Lattice Radiant Software User Guide

Contents

Chapter 1. Introduction

Introduction to Lattice Radiant Software

This user guide describes the main features, usage, and key concepts of the Radiant software design environment. It should be used in conjunction with the Release Notes and reference documentation included with the product software. The Release Notes document is also available on the Lattice website and provides a list of supported devices

Lattice Radiant® software is the leading-edge software design environment for cost- sensitive, low-power Lattice Field Programmable Gate Arrays (FPGA) architectures. The Radiant software integrated tool environment provides a modern, comprehensive user interface for controlling the Lattice Semiconductor FPGA implementation process. Its combination of new and enhanced features allows users to complete designs faster, more easily, and with better results than ever before.

Radiant Software Overview

The Radiant software uses an expanded project-based design flow and integrated tool views so that design alternatives and what-if scenarios can easily be created and analyzed. The Implementations and Strategies concepts provide a convenient way for users to try alternate design structures and manage multiple tool settings.

System-level information—including process flow, hierarchy, and file lists—is available, along with integrated HDL code checking and consolidated reporting features.

A fast Timing Analysis loop and Programmer provide capabilities in the integrated framework. The cross-probing feature and the shared memory architecture ensure fast performance and better memory utilization.

The Radiant software is highly customizable and provides Tcl scripting capabilities from either its built-in console or from an external shell.

The Radiant software has many of the same features as Lattice Diamond software, and adds new features, such as:

- Constraints support utilizing industry standard SDC format.
- Efficient, easy-to-use integrated graphical user interface (GUI) with a new look-and-feel that gives users more efficient access to popular tools.
- Unified timing analysis engine with enhanced timing reports for faster design timing closure.

Basic Design Prerequisites

Using the Lattice Radiant software to create a basic FPGA design requires the following prerequisite knowledge and software installation and licensing:

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Prerequisite Knowledge

To use the Lattice Radient software, you will need the following knowledge:

- Basic knowledge of digital design
- Basic knowledge of VHDL, Verilog HDL, System Verilog, or schematic tools

Prerequisite Software and Licensing

To use the Lattice Radiant software, your system must first meet the minimum Windows or Linux system requirements for installation. Next, download and install the software components. You must purchase a license for any applicable software prior to using the software.

The Lattice Radiant software is available for download from the Lattice Radiant Downloads and Licensing web page. Click the **Downloads** tab. Some documents and downloads are not visible. To view all items, log in to your Lattice account. Follow the product download instructions and uncompress the software.

Chapter 2. Getting Started

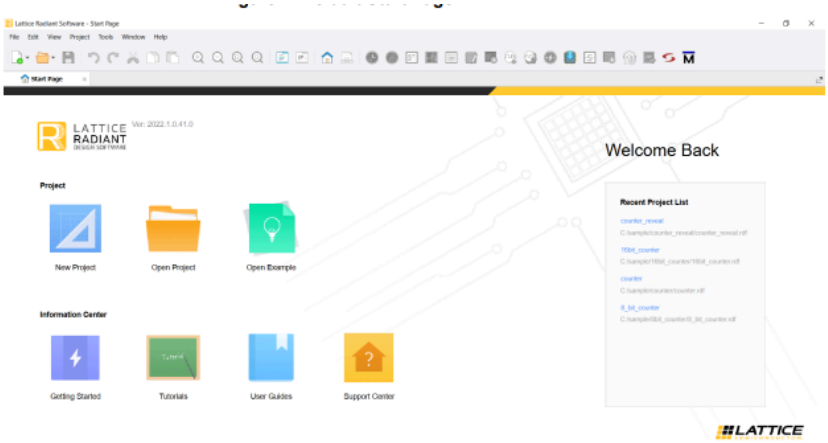
Running the Radiant Software

This topic describes how to run the Radiant software.

To run the Radiant software, follow these steps:

1. Download the software from the Lattice software web page and install the software.
2. Select **Radiant Software** from the installation location. The default Start page appears, as shown in Figure 1.

Figure 1. Figure 1. Default Start Page



Related information

Creating a New Project *(on page 5)*

Creating a New Project

This topic describes how to create a new project in the Radiant software.

A project is a collection of all files necessary to create and download your design to the selected device. The New Project wizard guides you through the steps of specifying a project name and location, selecting a target device, and adding existing sources to the new project.

Note:
Do not place more than one project in the same directory.

To create a new project, follow these steps:

From the Radiant main menu, click the **New Project** button, or choose **File > New > Project** .
The New Project confirmation window opens, as shown in Figure 2.

Figure 2. Figure 2. New Project Confirmation Window

Related information

Running the Radiant Software *(on page 5)*

Chapter 3. Design Environment Fundamentals

Radiant Software Design Environment

This chapter provides background and discussion on the technology and methodology underlying the Radiant software design environment.

Understanding some of the fundamental concepts behind the Radiant software framework technology will increase your proficiency with the tool and allow you to quickly come up to speed on its use.

The Radiant software is a next-generation software design environment that uses a new project-based methodology. A single project can contain multiple implementations and strategies to provide easily managed alternate design structures and tool settings

The process flow is managed at a system level with run management controls and reporting. Context-sensitive views ensure that you only see the data that is available for the current state in the process flow.

The shared memory technology enables many of the advanced functions in the Radiant software. Easy cross-probing between tool views and faster process loops are among the benefits.

Chapter 4. User Interface Operation

Radiant Software User Interface Operation

This chapter describes the user interface, controls, and basic operation of the Radiant software layout you choose.

The Radiant user interface (UI) provides a comprehensive, integrated tool environment. The UI is very flexible and configurable, enabling you to store constraints for the layout you choose.

Related information

Start Page *(on page 8)*
Menus and Toolbars *(on page 8)*
Basic UI Controls *(on page 9)*

Start Page

This section describes the major sections of the Start Page in the Radiant software.

The Start Page contains the following three major sections:

- **Project**: This section allows you to create a new project; open an existing Project, and open an example.
- **Information Center**: This section has links to Getting Started, Tutorials, User Guides, and Support Center.
- **Recent Project List**: Provides a quick way to load a recent project you've been working on.

The Start Page appears in the View area by default when the Radiant software is first launched, and can be opened from the View tab on the menu. The Start Page can be closed, opened, detached, and attached using the Attach button.

See Basic UI Controls *(on page 9)*.

Menus and Toolbars

This section describes the functionality of the menus and toolbars in the Radiant software.

At the top of the main window is the menu and toolbar area. High-level controls for accessing tools, managing files and projects, and controlling the layout are contained here. All toolbar functionality is also contained in the menus. The menus also have functions for system, project and toolbar control.

The Process Toolbar lists all the processes available, such as Synthesize Design, Map Design, Place & Route Design, and Export Files. A process is a specific task in the overall processing of a source or project. You can view the available processes for a design in the Process Toolbar. Click Task Detail View to see detailed information of the processes available.

Basic UI Controls

This section describes the basic UI controls for the Radiant software.

The Radiant software environment is based on modern industry standard user interface concepts. The menus, toolbars, and mouse pointer all behave in familiar ways. You can resize any of the window panes, drag and drop elements, right-click a design element to see available actions, and hold the mouse pointer over an object to view the tool tip. Window panes can also be detached from the main window and operated as independent windows.

Chapter 5. Working with Projects

Overview of Project and Implementation

This chapter covers projects and their elements. Implementations and strategies are explained and some common project tasks are shown.

Projects

A project is the top organizational element in the Radiant software design environment. Projects consist of design, constraint, configuration and analysis files. Only one project can be open at a time, and a single project can include multiple design structures and tool settings.

The Project menu commands enable you to do the following:

- Examine the project properties.
- Change the target device.
- Change the severity level of warning messages
- Set the synthesis tool
- Show the active strategy tool settings
- Set the top level design unit.

Implementations

An implementation is the structure of a design and can be thought of as what is in the design. For example, one implementation might use inferred memory while another implementation uses instantiated memory. Implementations also define the constraint and analysis parameters for a project.

There can be multiple implementations in a project, but only one implementation can be active at a time. And there must be one active implementation. Every implementation has an associated active strategy. Strategies are a shared pool of resources for all implementations and are discussed in the next section. An implementation is created whenever you create a new project.

Related information

Adding Implementations *(on page 11)*
Cloning Implementations *(on page 11)*

Adding Implementations

This section describes how to add implementations.

To add a new implementation to an existing project:, follow these steps:

1. Right-click the project name in the File List project view.
2. Select **Add > New Implementation**.
3. In the **New Implementation** dialog box, set the implementation name, directory, and default strategy.
4. To browse for the source files or use a source from an existing implementation, click on **Add Source**.

Cloning Implementations

This section describes how to clone implementations.

To clone an implementation, follow these steps:

1. In the File List view, right-click on the name of the implementation that you want to copy and choose **Clone Implementation**.
2. In the **Clone Implementation**dialog box, enter a name for the new implementation. This name also becomes the default name for the folder of the implementation.
3. Change the name of the implementation's folder in the Directory text box, if desired.
4. Decide how you want to handle files that are outside of the original implementation directory. Select one of the following options:
    - Continue to use the existing references
    - Copy files to new implementation source directory

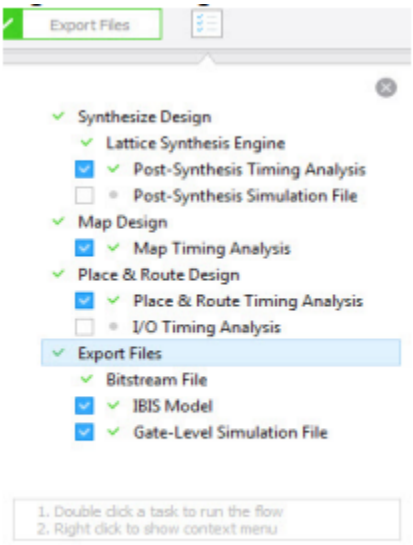
Chapter 6. Radiance Software Design Flow

Software Design Flow Overview

This chapter describes the design flow in the Radiant software. Running processes and controlling the flow for alternate what-if scenarios are explained.

The FPGA implementation design flow in the Radiant software provides extensive what-if analysis capabilities for your design. The design flow is displayed in the Task Detail View at the right end of the Process Toolbar.

Figure 3. Figure 54. Design Flow in Task Detail View



Chapter 7. Advanced Topics

Radiant Software Advanced Features

This chapter explains advanced concepts, features and operational methods for the Radiant software.

The Radiant software has the following advanced features and operational methods:

- Shared memory environment
- Customizable environment and tool options
- Batch tool operation
- Project archiving

Shared Memory Environment

This section describes the shared memory environment features for expert Radiant software users.

The Radiant software design environment uses a shared memory architecture. Shared memory allows all internal tool views to access the same image of the design at any point in time. Understanding how shared memory is being used can give you insight into managing the environment for optimum performance, especially when your design is large.

There is one shared database that contains the device, design, and constraint information in system memory.

Generating the hierarchy of your design uses an additional database separate from the primary shared memory database.

External tools referenced from within the Radiant software, such as those for synthesis and simulation, use their own memory in addition to what is used by the Radiant software.

Because it is accessing shared memory, the initial tool view launch will take longer than the launch of subsequent views.

Clear Tool Memory

This section describes the Clear Tool Memory feature for expert Radiant software users.

The “Clear Tool Memory command, available from the Tools menu, clears the device, design, and constraint information from system memory. Clearing the tool memory can speed up memory-intensive processes such as place and route. When your design is very large, it is good practice to clear memory prior to running place and route.

If you have open tool views that will be affected by clearing the tool memory, a confirmation dialog box will open to give you the opportunity to cancel the memory clear