RELEASE AND UPGRADE NOTES

LabVIEW™ FPGA Module

Version 2012

This document contains instructions for installing the LabVIEW 2012 FPGA Module and related products, introduces new features, and provides information about upgrading from the previous version of LabVIEW. Refer to the resources listed at the end of this document for information about developing applications with LabVIEW and the FPGA Module.

Contents

NATIONAL INSTRUMENTS™

System Requirements

The development computer is a PC or NI PXI/PXI Express system on which you install LabVIEW and the LabVIEW FPGA Module. You can use this computer to compile FPGA VIs, but if the FPGA design or target requires more than 2 GB of memory, National Instruments recommends installing the LabVIEW FPGA compilation tools on a separate computer. This computer is referred to as the remote compile server.

Development Computer

- LabVIEW 2012 Full or Professional Development Systems (32-bit)
- 1.2 GHz Pentium processor or equivalent
- 11 GB additional disk space
- Memory[1]:
    – At least 3 GB of RAM for Virtex-5 and earlier FPGA targets
    – At least 4 GB of RAM for Virtex-6 and later[2] FPGA targets
- One of the following operating systems:
    – Windows 7 (32-bit)[3]
    – Windows 7 (64-bit with 32-bit LabVIEW installed)
    – Windows Vista (32-bit)
    – Windows Vista (64-bit with 32-bit LabVIEW installed)
    – Windows XP Pro (Service Pack 3)
    – Windows Server 2003 R2 (32-bit)[4]
    – Windows Server 2008 R2 (64-bit with 32-bit LabVIEW installed)
- FPGA device
- Device driver software—To program most devices with the LabVIEW 2012 FPGA Module, install the NI-RIO 12.0 driver software. Refer to the hardware documentation for different requirements for a specific device.

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[1] Memory requirements vary according to both the FPGA target and the FPGA VI you create for that target. To determine your memory needs, monitor the memory usage of the `xst.exe` process in the Windows Task Manager.

[2] You must use a 64-bit OS to address 4 GB of RAM.

[3] The LabVIEW FPGA Module uses Xilinx compilation tools that do not officially support Windows 7. NI obtained permission from Xilinx to allow LabVIEW FPGA Module customers to use the tools on this platform, with the disclaimer that Xilinx is not able to fix any bugs found that are specific to this platform. NI tested the Xilinx tools that the LabVIEW FPGA Module uses and did not find any issues. If you encounter problems with the Xilinx tools and Windows 7, you might need to compile using Windows XP or Vista. In such cases, you might want to install the Xilinx compilation tools on a separate computer. Refer to ni.com/info and enter the Info Code fpgakb1rcs for information about installing the compilation tools on a separate computer. NI is not liable for any problems or issues related to the use of Xilinx tools with Windows 7.

[4] The LabVIEW FPGA Module does not support the Windows Server non-R2 editions.

Remote Compile Server and Worker

If you install the Xilinx compilation tools on a separate computer, you can configure that computer to be either the remote compile server or a remote compile worker. This computer must meet the following specifications:

- 11 GB of disk space for the complete set of Xilinx compilation tools
- One of the following operating systems:
  - Windows XP Pro (Service Pack 3)
  - Windows Vista (32-bit)
  - Windows Vista (64-bit)
  - (Worker only) Red Hat Enterprise Linux 5.6

NI also offers the LabVIEW FPGA Compile Farm Toolkit and the LabVIEW FPGA Compile Cloud Service, both of which increase your development efficiency by offloading compiles to multiple computers. Refer to the National Instruments web site at `ni.com` for information about these products.

Installation

The following sections provide information about installing the LabVIEW FPGA Module and related components.

📝 **Note** If you are upgrading from a previous version of LabVIEW, you must install LabVIEW 2012 before you install the LabVIEW 2012 FPGA Module to mass compile existing VIs successfully. If you mass compile existing FPGA VIs before you install the LabVIEW FPGA Module, some FPGA-specific VIs might have mutation issues.

Installing the LabVIEW FPGA Module on a Development Computer

Complete the following steps to install LabVIEW and the FPGA Module.

1. Log in as an administrator or as a user with administrative privileges.
2. Insert the LabVIEW Platform DVD 1.

   To request additional LabVIEW 2012 Platform DVDs, refer to `ni.com/info` and enter the Info Code `RequestDVD`. If you purchased this product with an NI Software Suite or NI Product Bundle, use the installation media that shipped with your purchase to install this product.

   💡 **Tip** If the installer does not start automatically, double-click `setup.exe` from the media to launch the installer.

3. Follow the instructions on the screen to install and activate the following software:

- **LabVIEW**
- **FPGA Module**
- **Compilation Tools**—Refer to your hardware documentation for information about the FPGA in your device and install the appropriate set of tools.
  - **Compilation Tools for Spartan 3, Spartan 6, Virtex 5, and Virtex 6 FPGA Devices**—Install these compilation tools on the development computer to create simulation exports, configure the IP Integration Node, or use the Configure Component-Level IP wizard.
  - (Optional) **Compilation Tools for Virtex-II FPGA Devices**—Install these compilation tools only if your FPGA device contains a Xilinx Virtex-II or Virtex-II Pro FPGA. To install these compilation tools, insert the 2012 Xilinx Compilation Tools installation media and follow the instructions on the screen.
- (Optional) **FPGA Compile Farm Toolkit**—Use the FPGA Compile Farm Toolkit to distribute FPGA VI compiles across multiple remote computers. You have a temporary license for this product. During this period, you can compile two FPGA VIs simultaneously. After the evaluation period expires, you can compile one FPGA VI at a time.
- (Optional) **Real-Time Module**—Use the LabVIEW Real-Time Module to program the real-time OS on NI PXI, NI PXI Express, NI CompactRIO, and NI Single-Board RIO devices. You have a temporary license for this product.
- **Device Drivers**—NI-RIO 12.0 is the device driver software for most FPGA targets. Refer to your hardware documentation for information about additional or different device drivers you need.

In addition to installing program files and documentation in the LabVIEW directory, the installer also puts files from Xilinx in the $x:\backslash$NIFPGA directory, where x is the drive on which you installed LabVIEW. The LabVIEW FPGA Module uses these files to compile FPGA VIs into code that runs on an FPGA target.

Installing the Compilation Tools on a Separate Computer

Setting Up a Remote Compile Server or Worker

- **Windows**—Refer to ni.com/info and enter the Info Code fpgakb1rcs for information about installing the Xilinx compilation tools on a computer that is not the development computer.
- **Linux**—Refer to ni.com/info and enter the Info Code FPGAcwl for information about setting up a remote compile worker.

Installing the Compilation Tools for Linux

Install the LabVIEW FPGA Compile Worker on a remote computer running Linux to use the remote computer to compile FPGA VIs:

1. Log into the system as `root`.

2. Insert the 2012 Xilinx Compilation Tools installation media. Use `mount/mnt/cdrom` to mount the media. On some systems, the media mounts automatically.

3. To change the current directory to the mounted media, enter the following command:

    ```
    cd /mnt/cdrom
    ```

4. To run the installation script, enter the following command:

    ```
    su ./INSTALL
    ```

Activating the LabVIEW FPGA Module

The LabVIEW FPGA Module relies on licensing activation. You have a temporary license that includes both the FPGA Module and the Xilinx tools that the FPGA Module uses. When the evaluation period expires, you must activate a valid FPGA Module license to continue using the software. Activating the FPGA Module license also activates the license for the Xilinx tools. You must create an `ni.com` User Profile to activate your software.

Use the NI License Manager, available by selecting **Start»All Programs»National Instruments»NI License Manager**, to activate NI products. Refer to the *National Instruments License Manager Help*, available by selecting **Help»Contents** in the NI License Manager, for more information about activating NI products.

Version 2012 Features and Changes

The LabVIEW 2012 FPGA Module includes the following new features. Refer to the *LabVIEW Help*, available by selecting **Help»LabVIEW Help** in LabVIEW, for more information about these features.

Starting Points for Designing Common Applications

The NI-RIO driver software provides the following sample projects to help you create applications that use reliable designs and programming practices:

*   **LabVIEW FPGA Control on CompactRIO**—Implements deterministic, hardware-based control of a plant. This sample project uses code written with the LabVIEW FPGA Module.
*   **LabVIEW FPGA Waveform Acquisition and Logging on CompactRIO**—Acquires continuous waveform data and logs it to disk. This sample project uses code written with the LabVIEW FPGA Module.
*   **LabVIEW Real-Time Control on CompactRIO (RIO Scan Interface)**—Implements deterministic, software-based control of a plant. This sample project uses the RIO Scan Interface for I/O.

Access these sample projects by selecting **File»Create Project** in LabVIEW.

Limited Support for the Single-Precision Floating-Point Data Type

Some functions now support the single-precision floating-point data type when used in FPGA VIs. For a list of supported functions, refer to the *Functions that Support the Single-Precision Floating-Point Data Type in FPGA VIs* topic in the *LabVIEW Help*.

Support for the FPGA Interface on 64-bit LabVIEW

You now can use 32- or 64-bit LabVIEW to run host VIs that communicate with FPGA bitfiles.

Compile Worker Support for Linux

You now can offload compiles to a remote compile server running Linux.

Improvements to Array Support

The following sections provide information about the improvements made to array support.

Support for Arrays in High Throughput Math Functions

The High Throughput Add, Subtract, and Multiply functions now support arrays of the fixed-point data type. The Reinterpret Number function now supports arrays of integer and fixed-point data types.

Support for Arrays and Clusters in Single-Cycle Timed Loops

You now can wire arrays and clusters to certain Numeric and Boolean functions inside a single-cycle Timed Loop. All Numeric and Boolean functions support array and cluster inputs in the single-cycle Timed Loop unless otherwise noted in the detailed information for each function.

Additional Control over Memory Implementation for Array Constants

You now can specify how LabVIEW implements array constants. In previous versions of the FPGA Module, LabVIEW implemented array constants only in flip-flops. You now can specify a block memory or look-up table implementation if you meet specific design requirements in your FPGA VIs.

Improvements to DMA and Peer-to-Peer FIFOs

LabVIEW 2012 brings the following improvements to DMA and peer-to-peer FIFOs:

- You now can create deeper DMA and peer-to-peer FIFOs.
- You now can use an external data value reference to implement DMA FIFOs without a data copy and while making better use of memory resources.
- You now can transfer multiple smaller data elements at once when using DMA or peer-to-peer FIFOs.

Improvements to Storing Data

You now can store and access memory from multiple clock domains or from different parts of your design while consuming fewer FPGA logic resources than the same design using FIFOs.

Timing Improvements to Single-Cycle Timed Loops

LabVIEW 2012 brings the following improvements to the timing performance of single-cycle Timed Loops:

*   Single-cycle Timed Loops running on the development computer in different clock domains now execute in phase with each other.
*   For some targets, you now can improve the timing performance of high-speed streaming applications by removing the implicit enable signal from eligible single-cycle Timed Loops. Refer to your target hardware documentation for information about support for removing the implicit enable signal.

Improved Support for LabVIEW Classes

You now can use more capabilities of LabVIEW object-oriented programming when creating FPGA VIs. You also can create LabVIEW classes in FPGA VIs that contain refnums or name controls.

Improving the Performance of FIFOs in a Single Clock Domain

If you implement a target-scoped FIFO in a single clock domain using block memory, the read-to-write latency is reduced in the LabVIEW 2012 FPGA Module.

Upgrade and Compatibility Issues

The following sections provide information about upgrading from the LabVIEW 2011 FPGA Module to the LabVIEW 2012 FPGA Module. Refer to previous editions of the *LabVIEW FPGA Module Release and Upgrade Notes*, available on ni.com, for changes in previous versions of the FPGA Module.

Note NI recommends you test all FPGA designs after upgrading. Upgrading the LabVIEW FPGA Module requires upgrading to a new version of the Xilinx compilation tools. This upgrade can change the timing or resource utilization characteristics of FPGA VIs you developed in previous versions or cause these VIs to fail to compile.

VIs that Contain an IP Integration Node

If you open a VI saved in a previous version of LabVIEW that contains an IP Integration Node, you must regenerate support files for the IP. To complete this task, select **Tools»FPGA Module»Regenerate Support Files for IP Integration Nodes** in LabVIEW 2012. Follow the on-screen instructions to generate the support files for LabVIEW 2012.

📝 **Note** LabVIEW might not be able to update all support files; in this situation, re-add the IP Integration Node to the VI and generate the support files for the new node.

Known Issues

Refer to the National Instruments web site at ni.com/info and enter the Info Code LVFPGA2012KI to access the known issues for the LabVIEW 2012 FPGA Module.

Where to Go from Here

NI provides many resources to help you succeed with your NI products. Use the following resources as you start exploring LabVIEW and the FPGA Module.

Documentation and Examples

Use the following resources to learn more about using LabVIEW and the FPGA Module.

- **Context Help Window**—Available by pressing <Ctrl-H>. This window provides brief descriptions of VIs, functions, and dialog boxes along with a link to more detailed information.

- **LabVIEW Help**—Available by selecting **Help»LabVIEW Help** in LabVIEW. Browse the **FPGA Module** book in the **Contents** tab for an overview of the FPGA Module and hardware-specific information. Browse the **FPGA Interface** book in the **Contents** tab for an overview of the FPGA Interface information.

- **Hardware Documentation**—Refer to the documentation that came with the FPGA target hardware for information about that hardware. The documentation might be installed on disk instead of printed.

- **Examples**—The driver software for many FPGA targets includes corresponding examples. Refer to the specific hardware documentation for information about whether the FPGA target you use comes with corresponding examples.

  You can start with an existing example and use it as a starting point for developing FPGA VIs and host VIs. From LabVIEW, launch the NI Example Finder by selecting **Help» Find Examples**. Browse the examples by directory or by task.

- **Sample Projects**—The NI-RIO driver software installs several sample projects that are designed as starting points for common applications. You can adapt these sample projects to your own applications. Access these sample projects by selecting **File»Create Project** in LabVIEW.

National Instruments Web Site

Refer to ni.com/info and enter the Info Code LabVIEW_FPGA for the latest NI Developer Zone articles, examples, and support information for the FPGA Module.

Refer to ni.com/info and enter the Info Code fpgatrn to access online training for the FPGA Module.

Where to Go for Support

The National Instruments Web site is your complete resource for technical support. At ni.com/support you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at ni.com/support and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, visit the Worldwide Offices section of ni.com/niglobal to access the branch office Web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.