

# NetSim™

## Closed-Loop Control Simulation Tool

### Applications

NetSim provides accurate control simulation for a wide variety of Woodward hardware platforms. The GAP code is compiled for simulation or for the target hardware in an identical manner. NetSim ensures the preservation of the dynamic performance from NetSim to the actual target hardware.

Supported hardware platforms include:

- MicroNet™ Plus (5200 processor)
- MicroNet™ (Pentium processor)
- MicroNet TMR® (5200 processor)
- MicroNet TMR® (040 processor)
- Atlas-II™ (5200 processor)
- AtlasPC™ (Pentium processor)
- 2301D (floating point compilation)
- PCMH
- MCU

NetSim has been applied to gas turbine generator packages, co-gen stations, mainline steam turbines, large process refrigeration systems, natural gas pipeline stations, marine applications, and more. As long as a model exists or can be generated, any application can be simulated in the NetSim environment.

### Description

NetSim™ is a tool that provides a powerful simulation environment for Woodward's picture-to-code GAP™ (Graphical Application Programmer) software. It produces a virtual test stand in the office or in the field.

Using no control hardware, the engineer performs dynamically accurate simulations of the control design. GAP supports a variety of programming environments—Functional Block Diagrams, Sequential Function Charts, Structured Text, and Ladder Logic Diagrams. The NetSim environment brings the GAP-generated control software and the model together into a total co-simulation. Testing with NetSim validates the design of the control software. The GAP code executes on the control exactly as it does in the simulation. The modeling software controls "time," giving the user complete control of program execution to thoroughly test and analyze control code.

NetSim consists of the following components:

- Control Executive and Utilities
- Model Linking Kit ("Virtual Wiring")

Each modeling environment requires special tools to interface with NetSim. These kits are specific to the modeling language being used. The model is "virtually wired" to the GAP inputs and outputs (I/O) using a Microsoft Excel-based utility. The ease of use of Excel and the compatibility of Excel with other standard database programs make it easy to maintain interface code. The Control Executive synchronizes time between the model and the control software so that rate group execution of the GAP is perfectly preserved.

Because the model owns and controls the "time," this co-simulation environment is ideal for testing. The simulation can be quickly advanced (faster than real time) to a trouble spot, stopped to allow review of the current conditions, and then single-stepped through the problem area to allow full de-bugging. The dynamic response of the control is unaffected because the model is running in the same relative time frame.

With reasonably accurate models, NetSim slashes field-commissioning time of turbine and engine control systems. When schedules are critical, NetSim is the obvious choice. Even with no commissioning pressure, NetSim finds problems early—when the cost of modification is low. Testing with NetSim is two to three times faster than traditional hardware simulation and provides far more coverage. Additionally, NetSim provides an ideal training tool for operators and other plant personnel.

- Works with GAP™ Programming Environment
- View GAP blocks during simulation
- Built-in data logging
- Built-in clock control
- Interfaces with MATLAB & MatrixX
- Runs on PC or Laptop using Windows 2000, XP, Vista, and 7 (32-bit)
- Downloadable from the Internet
- Saves valuable commissioning time
- Allows system response validation

When coupled with the actual HMI software on a separate PC, a NetSim training simulator provides an excellent platform to train operators on unit start-up, shutdown, load transients and simulated equipment failures. Operators gain experience with the control and HMI so that they know how to respond when it really counts.

## Features

- Run/Freeze/Single Time Step capabilities allow stepping through software one rate group time frame at a time to check software operation, which saves time during complex testing.
- Stop complex control algorithms to evaluate the internal and external effects of a specific event.
- Save/Restore complex operating states and conditions to resume testing at any point within the software.
- Data logging (adjustable resolution).
- Communications to external devices with Serial Modbus<sup>®</sup> \*, Ethernet Modbus (UDP & TCP), Ethernet OPC, and EGD.
- Drives dynamic "Monitor GAP".
- Tune/View control variables.
- Override hardware inputs and outputs.
- Runs multiple control instances simultaneously.
- Co-simulate between GAP / MATLAB<sup>®</sup> \*\* or other third-party tools.

## Modeling Languages

NetSim supports several industry-standard modeling languages to provide maximum flexibility. Each modeling environment has its own attributes and features, so each OEM or user can decide which environment is best suited to the job at hand. Existing models can usually be imported into one of the modeling environments. NetSim supports:

- MATLAB/Simulink<sup>®</sup> \*\*
- MatrixX/System Build

\*—Modbus is a trademark of Schneider Automation Inc.  
\*\*—MATLAB and Simulink are trademarks of The MathWorks, Inc.

## Communications

NetSim supports several industry-standard communication protocols. All of the communication structures can be included in the simulation testing. By including the various communications (such as HMI), all of the pieces of the system can be verified, and time in field commissioning is thereby reduced. Supported communication protocols include:

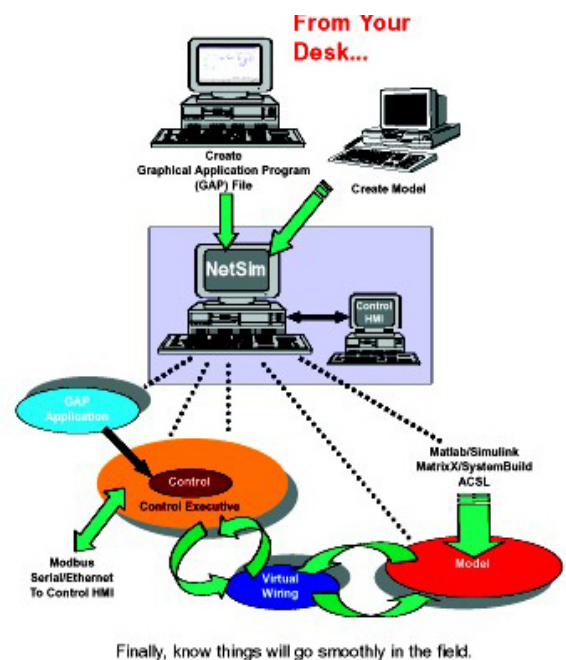
- Ethernet OPC
- Ethernet Modbus
- Serial Modbus

## Additional Services

Woodward provides modeling services in either MATLAB or ACSL. Models are configured per customer requirements to interface with a specific Woodward control for testing or training needs. The entire system or a partial subset can be modeled and simulated.

Woodward also offers analytical assistance with complex control issues. Using the NetSim environment and other advanced tools, Woodward can help in solving difficult or unusual problems.

NetSim product training is available at Woodward or customer designated sites. This training allows the user to maximize the usefulness of the NetSim tools.



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