



This document lists the release notes for the Nios® II Embedded Design Suite (EDS) version 6.1.

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New Features & Enhancements

The Nios II EDS version 6.1 addresses issues found in previous releases, and adds the following primary features:

- NicheStack TCP/IP Stack - Nios II Edition
- Interrupt vector custom instruction
- Nios II integrated development environment (IDE) based on the latest version of the Eclipse platform
- Memory footprint reduction options

The sections below provide a detailed list of all product updates, including known issues fixed in this release.

Device & Host Support

This release supports the following Altera® FPGA families:

- Stratix® III
- Stratix II and Stratix II GX
- Stratix and Stratix GX
- Cyclone™ II
- Cyclone



The host system requirements for the Nios II EDS are based on the requirements for the Altera Complete Design Suite. Refer to *Quartus II Installation & Licensing for PCs* or *Quartus II Installation & Licensing for UNIX and Linux Workstations* manual.

Installation and Licensing Instructions



For installation instructions, refer to *Quartus II Installation & Licensing for PCs* or *Quartus II Installation & Licensing for UNIX & Linux Workstations* on the Altera website at www.altera.com/literature/lit-qts.jsp.

Using Previously Installed Versions of the Nios II EDS

SOPC Builder and the Nios II IDE refer to the most recently installed version of components (such as the Nios II processor and peripherals) and their software drivers. To revert to a prior version of the Nios II development tools, you can reinstall the previous version of tools or modify the following environment variables.

- `SOPC_BUILDER_PATH` - Ensure that `SOPC_BUILDER_PATH` points to the installation directory of the desired Nios II version and no other Nios II versions.
- `SOPC_BUILDER_PATH_<version>` - Ensure that `SOPC_BUILDER_PATH_<version>` points to the installation directory of the corresponding Nios II version.
- `SOPC_KIT_NIOS2` - Ensure `SOPC_KIT_NIOS2` points to the installation directory of the desired Nios II version and no other Nios II versions.

If you have multiple versions of the Quartus II software installed, launch the supported version of Quartus II to ensure that the `QUARTUS_ROOTDIR` environment variable is updated.

Nios II Processor Cores

This section describes changes to the Nios II processor cores.

Interrupt vector custom instruction

This new custom instruction introduced in Nios II version 6.1 provides lower latency when dispatching interrupts. When enabled, it is automatically supported by the hardware abstraction layer (HAL).

Floating point custom instruction

The floating point custom instruction is enhanced in version 6.1. The changes include:

- Improved divide performance (Fmax)
 - Up to $2x f_{MAX}$ increase depending on design and target device
 - Increased memory utilization is a result of this improvement. Designs from version 6.0 will use more embedded memory blocks when compiled in version 6.1. The divider uses approximately 160,000 memory bits and 4,000 logic elements in Cyclone, Cyclone II, and Stratix devices and approximately 2,000 ALUTS in Stratix II devices.
- Increased latency
 - The latency in clock cycles for various operations is as follows. All operations require one initial clock cycle to register the inputs.
 - Divide: 32 (26 in version 6.0)
 - Multiply: 6 (unchanged from version 6.0)
 - Add / Sub: 8 (unchanged from version 6.0)
- No denormal outputs
 - All denormal inputs and output are treated as zero in version 6.1 floating point custom instruction.

SOPC Builder

This section describes changes to SOPC Builder which affect Nios II designers. For complete revision history of SOPC Builder and the Quartus II software, refer to the release notes for the Quartus II software version 6.1. The *Quartus II Handbook, Volume 4: SOPC Builder* contains complete documentation for SOPC Builder.

There are no major changes to SOPC Builder that affect the Nios II processor this release.

Nios II IDE

This section describes changes to the Nios II integrated development environment (IDE).

Updated to latest version of Eclipse and CDT

The Nios II IDE was updated to use Eclipse version 3.2 and CDT version 3.1. This update provides faster startup time, improved debugger responsiveness, and faster memory view scrolling.

New location for projects

By default, in version 6.1 the Nios II IDE starts in a clean workspace and does not prompt for a workspace at startup. To convert your existing projects to 6.1 projects, you can either individually import your projects into the new workspace, or point the IDE at your previous workspace to convert all your projects at one time. Refer to the [Upgrading Projects for the Nios II IDE v6.1 cheat sheet](#) available in the IDE. You can also enable the **Prompt for workspace on startup** option. To find this option, click **Preferences** on the Window menu, then expand the **General** group and click the **Startup and Shutdown** page.

Nios II C-to-Hardware Acceleration (C2H) Compiler

The Nios II C-to-Hardware Acceleration (C2H) Compiler was introduced in the Nios II EDS version 6.0. The C2H Compiler is a tool that allows you to create custom hardware accelerators directly from ANSI C source code, which can often improve the execution performance by an order of magnitude. Documentation on the C2H Compiler is available on the Nios II literature page, <http://www.altera.com/literature/lit-nio2.jsp>.

This section describes changes to the C2H Compiler.

Pipelined function calls

A function being accelerated by the C2H Compiler can contain sub-function calls. For each sub-function called within a C2H-accelerated function, the C2H Compiler generates an additional hardware accelerator which is then invoked by the original C2H accelerator generated for the top-level function. In version 6.1, a sub-function call from within a C2H-accelerated function can be pipelined with the calling function, based on normal data dependencies, and therefore may not stall the calling function's pipeline.

Multiplier sharing

The C2H Compiler will try to conserve FPGA resources by sharing hardware multipliers, barrel shifters, and dividers whenever possible. For example, when a loop or function in the accelerated C code contains more than one multiply operation, those multiply operations may be scheduled sequentially, using the same multiplier resource. This serialization of multiply operations occurs when, and only when, the extra multiply operations can be scheduled during cycles when the shared multiplier resource is otherwise idle. Stated another way, separate multiply operations will be scheduled sequentially using the same multiplier resource until it increases the CPLI of the loop or function. At that point, additional multiplier resources will be instantiated to perform the additional multiplies in parallel. Divider and barrel shifter sharing works in the same way.

Flash Programmer

This section describes changes to the flash programmer in the Nios II IDE.

Flash programmer user interface updates

The flash programmer in the Nios II IDE was updated to allow you to customize the location to program FPGA configuration data and other data files into flash memory.

Target Software

This section describes changes to Altera-provided target software which runs on the Nios II processor, such as the hardware abstraction layer (HAL) system library.

NicheStack TCP/IP Stack - Nios II Edition

The NicheStack TCP/IP Stack - Nios II Edition is introduced in the Nios II EDS version 6.1. This TCP/IP stack supersedes the Lightweight IP (lwIP) stack that is also shipped with the Nios II EDS. The lwIP stack will be deprecated, and is not recommended for new designs.

Memory footprint reduction options

Several options are included in the Nios II IDE version 6.1 to allow you to reduce your memory footprint. These options include reducing stdio services, removing C++ support, and indicating that `main()` does not exist. Details on these options are available in the Nios II IDE on-line help.

MicroC/OS-II updated to version 2.83

The update to version 2.83 of MicroC/OS-II provides new configuration options in the IDE.

Avalon slave ports not mastered by CPU are not in `system.h`

In pre-6.1 versions of the Nios II EDS, all slave ports on a module that was mastered by the CPU appeared in the `system.h` file. In version 6.1, `system.h` will only contain definitions for slave ports that are mastered by the CPU in the system. For example, if a Nios II processor masters one port, S1, of a dual-port memory, only the S1 port will be defined in `system.h`; the S2 port will not be defined.

Example Designs

Hardware Example Designs

Stratix III Fast Design

A Nios II fast design targeting a Stratix III device is available in version 6.1, in the `<Nios II EDS install path>/examples/` directory.

Stratix II EP2S60 RoHS Fast Design

The start of on-chip memory was moved from 0x10000 to 0x0, and all the other addresses were shifted accordingly. Also, the on-chip memory latency was changed from 1 cycle to 2 cycles.

Cyclone II EP2C35 Designs

All the EP2C35 designs were updated to set all SSRAM pins to have drive strengths of 12mA (originally 24mA). This was done to reduce the noise which affected stable PLL operation.

Cyclone EP1C12 Evaluation Kit Designs

The hardware designs for the Cyclone EP1C12 evaluation board have been removed from the Nios II EDS.

Software Example Designs

Simple Socket Server

The Simple Socket Server software example now uses the NicheStack TCP/IP Stack in place of the lwIP stack.

Web Server

The Web Server software example now uses the NicheStack TCP/IP Stack in place of the lwIP stack. Web page control of various components on the board is also available.

Hello World Small

The Hello World Small example was updated to use the memory footprint reduction options. The current memory footprint is approximately 330 bytes.

Errata Fixed in this Release

This section lists errata items from previous releases which are fixed in version 6.1.

Nios II IDE does not prompt for workspace

The Nios II IDE might not prompt for the workspace at startup.

Resource(s) out of sync with the file system when searching for files in the workspace

When searching through files in the IDE workspace, you might get an error message saying that one or more resources are out of sync with the file system.

Nios II IDE stops responding after you double-click a .o file.

Double-clicking a .o file in the Nios II IDE on Windows might cause the IDE to stop responding. This issue occurs only on systems with a separate installation of Cygwin in addition to Cygwin installed with the Nios II development tools.

Cannot connect Nios II tightly-coupled instruction and data masters to the same dual-port memory

SOPC Builder does not generate an error if you connect Nios II tightly-coupled instruction and data masters to both ports on a dual-port on-chip memory. However, this configuration is not supported in hardware.

Nios II IDE help system fails to display content

To display the help content, your computer must be able to recognize itself on the network. Incorrect proxy settings can cause the help content to fail to display.

Linux: Out of memory error in IDE

On Linux, you might receive an out of memory error in the Nios II IDE when it is launched from SOPC Builder

Linux: F1 Help in the Nios II IDE does not function on Linux

Selecting F1 in the IDE on Linux does not display help contents.



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