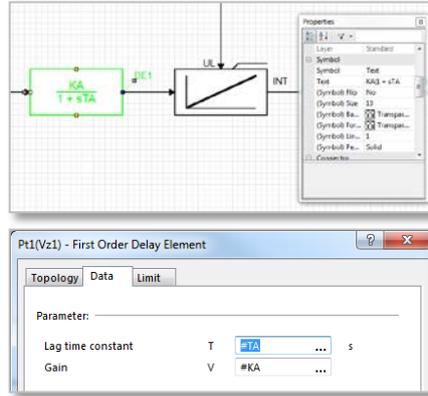

Figure 3: Data input in masks after double clicking

The block-oriented structures can be combined with FORTRAN-like terms (figure 4), such as mathematical functions, logical terms or instructions, (e.g., IF / THEN / ELSE and GOTO / CONTINUE).
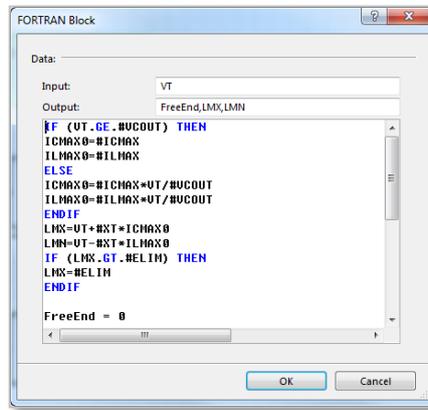

Figure 4: Special user blocks with FORTRAN statements

Input variables are available to the controllers in all units. In addition, the variables from other closed and open-loop controllers or the evaluation structures can be used as input variables. All inputs and outputs of blocks can be printed and plotted.
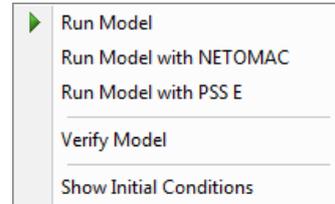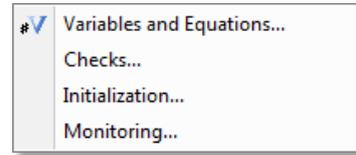

Figure 5: Parameterization and verification of the model

After finishing the design and testing of the model (figure 5), it can be used directly as a macro file without the need for compiling and linking.

Application example

Figure 6 shows a Static Condenser (STATCON) model built as a current source (GNE-I) using the GMB.
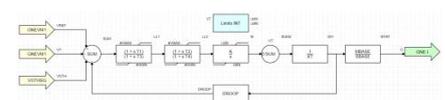

Figure 6: Example of static condenser control