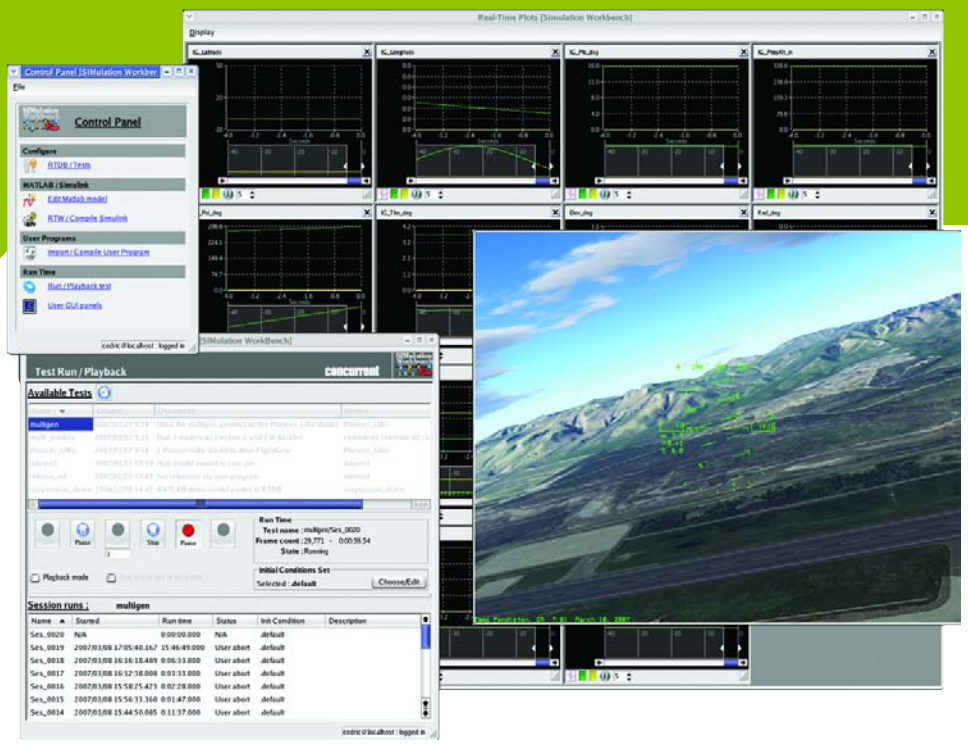
SIMulation Workbench™

Real-Time Modeling Environment

Features

- **Complete Simulation Control GUI**
  - I/O mapping configuration tool
  - Real-Time Database configuration tool
  - Data recorder
  - Playback of previously recorded sessions
  - Real-time data visualization and data plotting
  - Support for customized LabVIEW® user interfaces
- **Real-Time Development and Execution Environment**
  - Support for MATLAB/Simulink® models
  - Memory resident Real-Time Database
  - Support for multi-rate, multi-model simulations
  - Real-time scheduling via RedHawk™ Linux® Frequency-Based Scheduler
  - API for integration of C, C++ and Fortran models
  - Real-time test scripting
  - Asynchronous and synchronous data acquisition I/O tasks
  - GUI control of all run-time activities
  - Real-time debugging using Concurrent NightStar™ tools
- **Data Acquisition I/O support**
  - Analog input and output boards
  - Digital input and output boards
  - AFDX / ARINC 664
  - ARINC 429
  - CANbus
  - MIL-STD-1553
  - RVDT
  - Resolver
  - IRIG-B



Looking for fingertip control of your complex simulations? Need to easily remap your I/O without changing your Simulink model? Looking for fast access to simulation data?

Concurrent's SIMulation Workbench (SWB) is the answer. SIMulation Workbench provides a complete framework to develop and execute real-time hardware-in-the-loop and man-in-the-loop simulations.

Complete GUI Operation

SWB's powerful GUI allows users to conveniently configure, start, stop, record and play back simulation runs. SWB provides fast, direct shared memory access to all parameters and signals needed by your simulation. SWB's in-memory design optimizes performance and data conversion speed.

SWB is built upon a client-server architecture. A real-time server provides the run-time environment for simulation while network-based GUI clients control and display simulation activities. Real-time performance is maximized because the GUI clients run outside of the simulation server.

Real-Time Database

At the heart of SIMulation Workbench is a memory-resident database called RTDB that can be accessed by all simulator processes. RTDB stores the definition of all data items used by the simulation such as model variables and their mapping to I/O boards and model parameters. RTDB is configured externally via a GUI and provides for complete I/O independence. All the information necessary to configure I/O points and data bus protocols and to read, convert, write and store simulation variables is maintained in the database.

RTDB is organized as a dictionary where a main hash table index points directly to any individual item within the database. Values can be stored as any C language scalar type such as char, unsigned char, short, int, float, double, etc. RTDB also contains the engineering unit conversions for analog values, override flags, values, alternate values as well as raw unit values. If I/O points need to be reassigned, GUI panels provide convenient, model-independent remapping.

Data Recorder

SWB's powerful Data Recorder tool allows simulation data points to be logged individually and independently at the rate they are produced. Hardware and engineering values, as well as run-time flags and time stamps, can be recorded.

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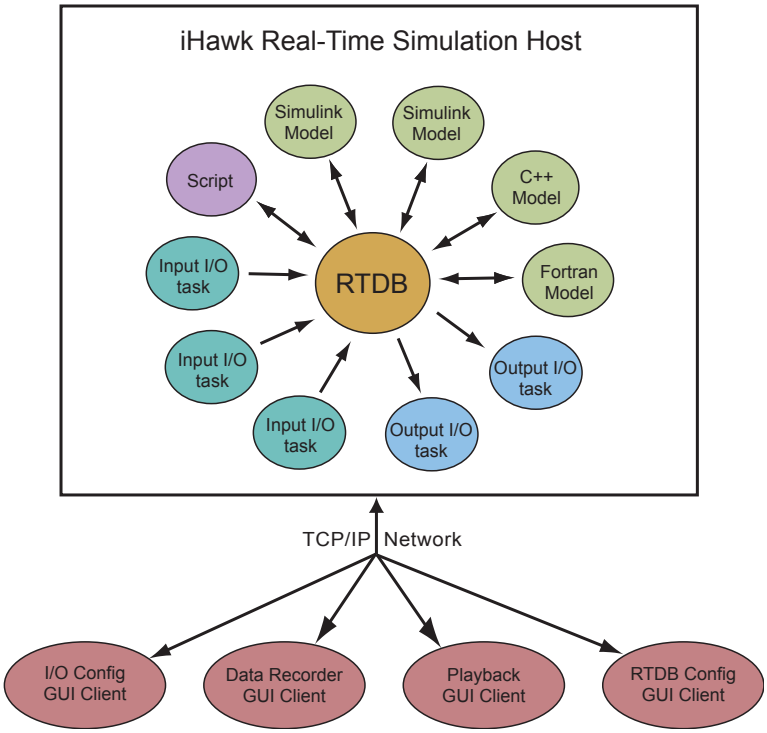
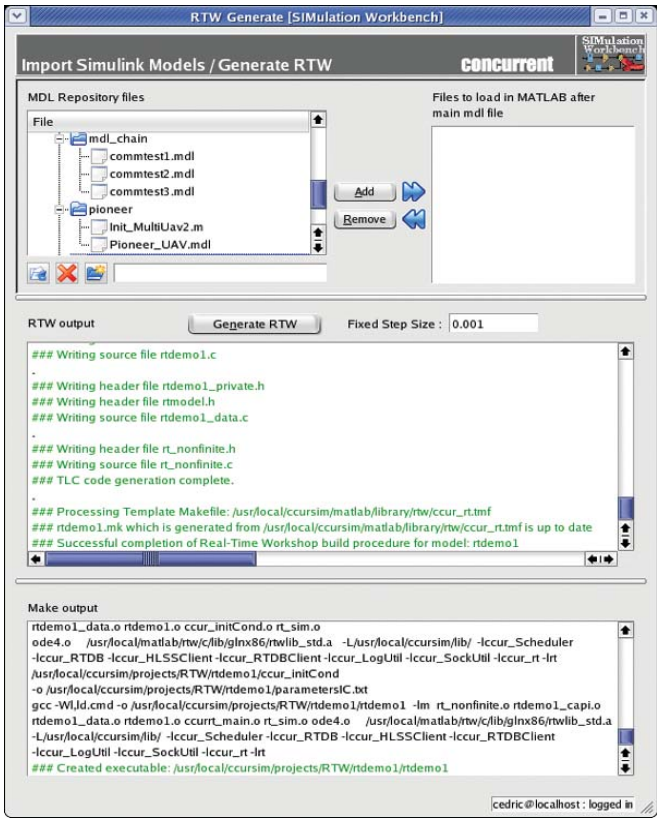
Integrated Solutions... Real Benefits



SWB's client-server architecture and RTDB assure real-time performance.



GUI clients provide for seamless integration of Simulink models.

Depending on the performance required, data recording can be run on the real-time host or on a separate networked server. Data recording can be turned on and off during simulation runs by GUI command, real-time script or user program.

Simulation Playback

SWB's Playback tool allows recorded test runs to be replayed into the system. The user selects the recorded session and simply starts a test run in playback mode.

Playback of recorded test runs is an alternate mechanism for storing data values into the RTDB. Instead of the data values being acquired from hardware, they are read from recorded files. Similarly, output variables that have been recorded override the outputs computed by the models. During a playback session, values for the data items that have not been recorded can be read from hardware as in a normal session run.

The playback interface allows a user to forward to a specified time within a recorded session as well as stepping through its execution frame-by-frame.

Support for Simulink and Legacy Models

SIMulation Workbench fully supports simulation models developed using The MathWorks' products. MATLAB/Simulink models can be integrated seamlessly into the SWB environment using Real-Time Workshop (RTW) and S-functions to the RTDB. Simulink model parameters are automatically extracted from the RTW model and mapped into the RTDB so they can be changed at run-time. An extensive API also allows C, C++ and Fortran legacy-code models to be integrated directly into SWB and executed together with Simulink models. Multi-rate execution is also supported.

Complete Real-time Linux Platform Support

SWB is fully supported on Concurrent iHawk™ multiprocessor platforms running RedHawk Linux. Simulation models are scheduled using RedHawk's Frequency Based Scheduler (FBS) under control of the iHawk's Real-Time Clock & Interrupt Module hardware (PCI) card. All I/O devices and Linux drivers required for your simulation are available directly from Concurrent.

Users can assign models to different system CPUs to achieve parallel execution. RedHawk Linux shielding features can also be used to guarantee real-time response by dedicating a CPU to a process.

Real-Time Scripting

SWB also provides the ability to control a simulation via a simple scripting language. Scripts give the user access to RTDB item values as well as access to test control, frame timing information and data recording. A script is run synchronously during its own subcycle as part of the synchronous execution loop. The scripting language also has the ability to attach signal generators and ramp functions to an RTDB item.

Data Visualization and Plotting

SWB's data browsing tool allows the value of all RTDB items to be viewed and plotted in real-time. This tool also provides a basic GUI to modify RTDB values. Visualization into real-time execution can be extended by designing custom user interfaces using industry standard National Instruments' LabVIEW virtual instruments.

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