

LabVIEW for Embedded Development

NI LabVIEW Embedded Development Module

- High-level graphical programming
- More than 400 built-in numerical analysis and signal processing VIs
- Embedded Project Manager for target processor platforms
- Plug-in examples for toolchain, board, and OS support
- Interactive front panel and block diagram based debugging
- Built in OCDI (on-chip debug interface)
- Code Generator for breadth of toolchain/target support

Required Software

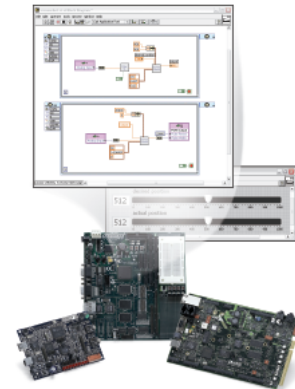
- Third-party embedded toolchains for 32-bit processors

Compatible Software

- Examples provided for:
 - Wind River Tornado and VxWorks
 - GCC and eCos

Compatible Hardware Targets

- 32-bit microprocessors with a C-supported toolchain
- Examples provided for:
 - Axiom CMD565
 - Intel IXDP 425



Increase Productivity through Graphical Development of Embedded Software

Use National Instruments LabVIEW graphical development to design embedded software that incorporates general-purpose logic, control, signal processing, and analysis capability. Unlike other high-level graphical development tools, the NI LabVIEW Embedded Development Module delivers a full-function graphical language or embedded software design from algorithm to implementation.

The LabVIEW Embedded Development Module makes it easy to incorporate legacy code as well as analog, digital, and communications I/O drivers through specialized VIs. The software is built on a plug-in framework with which you can automate the build process for your embedded toolchain, embedded OS, and 32-bit target platform of choice. Once you create the target plug-in, you can describe your entire application graphically, and automatically build an executable to be downloaded to your 32-bit custom design. With the built-in OCDI, you can connect directly to JTAG, BDI, and Nexus probes for live debugging of the target hardware.

Development Process

Use the LabVIEW Embedded Development Module to implement development in two steps. The first step involves the integration of a third-party toolchain and OS into the build process by using the Embedded Project Manager. This is a one-time operation for the target toolchain, OS, and processor combination. The LabVIEW Embedded Development Module comes with toolchain plug-in examples to demonstrate how you complete this integration.

Once you create the target plug-in, the interactive graphical design process begins. As shown in Figure 1, you need to develop or import an existing LabVIEW VI. Simply run the application to build an executable. You then can run the target executable on a PC-target simulator such as WindRiver VxSim Windows Console or download your application directly to the target platform. Once the executable is running on the target hardware, use an interactive front panel to send and receive data from the application or use graphical block-diagram debugging directly on the PC.

Applications

The LabVIEW Embedded Development Module is an ideal tool for embedded developers who are not experts at C-based programming and want to build applications that combine general-purpose logic with signal processing or numerical algorithms. The LabVIEW Embedded Development Module combines a set of more than 400 signal processing and analysis functions in addition to native LabVIEW programming structures to offer a complete graphical language for developing algorithms and implementing embedded software.

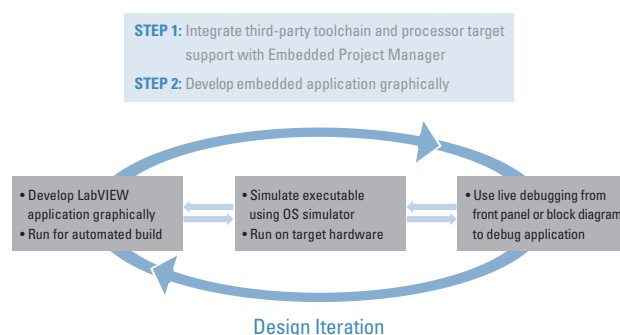


















Figure 1. Embedded Application Development Process

LabVIEW for Embedded Development





Signal Processing

	Signal Generation	Use the Signal Generation VIs to generate 1D arrays with specific waveform patterns. The Signal Generation VIs generate digital patterns and waveforms.
	Time Domain	Use the Time Domain VIs to perform time-domain analysis. The Time Domain VIs implement some transforms commonly used in mathematics and signal processing.
	Frequency Domain	Use the Frequency Domain VIs to implement common transforms used in mathematics and signal processing. The Frequency Domain VIs perform frequency-domain transformations, frequency-domain analysis, time-domain analysis, and other transforms, such as Hartley and Hilbert transforms. The Frequency Domain generates a waveform containing a sine wave.
	Filters	Use the Filter VIs to implement IIR, FIR, and nonlinear filters.
	Windows	Use the Windows VIs to implement smoothing windows and to perform data windowing.

Mathematics

	Formula	Use the Formula VIs to parse formulas, which are in the form of a string, and convert the formula strings to a form that you can use to evaluate results. A Formula VI simulates a sine wave, square wave, triangle wave, sawtooth wave, or noise (D.C.) signal.
	1D and 2D Evaluation	Use the 1D and 2D Evaluation VIs to examine 1D and 2D functions given in symbolic form, where parameterization is allowed. You can numerically calculate extreme and partial derivatives.
	Calculus	Use the Calculus VIs for calculus and solving differential equations.
	Probability and Statistics	Use the Probability and Statistics VIs to perform probability, descriptive statistics, analysis of variance, and interpolation functions.
	Curve Fitting	Use the Curve Fitting VIs to perform curve-fitting analysis or regression.
	Linear Algebra	Use the Linear Algebra VIs to perform matrix-related computations and analysis.
	Array Operations	Use the Array Operations VIs to perform common 1D and 2D numerical analysis.
	Optimization	Use the Optimization VIs to determine local minima and maxima of real 1D or n-dimension functions. You also can use special methods like linear programming, the Levenberg-Marquardt method in symbolic form, and the Pade and Chebyshev approximations.
	Zeros	Use the Zeros VIs to find the zeroes of 1D or n-dimension, linear or nonlinear functions or systems of functions.
	Special and Numeric Functions	Use the Special and Numeric Functions VIs to evaluate common mathematical functions.
	Polynomial	Use the Polynomial VIs to perform calculations and evaluations with polynomials.

Additional Libraries

	Elemental I/O	Use the Elemental I/O functions to acquire real-world signals on your board. You can perform analog I/O, digital I/O, digital bank I/O, and pulse-width modulation I/O.
	Embedded CAN	Use the Embedded CAN VIs on an embedded target running the VxWorks OS to communicate with CAN.
	File I/O	Use the File I/O VIs and functions to open and close files; read from and write to files; create directories and files you specify in the path control; retrieve directory information; and write strings, numbers, arrays, and clusters to files.
	Real-Time FIFO	Use the Real-Time FIFO VIs to transfer data between VIs in an application. RT FIFOs ensure deterministic behavior by imposing a size restriction on the data. Both a reader and writer can access the data in an RT FIFO at the same time, allowing RT FIFOs to work safely in a time-critical VI.

Ordering Information

NI LabVIEW Embedded Development Module779206-03

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