MULTI: Getting Started

Green Hills Software
30 West Sola Street
Santa Barbara, California 93101
USA
Tel: 805-965-6044
Fax: 805-965-6343
www.ghs.com

DISCLAIMER

GREEN HILLS SOFTWARE MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THE CONTENTS HEREOF AND SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. Further, Green Hills Software reserves the right to revise this publication and to make changes from time to time in the content hereof without obligation of Green Hills Software to notify any person of such revision or changes.

PubID: start-506382
Branch: http://toolsvc/branches/release-branch-60
Date: April 24, 2014

Contents

Preface v

About This Book vi
The MULTI 6 Document Set vii
Conventions Used in the MULTI Document Set viii

1. Introduction 1

The MULTI Integrated Development Environment 2
MULTI Launcher 2
Editing Tools 2
Building Tools 2
Debugging Tools 3
Administrative Tools 3
The MULTI Launcher 4
MULTI Workspaces 5
Accessing Online Help 6
Full Online Manuals 6
Context-Sensitive Help 6
Command, Configuration Option, and Keyword Help 7
The Help Viewer Window 7
Navigating Help 8
Searching Manuals in the Help Viewer 12

2. MULTI Tutorial 15

Creating Your First Project 16
Building Your Program 19
Starting the Debugger 20
Connecting to a Simulator 20
Debugging Your Program 21
Connecting to Your Target Hardware 22

Preparing Your Target 23
Setting Up a Workspace 24
Adding Actions to Your Workspace 24
Additional Examples 25
Configuring MULTI for Use with INTEGRITY or u-velOSity 26

Index **27**

Preface

Contents

About This Book vi
The MULTI 6 Document Set vii
Conventions Used in the MULTI Document Set viii

This preface discusses the purpose of the manual, the MULTI documentation set, and typographical conventions used.

About This Book

The *MULTI: Getting Started* book provides an introduction to the MULTI Integrated Development Environment. For installation instructions, see the installation document located in the root directory of the installation CD.

This book is divided into the following chapters:

- *Chapter 1: Introduction* provides an overview of the MULTI Integrated Development Environment, the MULTI Launcher, and online help. See Chapter 1, “Introduction” on page 1.
- *Chapter 2: MULTI Tutorial* introduces you to the basic components of the MULTI IDE and leads you through creating, building, running, and debugging a simple “Hello World” program. See Chapter 2, “MULTI Tutorial” on page 15.

Note

New or updated information may have become available while this book was in production. For additional material that was not available at press time, or for revisions that may have become necessary since this book was printed, please check your installation directory for release notes, **README** files, and other supplementary documentation.

The MULTI 6 Document Set

The primary documentation for using MULTI is provided in the following books:

- *MULTI: Getting Started* — Provides an introduction to the MULTI Integrated Development Environment and leads you through a simple tutorial.
- *MULTI: Licensing* — Describes how to obtain, install, and administer MULTI licenses.
- *MULTI: Managing Projects and Configuring the IDE* — Describes how to create and manage projects and how to configure the MULTI IDE.
- *MULTI: Building Applications* — Describes how to use the compiler driver and the tools that compile, assemble, and link your code. Also describes the Green Hills implementation of supported high-level languages.
- *MULTI: Configuring Connections* — Describes how to configure connections to your target.
- *MULTI: Debugging* — Describes how to set up your target debugging interface for use with MULTI and how to use the MULTI Debugger and associated tools.
- *MULTI: Debugging Command Reference* — Explains how to use Debugger commands and provides a comprehensive reference of Debugger commands.
- *MULTI: Scripting* — Describes how to create MULTI scripts. Also contains information about the MULTI-Python integration.

For a comprehensive list of the books provided with your MULTI installation, see the **Help → Manuals** menu accessible from most MULTI windows.

Most books are available in the following formats:

- A printed book (select books are not available in print).
- Online help, accessible from most MULTI windows via the **Help → Manuals** menu.
- An electronic PDF, available in the **manuals** subdirectory of your IDE or Compiler installation.

Conventions Used in the MULTI Document Set

All Green Hills documentation assumes that you have a working knowledge of your host operating system and its conventions, including its command line and graphical user interface (GUI) modes.

Green Hills documentation uses a variety of notational conventions to present information and describe procedures. These conventions are described below.

Convention	Indication	Example
bold type	Filename or pathname	**C:\MyProjects**
	Command	**setup** command
	Option	**-G** option
	Window title	The **Breakpoints** window
	Menu name or menu choice	The **File** menu
	Field name	**Working Directory:**
	Button name	The **Browse** button
italic type	Replaceable text	**-o *filename***
	A new term	A task may be called a *process* or a *thread*
	A book title	*MULTI: Debugging*
`monospace` type	Text you should enter as presented	Type `help` *`command_name`*
	A word or words used in a command or example	The **wait** [-global] command blocks command processing, where `-global` blocks command processing for all MULTI processes.
	Source code	`int a = 3;`
	Input/output	`> print Test` `Test`
	A function	`GHS_System()`
ellipsis (...) (in command line instructions)	The preceding argument or option can be repeated zero or more times.	**debugbutton** [*name*]...

Convention	Indication	Example
greater than sign (>)	Represents a prompt. Your actual prompt may be a different symbol or string. The > prompt helps to distinguish input from output in examples of screen displays.	`> print Test` `Test`
pipe (|) (in command line instructions)	One (and only one) of the parameters or options separated by the pipe or pipes should be specified.	**call** *proc* | *expr*
square brackets ([ ]) (in command line instructions)	Optional argument, command, option, and so on. You can either include or omit the enclosed elements. The square brackets should not appear in your actual command.	`.macro` *`name`* `[`*`list`*`]`

The following command description demonstrates the use of some of these typographical conventions.

gxyz [-*option*]...*filename*

The formatting of this command indicates that:

- The command **gxyz** should be entered as shown.
- The option `-`*`option`* should either be replaced with one or more appropriate options or be omitted.
- The word *`filename`* should be replaced with the actual filename of an appropriate file.

The square brackets and the ellipsis should not appear in the actual command you enter.

Chapter 1

Introduction

Contents

The MULTI Integrated Development Environment 2
The MULTI Launcher 4
Accessing Online Help 6

The MULTI Integrated Development Environment

The MULTI Integrated Development Environment (IDE) is designed especially for embedded systems engineers to assist them in building, debugging, and editing embedded applications.

The MULTI IDE includes the following tools, most of which can be launched from within the IDE or as a separate stand-alone program. Parenthetical text indicates corresponding executable files, which are located in your MULTI IDE installation.

MULTI Launcher

- **MULTI Launcher** (**mstart**) — The gateway to the MULTI IDE, which allows you to quickly launch any of the primary MULTI tools, access open windows, and manage MULTI workspaces. For more information, see "The MULTI Launcher" on page 4.

Editing Tools

- **MULTI Editor** (**me**) — A graphical editor for modifying text files.
- **Checkout Browser** (**mcobrowse**) — A graphical viewer for files managed under a version control system.
- **Diff Viewer** (**diffview**) — A graphical viewer that displays differences between two text files.

Building Tools

- **MULTI Project Manager** (**mprojmgr**) — A graphical interface for managing and building projects.
- **Integrate** (**integrate**) — A graphical utility for configuring tasks, connections, and kernel objects across multiple AddressSpaces when using the INTEGRITY RTOS.

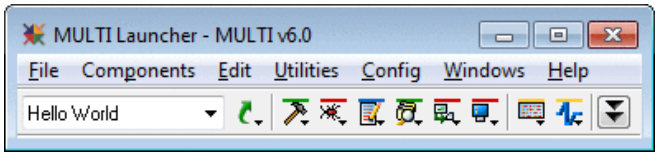
Debugging Tools

- **MULTI Debugger** (**multi**) — A graphical source-level debugger.
- **EventAnalyzer** (**mevgui**) — A graphical viewer for monitoring the complex real-time interactions of an embedded RTOS such as INTEGRITY or u-velOSity.
- **ResourceAnalyzer** (**wperf**) — A graphical viewer for monitoring the CPU and memory usage of an embedded system running the INTEGRITY RTOS.
- **Serial Terminal** (**mterminal**) — A serial terminal emulator for connecting to serial ports on embedded devices.
- **MULTI TimeMachine Tool Suite** — A wide variety of trace analysis tools that dramatically extend MULTI's trace and debugging capabilities.

Administrative Tools

- **Bug Report** (**gbugrpt**) — A utility for providing system configuration and tool version information to the Green Hills support staff.
- **Graphical Utilities** (**wgutils**) — A collection of utilities for analyzing and performing various operations on object files, libraries, and executables produced with the Green Hills toolchain.
- **MULTI License Administrator** (**mlmadmin**) — A graphical utility for managing Green Hills tools licenses.

The MULTI Launcher



The MULTI Launcher provides a convenient way to launch frequently used tools, to create or access files and projects, and to manage MULTI workspaces. To open the MULTI Launcher:

- Windows — From the Windows **Start** menu, select the MULTI menu item. Alternatively, use Windows Explorer to navigate to the directory where you installed the MULTI IDE, and double-click **multi.exe**.
- Linux/Solaris — Run the **multi** executable from your MULTI IDE installation directory.

Tip

If you cannot obtain a license to use MULTI, see Chapter 1, “Licensing for End Users” in the *MULTI: Licensing* book.

All of the main MULTI components can be accessed from the Launcher toolbar:

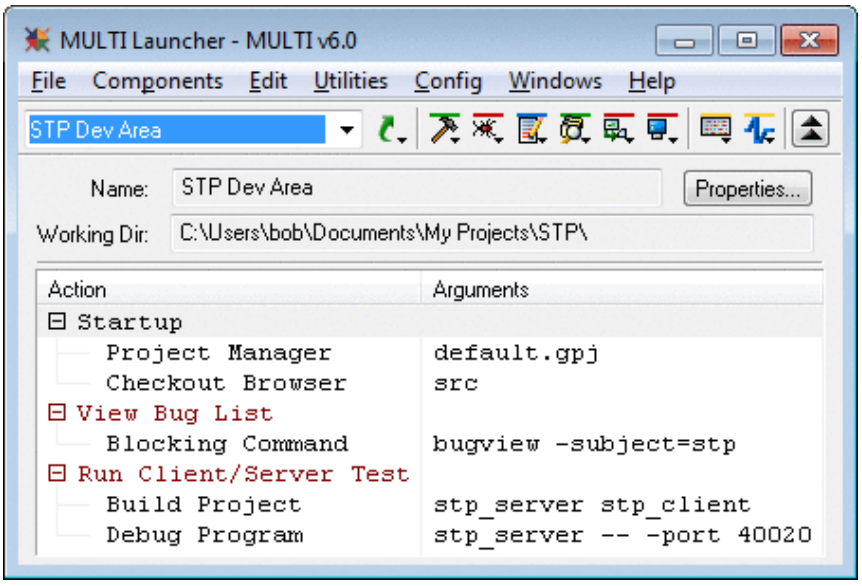
- — Runs a shortcut or an action sequence in the current workspace. Also allows you to create a new workspace or create or edit a shortcut.
- — Opens the Project Manager on a recent or new project.
- — Opens the Debugger on a recent or new executable.
- — Opens the Editor on a recent or new file.
- — Opens the Checkout Browser on a recent or new checkout.
- — Establishes a target connection or opens the Connection Chooser or Connection Organizer.
- — Opens a Serial Terminal using a recent or new connection.
- — Opens the EventAnalyzer (licensed separately).
- — Opens the ResourceAnalyzer (licensed separately).
- — Shows/hides the detail pane of the Launcher.

You can also launch the Green Hills License Administrator and, if installed, the Green Hills Probe Administrator from the **Utilities** menu.

During development, you can use the MULTI Launcher as a convenient, centralized window manager. You can access any of your open MULTI windows from the **Windows** menu of the Launcher.

MULTI Workspaces

The MULTI Launcher allows you to create and use *workspaces*. A MULTI workspace is a virtual area where the tools, files, and actions required for a particular project can be organized, accessed, and executed.



A workspace is typically created for each Top Project, and includes a working directory and a group of related *actions*—for example, opening a project in the MULTI Project Manager, connecting to a target, or performing a shell command. Actions are grouped into action sequences, so that a single mouse click can perform all the actions in the specified action sequence.

For more information, see Chapter 3, “Managing Workspaces and Shortcuts with the Launcher” in the *MULTI: Managing Projects and Configuring the IDE* book.

Accessing Online Help

Online help provides useful information about MULTI and can be accessed in several different ways. The following sections describe how to access online help and how to use the Help Viewer.

Full Online Manuals

You can open the MULTI Help Viewer on an indexed, hypertext version of any manual by selecting it from the list of installed manuals that appears in the **Help → Manuals** menu. The list is populated with manuals from your IDE installation, linked Compiler installation, and configured OS installation (see "Configuring MULTI for Use with INTEGRITY or u-velOSity" on page 26). Note that the configured OS installation is overwritten in the current MULTI session if you open the Project Manager on an INTEGRITY or u-velOSity project that specifies a different OS installation.

You can also access manuals from the command line. Ensure that the IDE installation directory is in your path, and enter the following command:

helpview *pathname* | -m *manual_name*

where:

- *pathname* opens the **.chm** file specified in *pathname*. You must provide a full path.
- -m *manual_name* opens the manual *manual_name*. An example manual name is "MULTI: Debugging". If the manual name contains a space as in the preceding example, you must enclose it in quotation marks.

Context-Sensitive Help

Many MULTI windows and dialog boxes are linked to specific topics in the online manuals. To view the topic for an active window or dialog box, press **F1**.

If you are using the MULTI Editor, you can also open context-sensitive help about a button or a menu item by selecting **Help → Identify** and then clicking the button or selecting the menu item.

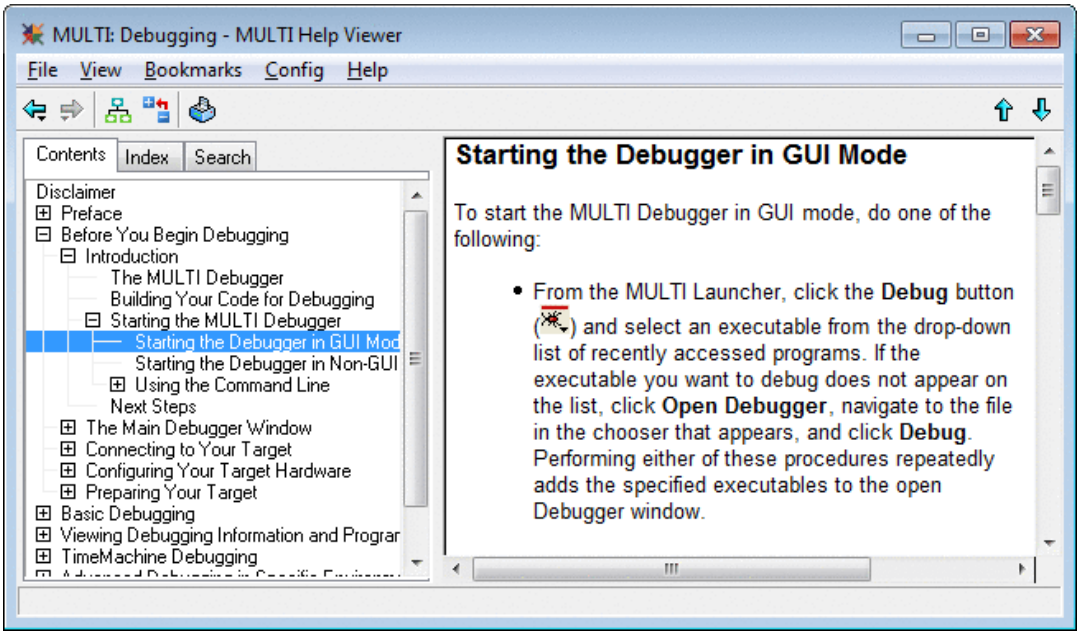
Command, Configuration Option, and Keyword Help

You can obtain help information about a MULTI Debugger command, a MULTI configuration option, or a keyword by typing `help` *`command_name`*, `help` *`configuration_option`*, or `help` *`keyword`* in the Debugger command pane. If you specify the name of a command or configuration option, the Help Viewer opens on documentation for the command or option. If you specify a keyword (a word that is not a command or configuration option), the Help Viewer searches all manuals for *`keyword`*.

To print the basic syntax of a MULTI Debugger command to the command pane, type `usage` *`command_name`*.

The Help Viewer Window

The following graphic displays the Help Viewer window.



The Help Viewer toolbar contains the following buttons, from left to right:

- **Back** ( ) and **Forward** ( ) — Returns to pages you have visited during the current help session. Click the button once for each page you want to revisit. Click and hold the button to select from a list of pages you have visited. These buttons function across books.

- **View All Subtrees** () — Toggles the display of the current selection's sub-topics (if any) in the view pane. When you open the Help Viewer, this button defaults to its last value.
- **Contract All Unselected** () — Collapses expanded topics in the **Contents** tab if the topics do not contain any selections.
- **Print** () — Prints the help page displayed in the view pane. To create a help page consisting of mixed topics, hold down the **Ctrl** key while clicking separate topics. MULTI combines the separate topics and orders them by their location in the **Contents** tab.
- **Previous Page** () and **Next Page** () (located at far right) — Displays the previous or following topic as ordered in the **Contents** tab. If the previous or next topic includes sub-topics and the **View All Subtrees** button is enabled, the Help Viewer displays the sub-topics along with the section.

The MULTI Help Viewer contains two panes. The right-hand pane, or the *view pane*, displays the help page for your selection. The left-hand pane contains the following three tabs:

- **Contents** — Displays topics in the manual you are viewing. Click a plus or minus icon to show or hide nested topics. Click a topic to display it in the view pane.
- **Index** — Displays index entries for the manual. To search the index entries, enter a word or words in the text box located at the top of the pane. MULTI returns results that contain the word(s) you typed. Click an index entry to display the associated topic in the view pane.
- **Search** — Allows you to search for specific words in the current manual or in all manuals. For information about searching from this tab, see “Searching Manuals in the Help Viewer” on page 12.

Navigating Help

Navigating manuals in the MULTI Help Viewer is easy. This section describes different ways to find information.

Viewing Previous and Next Topics

To display the previous or following topic as ordered in the **Contents** tab, do one of the following:

- Click the  or  button located in the upper-right corner of the Help Viewer window.
- Select **View** → **Previous Contents Entry** or **View** → **Next Contents Entry**.

If the previous or next topic includes sub-topics and the **View All Subtrees** button () is enabled, the Help Viewer displays the sub-topics along with the topic.

Returning to Previously Viewed Help Pages

To return to pages you have visited during the current help session, do one of the following:

- Click the  or  button located in the left corner of the toolbar. Click the button once for each page you want to revisit. Click and hold the button to select from a complete list of pages you have visited during the current help session. These buttons function across books.
- Select **View** → **Back** or **View** → **Forward** from the menu bar. This feature functions across books.

Linking to Related Topics

The underlined links available in the view pane allow you to jump to related topics.

If, when you click a link, a dialog box appears with the message:

```
You have requested information that the Help Viewer is unable
to retrieve.
```

one of the following factors may be the cause:

- The manual that the link points to may not be included with your distribution.
- If the link points to an INTEGRITY or u-velOSity manual, you may need to set the location of the installed OS distribution so that the Help Viewer can

locate the relevant help files. For information about how to do this, see "Configuring MULTI for Use with INTEGRITY or u-velOSity" on page 26.

- If the link points to an INTEGRITY or u-velOSity manual, you may be using a version of the operating system that does not support links from MULTI help.

Note

If you are using MULTI with multiple target architectures (such as ARM and Power Architecture), you may install tools of the same version number into a single directory. If you click a link to a target-specific book in this case, MULTI chooses which version of the book to link to (ARM or Power Architecture in this example).

Bookmarking Help Pages

You can use bookmarks to return to pages you have visited across MULTI sessions. To bookmark a page, select **Bookmarks → Bookmark This Page**.

You can bookmark a help page consisting of mixed topics by holding down the **Ctrl** key while clicking separate topics. MULTI combines the separate topics in the view pane and orders them by their location in the **Contents** tab. Bookmark the page as usual.

The **Bookmarks** menu lists all your bookmarks from across MULTI manuals and sessions. To return to a bookmarked page, do one of the following:

- Select **Bookmarks**, and choose a bookmark.
- Select **Bookmarks → Manage Bookmarks**, and double-click a bookmark.
- From any MULTI tool, select **Help → Bookmarks**, and choose a bookmark.

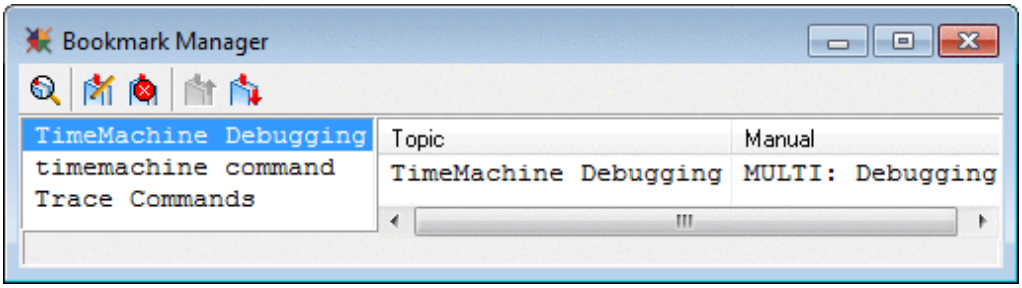
To rename, delete, or reorder existing bookmarks, launch the **Bookmark Manager** as described in the next section, "Managing Bookmarks" on page 10.

Managing Bookmarks

You can use the **Bookmark Manager** to rename or delete bookmarks, navigate to bookmarks, or modify the ordering of bookmarks in the **Bookmarks** menu.

To open the **Bookmark Manager**, do one of the following:

- In the Help Viewer, select **Bookmarks** → **Manage Bookmarks**.
- From any MULTI tool, select **Help** → **Bookmarks** → **Manage Bookmarks**.



The list on the left side of the **Bookmark Manager** displays the names of all the bookmarks you have created. When a bookmark is selected, the topic(s) and the manual marked by that bookmark are displayed in the right side of the window. The bookmark may reference multiple topics if, for example, you created the bookmark with multiple entries selected in the **Contents** tab or if you selected an index entry associated with multiple topics. Double-clicking a bookmark or a topic displays that bookmark or topic in the Help Viewer.

The toolbar buttons in the **Bookmark Manager** allow you to perform the following operations on bookmarks:

- — Display the selected bookmark(s) in the Help Viewer.
- — Rename the selected bookmark.
- — Delete the selected bookmark(s).
- and — Move the selected bookmark up or down in the list. The order of the bookmarks in the **Bookmarks** menu mirrors the order of the bookmarks in the **Bookmark Manager**.

Note

The and buttons are available for use on multiple bookmarks. You can select multiple bookmarks from the left side of the window by dragging to select rows or by using **Shift** or **Ctrl** to select items.

Opening Additional Manuals from the Help Viewer

To open a new manual in the current window, do one of the following:

- Select **File → Open Manual** and choose from the list of installed manuals. For information about how the list is populated, see "Full Online Manuals" on page 6.
- Select **File → Open Manual File** and navigate to a particular file in the file chooser that appears.

To open a new manual in a new window, select **View → Open Other Manuals in New Window** and then open the manual as usual. When you open the Help Viewer, the **Open Other Manuals in New Window** toggle option defaults to its last value.

Searching Manuals in the Help Viewer

With the Help Viewer's **Search** feature, you can search the current manual or all manuals simultaneously. Follow these steps to perform a search:

1. Type a word or words in the **Search** tab's text box.

   To search for a phrase, put quotation marks around the phrase. To exclude a word from the search, prefix it with an exclamation point (!). For example, typing `help !MULTI` displays all the search results for `help` that do not contain the word `MULTI` in their content. To search for an exclamation point at the beginning of a word, you must enter a plus sign followed by an exclamation point (`+!`). Full regular expressions are not supported.
2. To search for *all* keywords — Select **all** from the **Find pages matching** drop-down list. The search function returns results that contain all the search words; however, they may not occur as a phrase unless you enclosed them in quotation marks.

   To search for *any* keywords — Select **any** from the **Find pages matching** drop-down list. The search function returns results that contain one of the words, a combination of the words, or all of the words.
3. Select the **Match whole word only** check box if you want the search results to contain the keyword as you typed it. For example, if you select this option, search results for a singular word do not contain the plural form of the word.

4. To search all installed manuals, select the **Search all manuals** check box. For information about what installations the manuals are pulled from, see “Full Online Manuals” on page 6. To search only the current manual, clear this check box.
5. Press **Enter** to display a list of search results. Click any entry in the list to display the entry's help page in the view pane. If no results appear, no matches were found.

Chapter 2

MULTI Tutorial

Contents

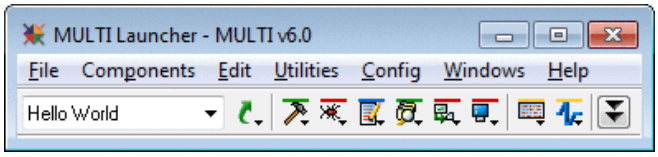
Creating Your First Project 16
Building Your Program 19
Starting the Debugger 20
Connecting to a Simulator 20
Debugging Your Program 21
Connecting to Your Target Hardware 22
Preparing Your Target 23
Setting Up a Workspace 24
Additional Examples 25
Configuring MULTI for Use with INTEGRITY or u-velOSity 26

This chapter introduces you to the basic components of the MULTI IDE, and leads you through creating and building a simple **Hello World** program. You will then run and debug this program on both a simulator and your target hardware.

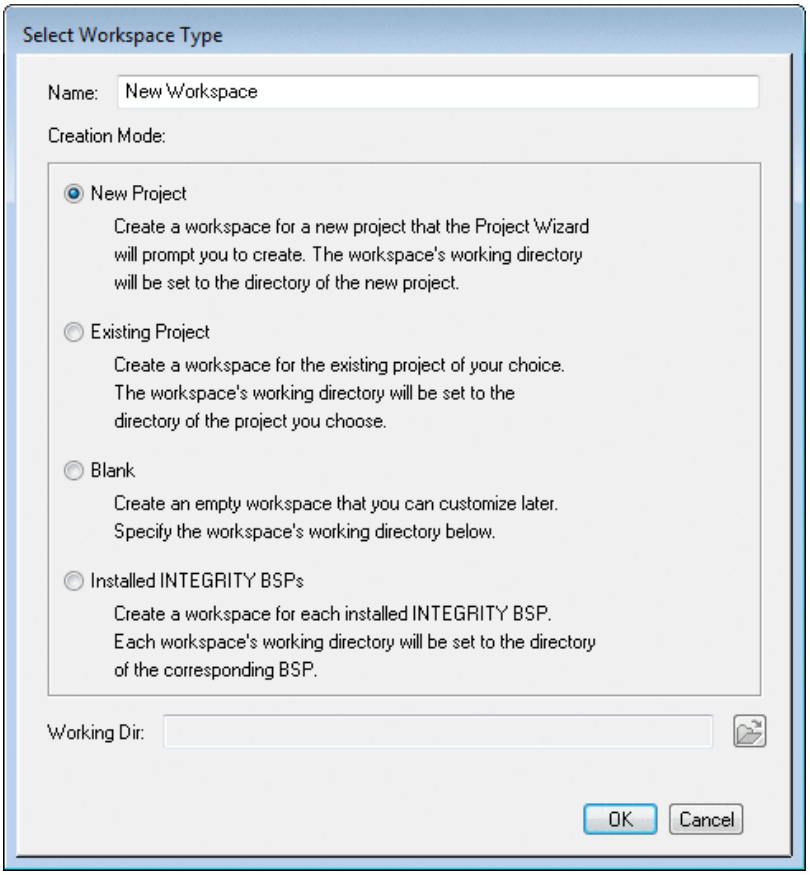
Creating Your First Project

A project is a collection of source code and resource files that is used to build one or more programs or libraries. Follow the steps below to create the **Hello World** project that is used for the remainder of this tutorial.

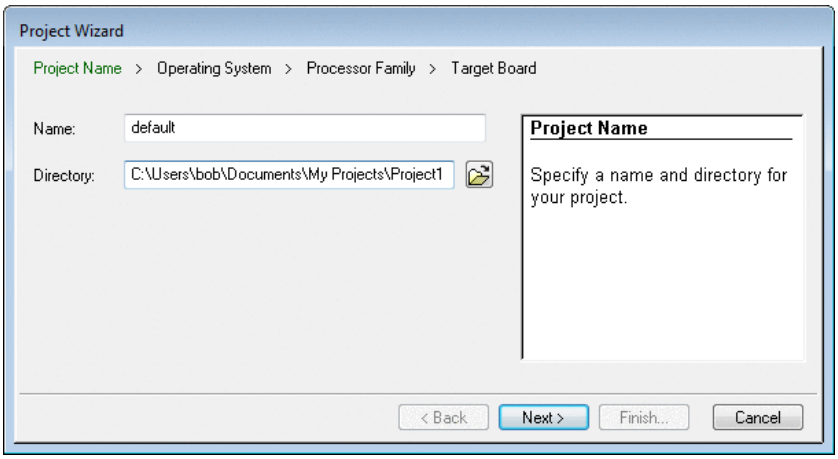
1. Start the Launcher as described in “The MULTI Launcher” on page 4.



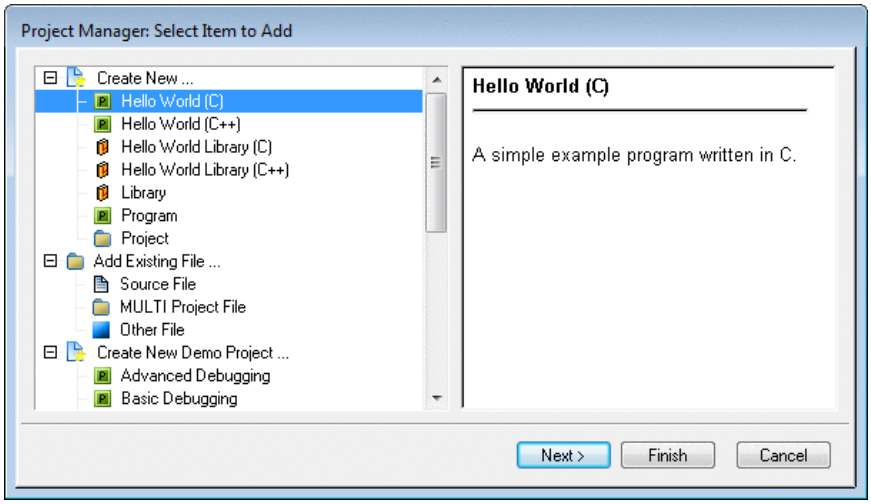
2. Select **File → Create Workspace** to open the **Select Workspace Type** dialog.



3. Enter `Hello World` in the **Name** field. Click **OK** to create a workspace and launch the **Project Wizard**.



4. Click **Next** to accept the default settings for the project name and directory.
5. Select the **Stand-alone** operating system. Click **Next**.
6. If only one processor family is available, the **Project Wizard** automatically selects it and continues to the next screen. Otherwise, select your processor family and click **Next**.
7. Select your target board. If it is not listed or if you have not yet decided on one, expand the **Generic** list and select the processor you intend to target. Click **Finish**.
8. In the **Top Project Created** dialog box that appears next, click **OK**.
9. The **Project Manager: Select Item to Add** screen appears next. This screen allows you to add an example or executable to the framework just created by the **Project Wizard**.



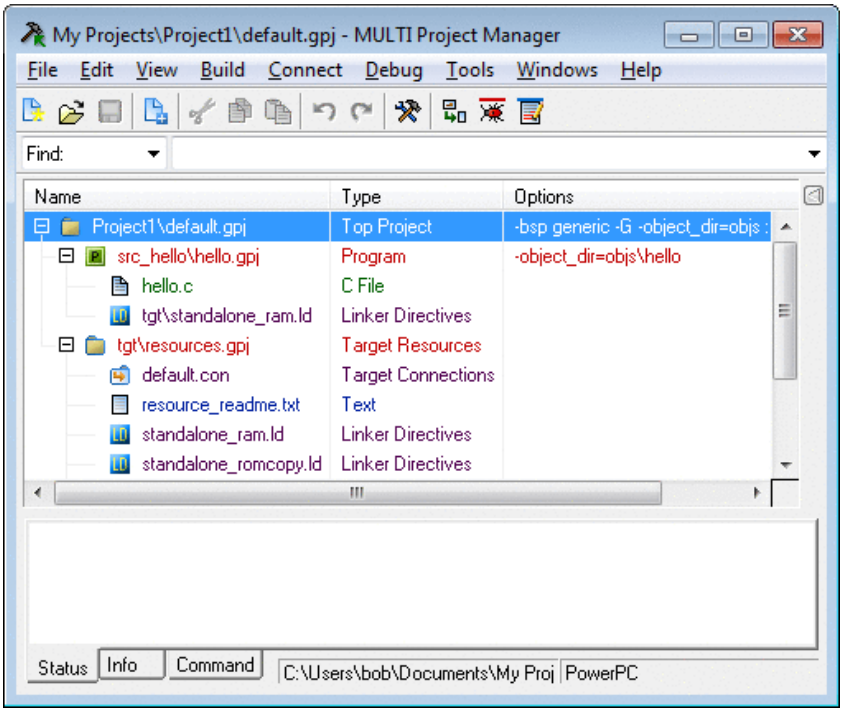
For this tutorial, select **Hello World (C)** and click **Finish** to accept the defaults for the remaining settings. The Project Manager will open on your new project.

For information about creating an INTEGRITY project, see "Building INTEGRITY Applications" in the *INTEGRITY Development Guide*.

For comprehensive information about the **Project Wizard**, see "Creating a Project" in Chapter 1, "Creating a Project" in the *MULTI: Managing Projects and Configuring the IDE* book.

Building Your Program

In the previous section, you created a project and added all the files necessary to build your **Hello World** executable.

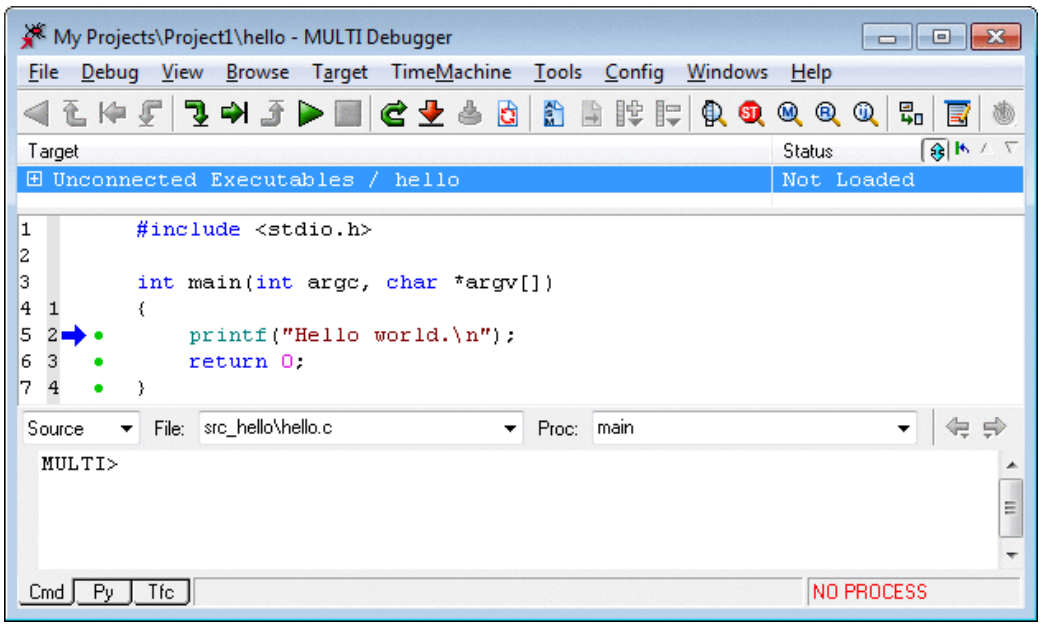


The project is ready to build at this point. Click (**Build**) to build the executable program, **hello**. You can follow the progress of the build in the **Status** pane at the bottom of the Project Manager window.

For more information about the MULTI Project Manager, see Chapter 2, “Managing and Building Projects with the Project Manager” in the *MULTI: Managing Projects and Configuring the IDE* book.

Starting the Debugger

Now that your project is built, click (**Debug**) to open the MULTI Debugger on the **hello** executable.

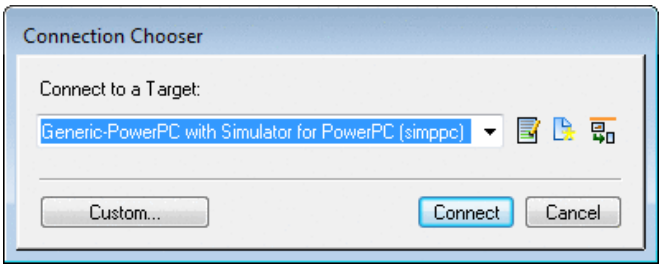


For information about the MULTI Debugger, see Chapter 2, “The Main Debugger Window” in the *MULTI: Debugging* book.

Connecting to a Simulator

Before debugging the program in the MULTI Debugger, you must connect to a hardware target or simulator that will run the program. The simulators provide an easy-to-use platform to develop and debug your application before you begin working with actual hardware. Perform the following steps to connect to a Green Hills simulator:

1. Click (**Connect**) on the MULTI Debugger toolbar to open the **Connection Chooser**.



2. MULTI creates several *Connection Methods* for your target board as part of your project. Select the simulator connection from the drop-down list and click **Connect**.

For more information about connecting to a target, see Chapter 3, “Connecting to Your Target” in the *MULTI: Debugging* book.

Debugging Your Program

Now that you are connected to the simulator, you can step through your code, use breakpoints, view registers and memory, and perform many other debug tasks with the MULTI Debugger.

Try the following basic debugging techniques:

- To step into the program, click **(Step (into Functions) on Selected Items)** on the Debugger toolbar.

Note

MULTI will automatically download your program to the simulator when you first begin executing the code.

- To set a breakpoint (), click any of the green breakdots ().
- To step to the next line, click **(Next (over Functions) on Selected Items)** on the Debugger toolbar.
- To view register values, click **(Registers)** on the Debugger toolbar.
- To view interlaced command and target output, see the Debugger **Cmd** (command) pane at the bottom of the window. To view just the target output, select the **I/O** tab.

- To view interlaced assembly and source code, click (**Assembly**) on the Debugger toolbar.

For more information about debugging your program, see the *MULTI: Debugging* book.

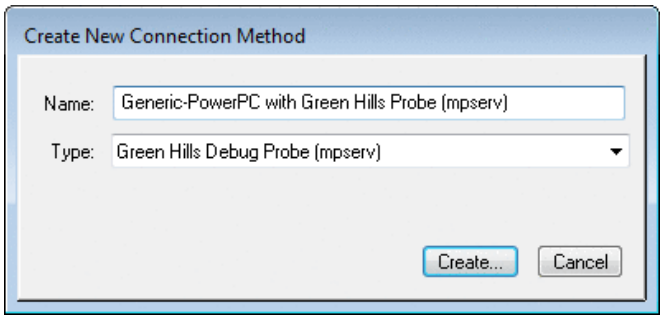
For a quick reference to the commands available in the MULTI Debugger, see the *Quick Reference Card* (only available in print).

Connecting to Your Target Hardware

Earlier, you connected to a simulator to debug your program. Now, use the following steps to connect to your target board:

1. If you are still connected to the simulator, disconnect from it by clicking (**Disconnect**) on the MULTI Debugger toolbar.
2. Connect your target board to the host computer via a debug device or serial cable, depending on which protocol you will be using to debug your board.
3. Click (**Connect**) to open the **Connection Chooser**.
4. Select the Connection Method corresponding to your debug device from the drop-down list.

   If your debug device is not listed, click (**Create a new Connection Method**) and enter a name and type for your connection.



   Click **Create** and review the information to verify that this Connection Method is configured correctly for your board setup. Double-check the connection type and name (or address), and any other relevant settings. Click **OK** when all of the settings are correct.

5. Click **Connect** to connect to your target hardware.
6. If more than one CPU is present on your target, the **Bind to which Remote/CPU** dialog box appears. Select a CPU and click **OK**.

For more information about connecting to a target, see Chapter 3, “Connecting to Your Target” in the *MULTI: Debugging* book.

Preparing Your Target

Before you can run or debug an executable on your target, you must download or flash the executable to your target's memory, or verify that the executable is already present on the target. To accomplish this, perform the following steps:

1. Select the **hello** executable in the target list (located at the top of the Debugger window).
2. Click (**Prepare Target**) on the Debugger toolbar to open the **Prepare Target** dialog box.
3. MULTI recommends settings for preparing your target based on the executable you are debugging. Click **OK** to accept the recommended settings and download the **hello** executable to your target.

Note

Some target boards may require modifications to the setup script provided by Green Hills. For more information, see “Configuring Your Target Hardware for Debugging” in Chapter 6, “Configuring Your Target Hardware” in the *MULTI: Debugging* book.

You are now ready to debug your program on your target board.

Once you are finished debugging, click (**Disconnect**) to disconnect from your target hardware. Then close the MULTI Debugger and the MULTI Project Manager.

Setting Up a Workspace

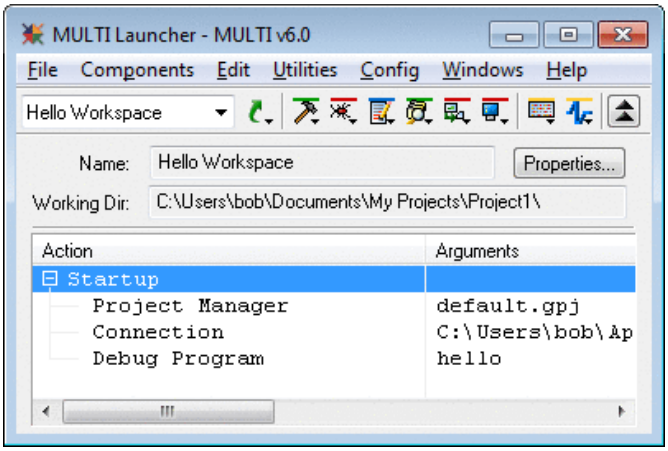
MULTI workspaces allow you to easily associate actions with a project and perform those actions from within the Launcher. You will now add actions to the workspace created at the beginning of this tutorial.

Adding Actions to Your Workspace

Workspace actions are grouped into action sequences. Your new workspace contains the automatically created **Startup** action sequence. The **Startup** action sequence contains an action that launches the MULTI Project Manager on your project.

Follow the steps below to add additional actions that connect to your target and open your program in the MULTI Debugger:

1. Switch to or start the Launcher, and select the **Hello World** workspace from the drop-down list.
2. Right-click the **Startup** action sequence and select **Add Action** from the shortcut menu.
3. Select **Connection** in the **Action** drop-down list.
4. Select your hardware target Connection Method in the **Target** drop-down list and click **OK**.
5. Right-click the **Startup** action sequence and select **Add Action** from the shortcut menu.
6. Select **Debug Program** in the **Action** drop-down list.
7. Select your **hello** executable in the **Prog** drop-down list and click **OK**.



The **Startup** action sequence in your workspace now contains two additional actions, one each of type **Connection** and **Debug Program**. Now, whenever you run the **Startup** action sequence, MULTI will open your project in the MULTI Project Manager, connect to your target, and open your program in the MULTI Debugger.

Run the **Startup** action sequence by clicking the (**Run Action Sequences or Shortcuts**) button and selecting **Hello World: Startup**.

For more information about workspaces, see Chapter 3, "Managing Workspaces and Shortcuts with the Launcher" in the *MULTI: Managing Projects and Configuring the IDE* book.

Additional Examples

There are a number of example projects that highlight particular features of the MULTI Debugger. To access these examples, perform the following steps:

1. Switch to or start the Launcher, and select the **Hello World** workspace from the drop-down list.
2. Double-click the **Project Manager** action.
3. In the Project Manager, select the **default.gpj** file for the **Hello World** project you created earlier, and click (**Add Item into default.gpj**).
4. Select one of the demo projects in the **Project Manager: Select Item to Add** dialog box. The **Basic Debugging** project is a good one to start with. Click **Finish**.

5. Select the demo project you just added, and click (**Build**).
6. Click (**Debug**), and follow the **Cmd** pane directions, which lead you through the example.

Configuring MULTI for Use with INTEGRITY or u-velOSity

In the preceding tutorial, you created a stand-alone project. If you plan to use INTEGRITY or u-velOSity for future projects, you should provide MULTI with the location of the installed OS distribution. This information is used to:

- Determine the default OS distribution directory used by the **Project Wizard**
- Add relevant documentation to MULTI's **Help** menu (see "Full Online Manuals" on page 6)
- Enable cross-book links between MULTI and INTEGRITY books or between MULTI and u-velOSity books if the version of the operating system you are using supports this
- Determine the location of the Event Analyzer configuration file (see the *EventAnalyzer User's Guide*)

To define the location of the installed OS distribution:

1. Select **Set INTEGRITY Distribution** or **Set u-velOSity Distribution** from one of the following locations:
   - The **Config** menu located in the MULTI Launcher, Debugger, or Help Viewer
   - The **Tools → Configuration** submenu located in the MULTI Project Manager

   The dialog box that appears is an interface to the per-user file **integrity.dist** or **uvelosity.dist**.
2. Type the path to your INTEGRITY or u-velOSity installation directory, or use the browse button to navigate to the directory.
3. Click **Save**.

Index

A
adding actions to workspaces, 24

B
breakpoints
  setting, 21
building projects, 19

C
command help, 7
commands
  help regarding, 7
  helpview, 6
configuration options
  help regarding, 7
connecting
  to hardware, 22
  to simulator, 20
context-sensitive help, 6
conventions
  typographical, viii
creating
  projects, 16
  workspaces, 17

D
Debugger
  starting, 20
  using, 21
document set, vi, vii

E
example projects, 25

F
F1 key, for help, 6

H
hardware
  connecting to, 22
help (see online help)
Help menu
  online help, obtaining, 6
Help Viewer
  navigating, 8, 9, 10
  opening additional manuals in, 12
  searching, 12
  window, 7
helpview command, 6

I
Integrated Development Environment (IDE) (see MULTI Integrated Development Environment (IDE))
INTEGRITY
  using with MULTI IDE, 26
interlaced assembly
  viewing, 22

K
keyword help, 7

L
Launcher (see MULTI Launcher)

M
MULTI Integrated Development Environment (IDE)
  document set, vii
  online help, 6
  overview, 2
  using with INTEGRITY or u-velOSity, 26
MULTI Launcher
  overview, 4

O
online help, 6
  (see also Help Viewer)
  for commands, 7
  for configuration options, 7
  context-sensitive, 6
  for keywords, 7
  limitations, 10
  online manuals, 6
  overview, 6

P

preparing your target, 23
programs
    stepping into, 21
Project Wizard, 17
projects
    building, 19
    creating, 16
    examples, 25

R

registers
    viewing, 21

S

setting breakpoints, 21
simulator
    connecting to, 20
starting
    Debugger, 20
stepping into programs, 21

T

target
    preparing, 23
typographical conventions, viii

U

u-velOSity
    using with MULTI IDE, 26

V

viewing
    interlaced assembly, 22
    registers, 21

W

workspaces
    adding actions to, 24
    creating, 17
    overview, 5