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DRC Coprocessor Systems
accelerating results

Reconfigurable Computing Toolbox

The Reconfigurable Computing Toolbox is the premier FPGA supercomputing solution for MATLAB® and Simulink®. DSPlogic's RC Toolbox removes the barriers to software acceleration using Reconfigurable Computing platforms. From reconfigurable supercomputers to embedded systems, the RC Toolbox allows software programmers to harness the performance of hybrid CPU/FPGA computers. For hardware engineers, the RC Toolbox provides dramatic increases in productivity while maintaining performance and robustness. For applications ranging from molecular dynamics and finance to bioinformatics and DSP, the RC Toolbox's hardware abstraction and portability protect your programming investment and enable future technologies.

Performance

High clock rates, easy expression of parallelism and pipelining maximize software acceleration

Would you buy a 1 GHz processor when you can get a 2 GHz processor for the same price? That's the difference between DSPlogic and our competitors. Our programming language and Platform Compiler have been designed to maximize clock speeds for each RC platform – up to twice the speed of some high-level C-to-FPGA compilers. Same hardware – twice the performance. So which programming tool would you choose?

DSPlogic's graphical programming language also allows you to easily express the fine-grained parallelism and pipelining that are key to performance. High Level Language (HLL) compilers have a notoriously difficult time extracting this information from existing code, if it even exists.

Hardware engineers still have access to HDL and low-level programming for further performance optimization, if needed.

Our platform optimized CPU/FPGA communications provides maximum acceleration when the FPGA is used as a co-processor.

Productivity

Graphical programming, the Platform Builder and the RC Debugging Toolbox maximize productivity.

- **Graphical Programming** – Improves productivity of software programmers with a short learning curve and productivity of hardware engineers with a high-level alternative to HDL for rapid programming.
- **Platform Builder** – Just select an RC Platform and the Platform Builder does the rest – automatically generates platform-specific logic and executes FPGA implementation tools. Allows programmers to focus on software, not hardware and platform specific details.
- **Debugging Toolbox** – Debug and validate applications remotely - without access to hardware. Use Matlab to easily create input data, verify output data, and visualize results.
- **IP Integration** – Easily include existing IP cores, optimized HDL, or the output of high-level C compilers into your program.
- **Matlab®/Simulink® Integration** – Theorize, analyze, visualize, and program accelerated applications in one familiar environment.



Portability

Program your application, not the hardware!

Protect the investment you make when you create an accelerated RC application. Hardware abstraction and automatic platform code generation allow you to focus on programming your application, not platform specific details. Take advantage of new FPGA technology and RC platforms without the large cost of application porting.

- **Portable, platform independent CPU/FPGA communications** – Easily send data and function call parameters back and forth between CPU and FPGA programs. Bandwidth and latency optimization are handled transparently by DSPlogic's RCIO libraries.
- **One-click bitstream generation** – Easily switch RC platforms without modifying software. Use the Platform Builder to automatically recompile your program into an executable bitstream. While other tools may leave you at the mercy of hardware implementation tools (i.e. synthesis, place and route) the Platform Builder finishes the job.

Applications

The RC Toolbox is a general-purpose programming environment that may be used to develop both accelerated software applications and high-performance embedded solutions. Application areas include:

- Oil Exploration / Seismic Processing
- Database searching
- Bioinformatics
- Software Defined Radio
- Cryptography
- Digital Signal and Image Processing
- Molecular Dynamics
- Traffic and Crash Simulation
- Remote Sensing, Astrophysics

Programming

The RC Toolbox includes a high-productivity and high-performance graphical programming language.

With a short learning-curve, programmers can quickly create custom reconfigurable computing applications. The graphical environment makes it easy to visualize the parallel and pipelined program constructs necessary for maximum acceleration.

- **Simple program flow** – easily implement loops, conditional branches, case statements and other common programming constructs
- **Math Library** – Perform floating-point, fixed-point and integer math operations
- **Parallel memory access** – Easily program parallel memory reads and writes for efficient use of underlying hardware and maximum acceleration.

Seamless Matlab®/Simulink® Integration

DSPlogic has created the first and only reconfigurable computing toolbox available for the Matlab/Simulink tool suite.



Applications are programmed within Simulink using optimized libraries from the RC Blockset. The RC Blockset allows users to implement programming constructs – from simple loops and branches to advanced parallel operations and memory accesses that cannot be represented in standard ANSI-C.

The RC Toolbox also allows users to:

- Debug and verify applications
 - Create, analyze, and visualize data
 - Compile FPGA bitstreams
- all within the Matlab/Simulink environment.

IP Integration and HLLs

Integrate your own Intellectual property (IP) cores, HDL designs, or use optimized cores from Xilinx System Generator, such as the FFT.

Some customers have even incorporated high-level C-to-FPGA designs into the RC Toolbox programming flow.

One environment for all programmers

The RC Toolbox offers benefits for all types of programmers:

- **Software Programmers** – Spend your time programming software – not designing hardware
- **Hardware Engineers** – Improve productivity without compromising performance. Low-level programming and IP core integration are available for further optimization
- **Scientists** – Theorize, analyze, and visualize, and implement algorithms in one familiar environment.

Integrated CPU/FPGA Communications

The Reconfigurable Computing I/O (RCIO) abstraction layer provides platform independent, transparent CPU/FPGA communications, providing an easy way for CPU and FPGA functions to pass parameters and data.

A key factor in both application portability and performance, the RCIO Libraries are optimized for each RC platform, providing high bandwidth, low latency, and low overhead.

RC Debugging Toolbox

A comprehensive Matlab-based Debugging Toolbox lets you debug and validate the entire reconfigurable program without access to hardware.

The Debugging Toolbox allows you to easily pass data to and from the reconfigurable application, perform a cycle- and bit-accurate simulation within Simulink, and validate the results.

By simulating only the application processor, not platform specific logic, the speed of debugging and simulation is greatly improved.

Platform Builder

The RC Toolbox doesn't leave you at the mercy of confusing FPGA implementation tools.

The RC Toolbox uses a total platform programming approach. When the

application is debugged and validated, the Platform Builder **automatically**:

- compiles your graphical program,
- generates RCIO logic,
- generates all platform-specific logic,
- performs synthesis, mapping, place and route,
- validates the performance and computational integrity of program, and
- creates a verified FPGA bitstream

By simply selecting another platform in the Platform Builder, a program may be re-compiled to compare the performance of two platforms.

Supported Platforms

The RC Toolbox has been designed to be portable to all hybrid CPU/FPGA platforms. The development environment is ideal for reconfigurable supercomputers, embedded systems and software radio platforms.

Fully supported, commercial versions of the RC Toolbox are currently available for all Cray and DRC FPGA computing platforms.

DSPlogic also creates custom Platform Support Packages (PSPs) for both proprietary and commercially available FPGA computing platforms.

For more information on creating a PSP for your hardware platform, please contact DSPlogic.

Software Requirements

Software development is supported on the Windows XP operating system. The following additional software is also required to use the RC Toolbox:

- Matlab/Simulink
- Xilinx ISE Foundation
- Xilinx System Generator

Bundled pricing is available.

For More Information:

Call **1-877-DSPLOGIC** or visit www.dsplogic.com



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