

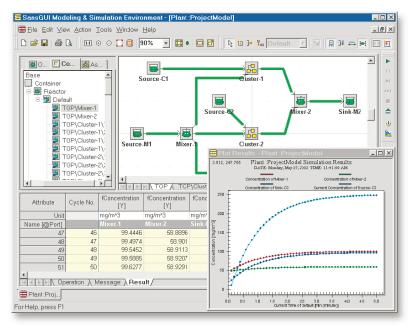
Modeling and Simulation Environment for Developing and Deploying Scientific and Engineering Simulators *without* Writing Any *Graphical User Interface* Code

# Why SansGUI?

How do you develop the graphical user interface (GUI) for your scientific or engineering simulators? Do you find it hard to develop and deploy windows-based simulation software? Do you spend more time on developing the GUI front-end than the actual simulator core routines? Do you create an *ad hoc* GUI for each and every simulator? How do you let your users know what input ranges they should use? How do you resolve the unit discrepancies between the user input/output and your simulator? How do you synchronize the changing input specifications between your simulator and the GUI? Does the GUI development force you to learn yet another programming language? Do your users request GUI environments for your legacy simulation code? Is the GUI only a shell to invoke your simulator without run-time user controls? Do you outsource your GUI project to consultants but find it already obsolete as soon as it is delivered to you? Does the GUI cost you too much to develop, maintain, and support?

# The SansGUI Solution

SansGUI has been developed to address all of these issues for you. Using the innovative SansGUI software, you get a modern, highly interactive, object-oriented modeling and simulation environment for your simulators *without writing a single line of GUI code*.



For simulation developers, research scientists or engineers, SansGUI is a framework for modeling physical or abstract systems. You can use SansGUI to create models with different levels of complexity, from a few simple data forms, to a single level network of parts and links, or to as complex as multiple levels of assemblies with interconnections and reference data in many scientific and engineering disciplines.

# **The Application Domains**

The following are some sample application domains that can take advantage of SansGUI's modeling capabilities:

- Physical Systems
- Mechanical Dynamics
- Hydraulic Pipeline Systems
- Control Systems
- Communications Networks
- Electrical/Electronic Circuits
- · Artificial Neural Networks
- · Other Simulation Fields

SansGUI currently implements continuous, cycle-driven simulation control for highly interactive, tightly-coupled, in-process simulators. Stand-alone, external process simulators are not limited to built-in simulation flow controls. SansGUI provides a mechanism to integrate legacy simulators written in any programming language.

# **How SansGUI Works**

One of the many innovative concepts introduced by SansGUI is the *SansGUI*Data Object, a simple and easy-toimplement protocol for simulation engines to communicate with SansGUI. One data object format and one application programming interface (API) are the only requirements for creating simulators tightly coupled with SansGUI. Such simplicity implies that it require only minimal effort from developers to master the whole system and be ported to other platforms or translated to other protocols easily.

A simulation developer uses SansGUI to specify the classes of model building blocks in a target system as a *Schema Definition* and compile it into an *Object Library* and a set of source routines, in supported programming languages, for implementing the behavior of the classes. A simulation user installs the Object Library and the associated simulator executables from the simulation developer to create a *Project Model* with a model configuration, a certain input data set and parameters. SansGUI takes care of user interaction, hierarchical

model configuration, object sharing, data entry assistance and validation, unit conversion, dynamic memory allocation, multi-thread/process simulator execution, simulation control, result logging, displaying, plotting, and, most importantly, evolving the user's model data in case that the simulator has Schema Definition changes between versions. An external process simulator receives a textual *Model File*, in Tabular Data Blocks or XML Model Data formats, with a flattened model configuration. Dealing with hierarchical models and object-orientation is highly recommended, but not required.

#### SansGUI Features

#### **Features Benefits** SansGUI Development Environment Object-oriented development Encourage well-organized data and code modules Hierarchical class schema Create subclasses with attribute and behavior inheritance Multi-level class sharing Reuse classes among simulators, workgroups or companies Rich GUI control types Enhance user interface for data entry and editing Rich data validation rules Reduce or eliminate errors from user input Programmable data validation Validate data entries across multiple fields Automatic unit conversion Guarantee correct units in data Aggregate data types Support collections, tables, matrices and more Meet programming language storage requirements Row or column major order Dynamic memory allocation Request data storage as needed at run-time Single data object format Unify the protocol for program module communication Single API function prototype Reduce learning time for simulator development Source file framework Generate simulator routine skeleton for DLL creation Multi-programming languages Choose familiar programming languages for development Schema version control Manage changes in class schema and keep track of versions In-process simulator support Build highly interactive simulation control External process support Support legacy code integration and XML file format Robust debugging support Trace through simulator code in question On-line documentation Add on-line documentation to simulators

#### SansGUI Run-Time Environment

Object-oriented model building User extensible unit conversion Symbolic parametric values Qualitative input assistant User overridable routines Simulation run control Data modification and visualization Version evolution/update

Reduce redundant data entries with multi-level assemblies Choose data units according to user's preferences Test variations of models with case parameters Convey value semantics from the developer to the user Initialize data arrays and/or extend the simulator's behavior Start, pause, stop, step, or fast forward simulation run Change values and plot data dynamically during run-time Keep Project Models in synchronization with simulators

## **License Options**

Option	Description	Develop	Run-Time	Notes
SGpro	Professional Edition	Yes	Yes	Full features
SGstu	Student Edition	Yes*	Yes	*Limited to 10 classes, 20 attributes each
<b>SGrun</b>	Run-Time Edition	No	Yes	No class schema creation
SGdemo	Demonstration Only	No	Yes**	**No file saving capability



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# **Run-Time Environment System Requirements**

- Pentium® class or compatible computer system
- 16 MB physical memory, 32 MB or more recommended
- · 800x600 SVGA display with 256 colors, higher recommended
- · 15 MB minimum hard disk space for installation
- Microsoft® Windows® NT 4.0 (SP3 or later), Windows® 2000, XP, or Windows® 95/98/Me

# **Developer Environment System Requirements**

- Pentium® class or compatible computer system
- · 32 MB physical memory, 64 MB or more recommended
- 1024x768 SVGA display with 256 colors, higher recommended
- · 20 MB minimum hard disk space for installation
- Microsoft Windows® NT 4.0 (SP3 or later), Windows® 2000, XP, or Windows® 95/98/Me

### **Development Environment** for In-Process Simulators

- Microsoft Visual C/C++® 6.0+
- Compaq Visual Fortran® 6.1+
- · Any programming language or environment that can generate Win32 DLLs callable by Microsoft Visual C/C++®

### **Development Environment** for External Process **Simulators**

· Any programming language or environment that can generate stand-alone executables



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