CodeWarrior Development Studio for Power Architecture Processors Getting Started Guide

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Contents

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Chapter 1 Introduction

This Getting Started guide explains how to install the CodeWarrior software, prepare the boards supported by the current release, and then create, build, and debug a simple project.

This chapter contains:

- System Requirements
- Installing CodeWarrior
- Supported Devices

1.1 System Requirements

This section provides operating platform requirements for installing CodeWarrior software.

Table 1-1. System Requirements

Processor	Intel® Pentium® 4 processor - 2 GHz or faster, Intel Xeon™, Intel Core™, AMD Athlon™ 64, AMD Opteron™, or higher
Memory	2 GB RAM
Hardware	• CD-ROM drive for CD installation • Microsoft Mouse compliant pointing device • Internet connectivity for web downloads and update access
Operating System	Windows: • Windows 7 SP1 (32-bit and 64-bit) • Windows 10 (64-bit) Linux: • Ubuntu 14.04 (32-bit and 64-bit) • CentOS 7.0.1503 (64-bit) • OpenSUSE 13.2 (64-bit) • Debian 8.2.0 (64-bit)

Table continues on the next page...

Table 1-1. System Requirements (continued)

	• Fedora 22 (64-bit) • RHEL 6.5 (64-bit) • Mint 15 (64-bit) **NOTE:** Other Linux distributions could be used, but will likely require more manual identification and installation of missing, required libraries.
Disk space	2.3 GB, additional space required during installation

1.2 Installing CodeWarrior

This section provides the steps required to install the CodeWarrior software.

CodeWarrior usage on a Microsoft® Windows operating system:

Administrator rights are required to install CodeWarrior software on Microsoft Windows 7 operating system, since the installer copies files into the `System` folder. The default CodeWarrior installation folder is `C:\Freescale`.

In addition, your project workspace must be created in a folder to which you have full access rights.

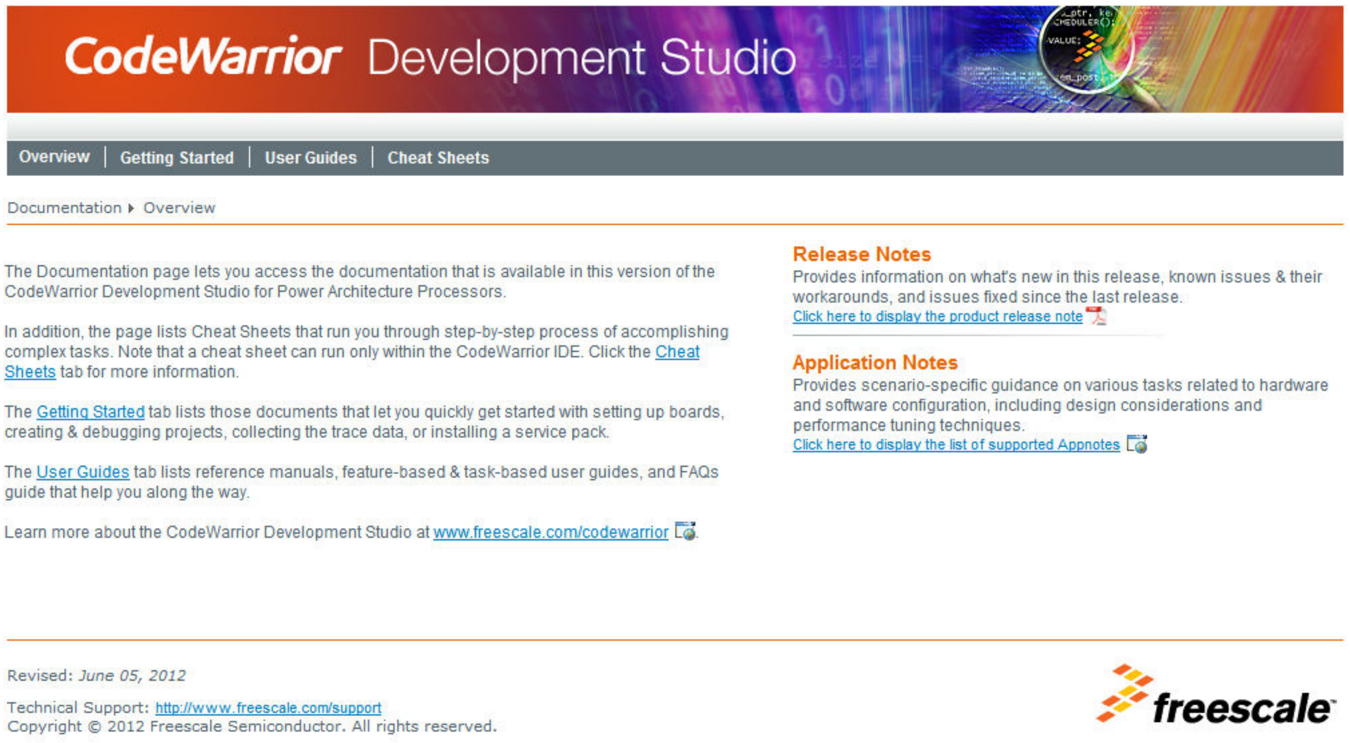
CodeWarrior usage on a Linux operating system:

CodeWarrior installer must be run from a root account. CodeWarrior needs read/write access to the installation folder. Ensure that the CodeWarrior installation folder has the appropriate permissions for all users, and your project workspace has the read and write permission.

To install the CodeWarrior software, perform the following steps:

1. Run the installer - the install wizard appears.
2. Follow the wizard's on-screen instructions to install the CodeWarrior software.
3. When installation completes, the **InstallShield Wizard Completed** page appears.
4. Check the Display Documentation checkbox.
5. Click **Finish.**

   The wizard closes. A browser starts and displays the **Documentation** page. This page contains tabs that group the CodeWarrior documentation into categories.


CodeWarrior Development Studio
Overview | Getting Started | User Guides | Cheat Sheets
Documentation ▸ Overview

The Documentation page lets you access the documentation that is available in this version of the CodeWarrior Development Studio for Power Architecture Processors.

In addition, the page lists Cheat Sheets that run you through step-by-step process of accomplishing complex tasks. Note that a cheat sheet can run only within the CodeWarrior IDE. Click the Cheat Sheets tab for more information.

The Getting Started tab lists those documents that let you quickly get started with setting up boards, creating & debugging projects, collecting the trace data, or installing a service pack.

The User Guides tab lists reference manuals, feature-based & task-based user guides, and FAQs guide that help you along the way.

Learn more about the CodeWarrior Development Studio at www.freescale.com/codewarrior

Release Notes

Provides information on what's new in this release, known issues & their workarounds, and issues fixed since the last release.

Click here to display the product release note

Application Notes

Provides scenario-specific guidance on various tasks related to hardware and software configuration, including design considerations and performance tuning techniques.

Click here to display the list of supported Appnotes

Revised: June 05, 2012

Technical Support: http://www.freescale.com/support

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Figure 1-1. Documentation Page

NOTE

Click any tab in the **Documentation** page to browse the CodeWarrior documentation.

You have successfully installed CodeWarrior Development Studio.

NOTE

For licensing and activation of your CodeWarrior Development Studio for Power Architecture Processors, see *CodeWarrior Development Suite Quick Start*. Save the license file, *license.dat*, to the installation root folder; the default location is *<CodeWarrior-Install-Dir>\PA*, where `<CodeWarrior-Install-Dir>` is the path to your CodeWarrior installation.

1.3 Supported Devices

This section talks about the device families and targets supported by CodeWarrior Developer Studio for Power® Architecture Processors.

Table 1-2. Supported Device Families and Targets

Device Family	Supported Targets
82xx	Supports generation of 8250 target projects.
83xx	Supports generation of 8306, 8309, 8323, and 8377 target projects.
85xx	Supports generation of 8536, 8548, 8560, 8568, 8569, and 8572 target projects.
C29x	Supports generation of C29x target projects.
Qonverge	Supports generation of B4420, B4460, B4860, BSC9131, BSC9132, G1110, and G4860 target projects.
QorIQ_P1	Supports generation of P1010, P1011, P1012, P1013, P1014, P1015, P1016, P1017, P1020, P1021, P1022, P1023, P1024, and P1025 target projects.
QorIQ_P2	Supports generation of P2010, P2020, P2040, and P2041 target projects.
QorIQ_P3	Supports generation of P3041 target projects.
QorIQ_P4	Supports generation of P4040 and P4080 target projects.
QorIQ_P5	Supports generation of P5010, P5020, P5021, and P5040 target projects.
QorIQ_T1	Supports generation of T1013, T1014, T1020, T1022, T1023, T1024, T1040, and T1042 target projects.
QorIQ_T2	Supports generation of T2080 and T2081 target projects.
QorIQ_T4	Supports generation of T4160 and T4240 target projects.

Chapter 2
Configuring Target Hardware

This chapter explains how to configure the boards supported by the CodeWarrior Developer Studio for Power® Architecture Processors. You can configure these boards using an integrated development environment (IDE), such as Freescale's CodeWarrior IDE.

This chapter contains these topics:

2.1 Configuring B4420 QDS Board

This section describes the configuration of a B4420 QDS board.

Perform the following steps to configure a B4420 QDS board:

1. Ensure that the board is not connected to the power.
2. Ensure that the power to the chassis or the standalone power supply is OFF.

NOTE

It is recommended that you wear a wrist strap before handling the B4420 QDS board to protect the board from electrical charges.

3. Check the default switch positions and jumper settings and verify if the board is operational.

NOTE

The board is shipped with default settings. See the document shipped with the board to verify the default switch and jumper settings.

4. Assemble the power supply.
   a. Ensure that all power is turned OFF.
   b. Connect the power supply, power cable, and country-specific wall outlet plug.
   c. Connect the power-supply cable to the 12-volt board jack.
   d. Plug power supply cable into the wall outlet.
5. Perform an initial board check and look for correct LED functioning.
6. Move the power switch to the `ON` position.
7. Check for completion of the PRESET (Power-on-Reset) sequence indicated by the LEDs.
8. Move the power switch to the `OFF` position to power off the system.

NOTE

For more information, see the documentation shipped with the B4420 QDS board.

2.2 Configuring B4860 QDS Board

This section tells how to configure a B4860 QDS board.

Perform the following steps to configure a B4860 QDS board:

1. Ensure that board is not connected to the power.
2. Ensure that the power to the chassis or the standalone power supply is OFF.

NOTE

It is recommended that you wear a wrist strap before handling the B4860 QDS board to protect the board from electrical charges.

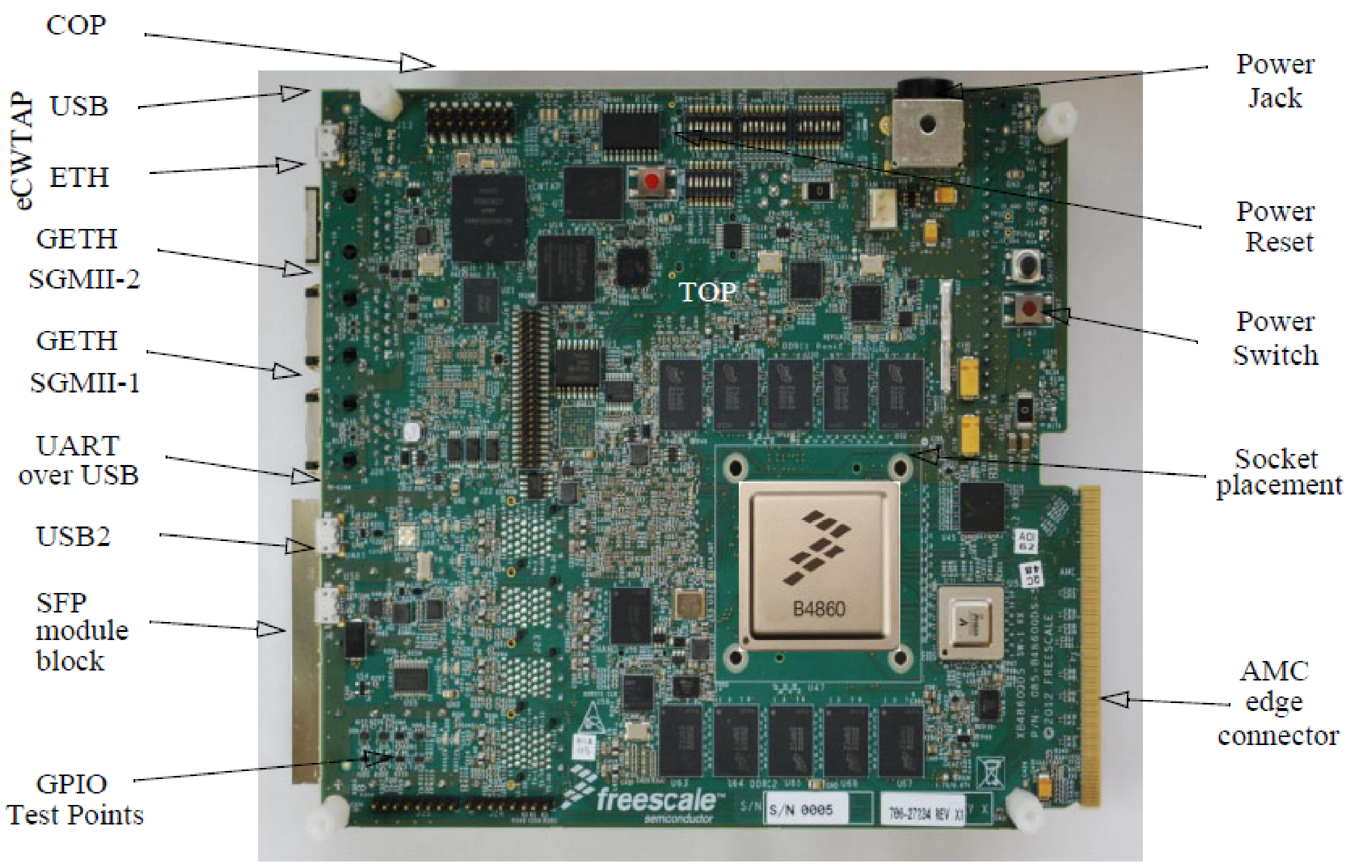


Figure 2-1. B4860 QDS Board

3. Check the default switch positions and jumper settings and verify if the board is operational.

NOTE

The board is shipped with default settings. See *Quick Start Guide for B4860QDS* to verify the default switch and jumper settings.

4. Assemble the power supply.
   a. Ensure that all power is turned OFF.
   b. Connect the power supply, power cable, and country-specific wall outlet plug.
   c. Connect the power-supply cable to the 12-volt board jack (P2).
   d. Connect the USB cable between the B4860 QDS USB socket (J2) and the USB port of the PC.

      This setting relates to the internal debug probe, eCWTAP usage.

   e. Connect an ETH cable between a network plug and the RJ-45 eCWTAP (J16) jack.
   f. Connect a second ETH cable between a network plug and the RJ-45GE1 (J18) jack.

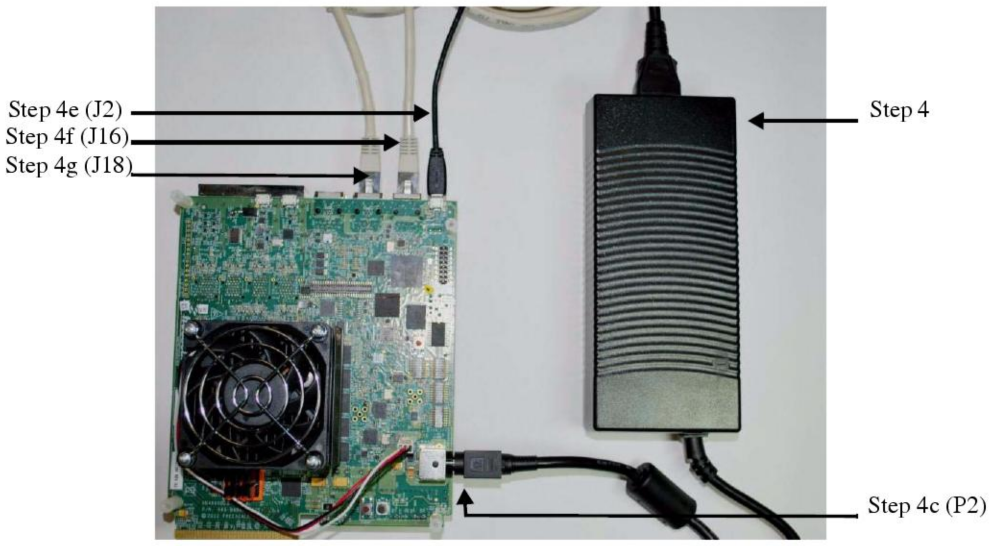


Figure 2-2. Connecting the B4860 QDS Board

   g. Plug power supply cable into the wall outlet.

5. Perform an initial board check and look for correct LED functioning.
   a. LED `LD9` and LED `LD10` are a steady green color.
   b. LED `D1` (eCWTAP) flashes orange and if the CodeWarrior TAP establishes a link via the Ethernet, `D1` changes to a steady green color, after several seconds of charging.
6. Move the power switch (`SW6`) to the `ON` position.
7. Check for completion of the PRESET (Power-on-Reset) sequence indicated by the LEDs. The LEDs on the board follow the below sequence:
   a. LED `LD1` and LED `LD2` flash green.
   b. LED `LD8` (12 V) displays steady green light indicating that the SoC has exited `reset` and is now in a `Ready` state.

NOTE

Some RCW combinations can change SOC ASLEEP signal functionality to GPIO. In this case, LED **LD8** enters an `OFF` state following the reset sequence.

8. Move the power switch (`SW6`) to the `OFF` position to power off the system.

NOTE

See *Quick Start Guide for B4860QDS* for more information about the B4860 QDS board.

2.3 Configuring P4080DS Board

This section explains how to configure a P4080DS board.

Perform the following steps to configure a P4080DS board:

1. Power off the P4080DS desktop development system.

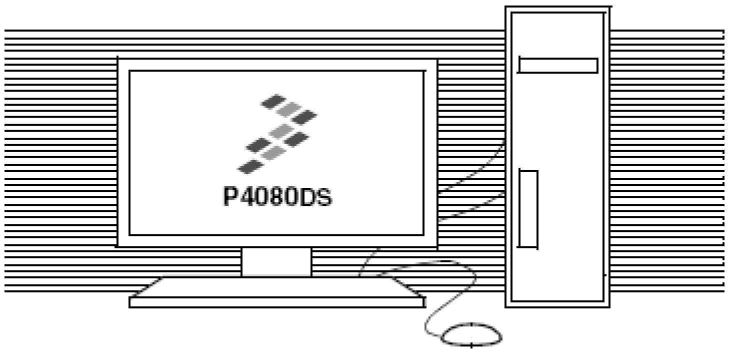


Figure 2-3. P4080DS Desktop Development System

2. Disconnect the development system from the power.

NOTE

It is recommended that you wear a wrist strap before handling the P4080DS board to protect the board from electrical charges.

3. Connect a serial cable:
   a. Connect one end of a serial cable to your PC.
   b. Connect the other end to the DB9 serial connector on the back of the development system. Use the connector farthest from the fan.
4. Connect the CodeWarrior TAP (over USB).

NOTE

For more details on using an Ethernet TAP or a Gigabit TAP, see *Ethernet TAP Quick Start* or *Gigabit TAP Users Guide* available in the `<CodeWarrior-Install-Dir>\PA\Help\PDF` folder.

   a. Remove the development system's cover to expose the P4080DS board.

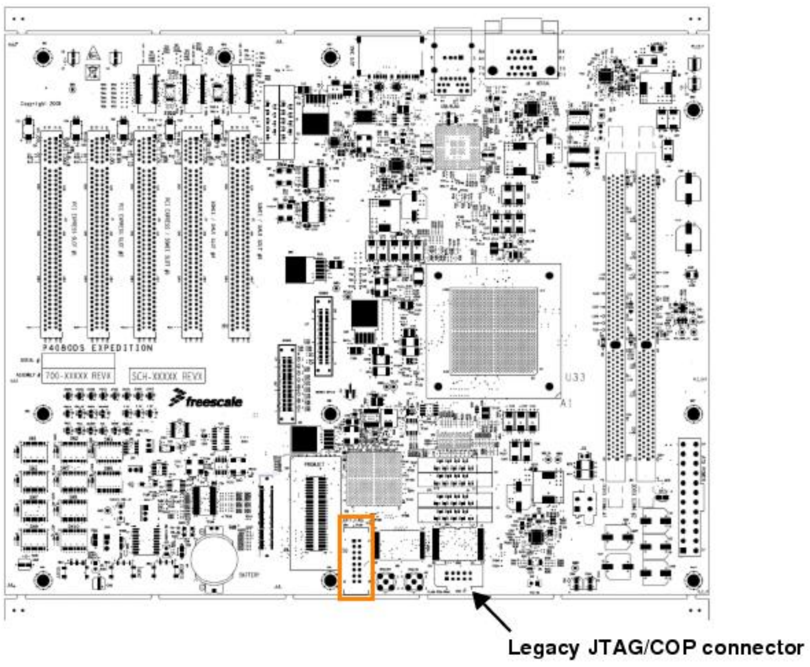


Figure 2-4. P4080DS Board

b. Connect the USB TAP's ribbon cable to the P4080DS board's legacy JTAG/COP connector (see the figure above).

NOTE

Ensure that `pin 1` of the USB TAP cable is aligned with `pin 1` of the board's JTAG/COP connector.

c. Connect the USB TAP's USB cable to your PC.

5. Power up the P4080DS desktop development system.

2.4 Configuring BSC9131/G1110 RDB Board

This section tells how to configure a BSC9131/G1110 RDB board.

Perform the following steps to configure a BSC9131/G1110 RDB board:

1. Ensure that board is not connected to the power.
2. Ensure that the power to the chassis or the standalone power supply is OFF.

NOTE

It is recommended that you wear a wrist strap before handling the BSC9131/G1110 RDB board to protect the board from electrical charges.

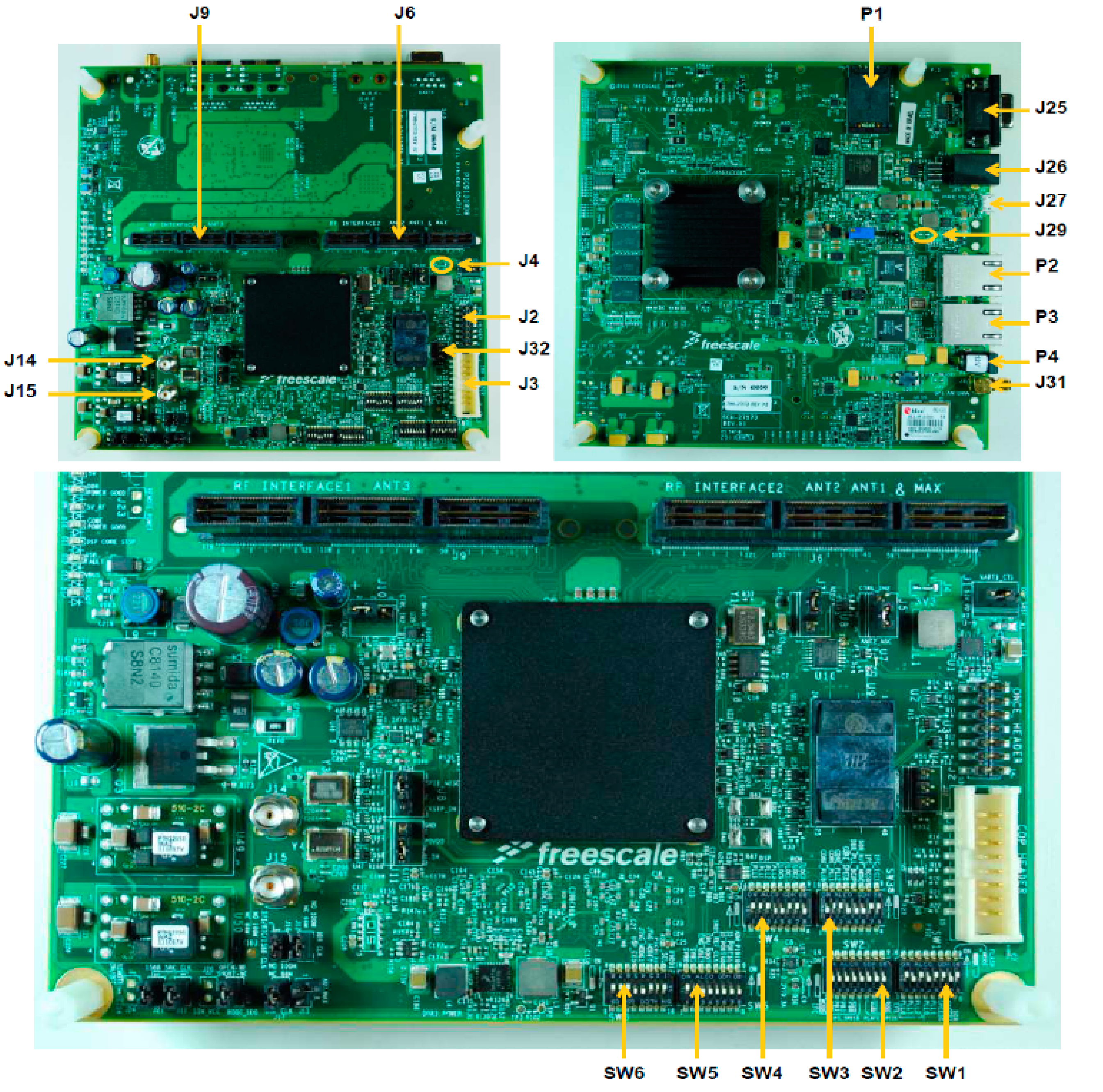


Figure 2-5. BSC9131/G1110 RDB Board

3. Check the default switch positions and verify if the board is operational, before changing the switches.

   The BSC9131 RDB board has dedicated switches controlling the JTAG topology configuration, irrespective of whether the StarCore and Power Architecture TAPs are daisy chained or accessed separately from the JTAG ports.

   • For the dual TAP mode on Power Architecture JTAG port (the Power Architecture TAP and DSP TAP are daisy chained and accessed from the Power

Architecture JTAG port; the DSP JTAG port is not used), set the on-board dip switch `SW6[3:4]` to `ON/ON (CFG_JTAG_MODE[0:1] = 00)`.
- For the single TAP mode through primary JTAG header (Power Architecture TAP is accessed from the Power Architecture JTAG port; the DSP TAP and DSP JTAG port are not used), set the on-board dip switch `SW6[3:4]` to `OFF/ON (CFG_JTAG_MODE[0:1] = 10)`.
- For the single TAP per JTAG port mode (Power Architecture TAP is accessed from the Power Architecture JTAG port, DSP TAP is accessed from the DSP JTAG port), set the on-board dip switch `SW6[3:4]` to `OFF/OFF (CFG_JTAG_MODE[0:1] = 11)`.

NOTE

See *BSC9131/G1110 RDB Hardware Getting Started Guide* to learn how to specify the switches and jumper header settings.

- Assemble and connect the board.
  1. Ensure that all power is turned off.
  2. Connect 12-volt power supply, power cable, and country-specific wall plug.
  3. Connect the power-supply jack cable to the board power connector P5.
  4. Plug power supply into the surge-protected strip.
  5. Connect the surge-protected strip to the AC outlet.
  6. Connect dual RS-232 to single DIL 10-pin cable to connector J18.
  7. Connect R232 9-pin cable to COM1 cable end. Note that the R232 9-pin cable is not included in hardware kit.
  8. Connect the CodeWarrior TAP (over USB) to your development machine and to the JTAG/COP 16-pin connector (J16) of the BSC9131/G1110 RDB board.

NOTE

For more details on using an Ethernet TAP or a Gigabit TAP, see *Ethernet TAP Quick Start* or the *Gigabit TAP Users Guide* available in the `<CodeWarrior-Install-Dir>\PA\Help\PDF` folder.

  9. Move the power switch (S1) to the ON position.
  10. Check for completion of the reset sequence indicated by the LEDs.
  11. Move the power switch (S1) to the OFF position to power off the system.

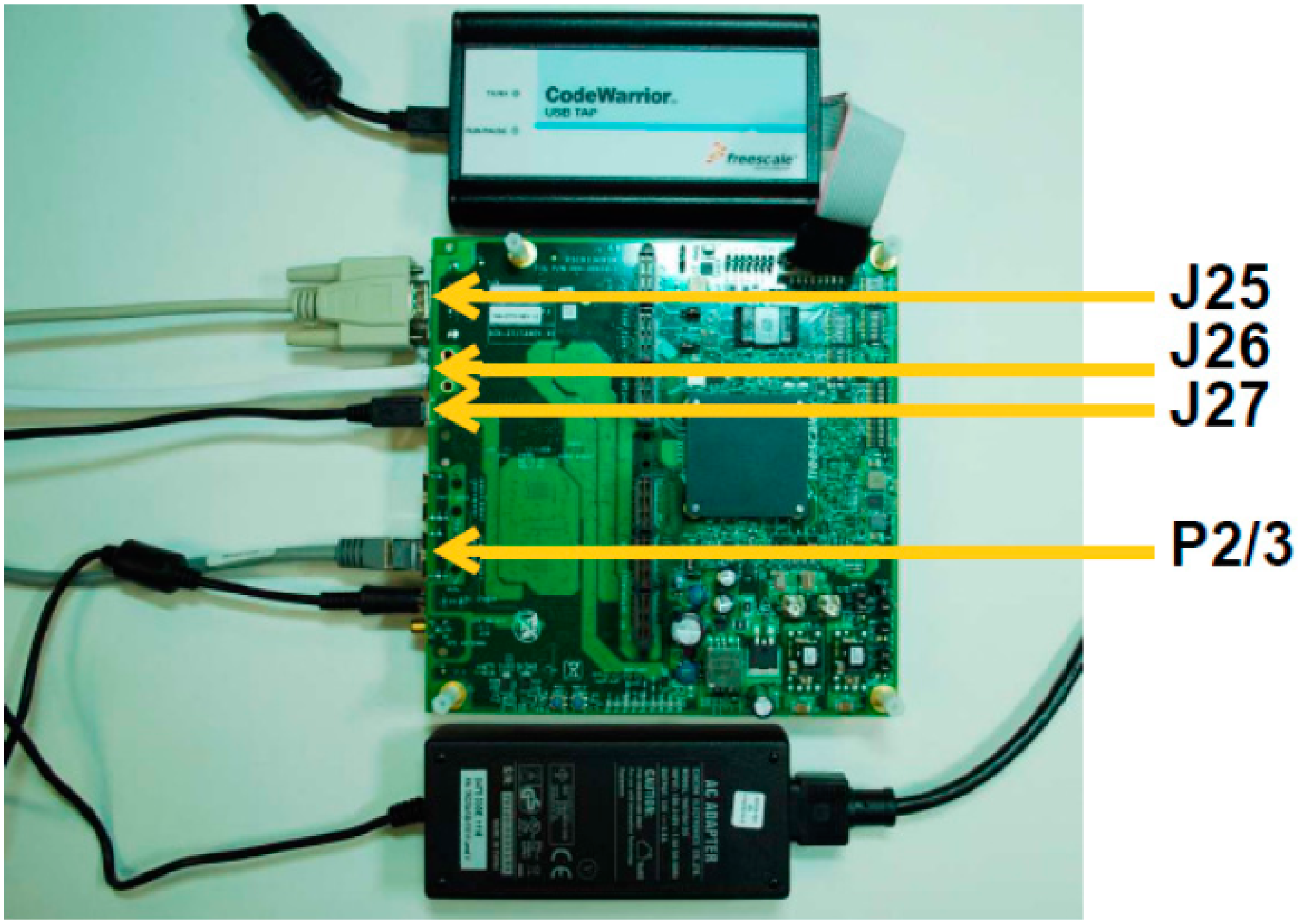


Figure 2-6. Connecting the Board

NOTE

See *BSC9131/G1110 RDB Hardware Getting Started Guide* and *BSC9131/G1110 RDB Reference Manual* for more information about the BSC9131/G1110 RDB board.

2.5 Configuring BSC9132 QDS Board

This section describes how to configure a BSC9132 QDS board.

Perform the following steps to configure a BSC9132 QDS board:

1. Ensure that board is not connected to the power.
2. Ensure that the power to the chassis or the standalone power supply is OFF.

NOTE

It is recommended that you wear a wrist strap before handling the BSC9132 QDS board to protect the board from electrical charges.

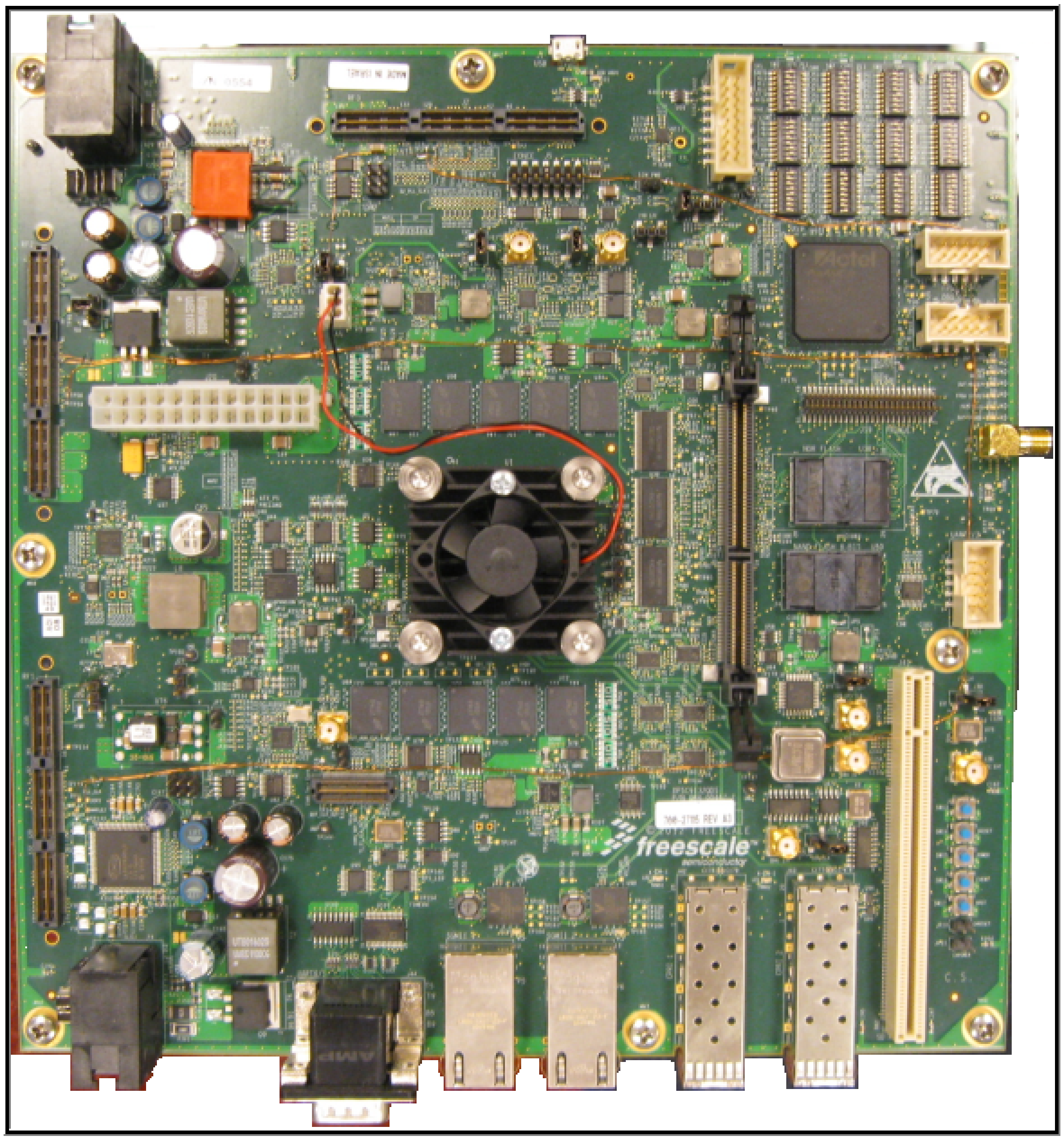
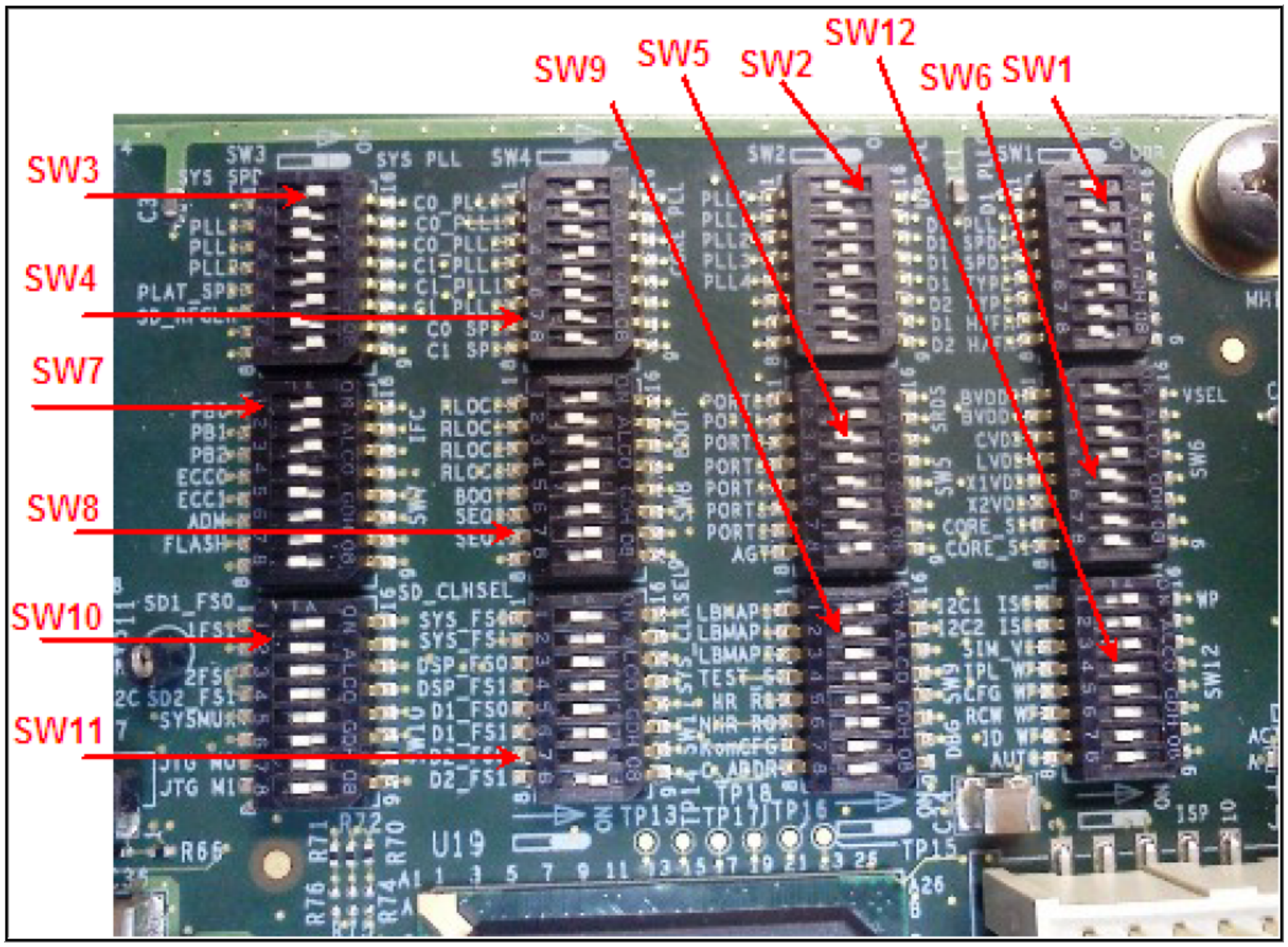


Figure 2-7. BSC9132 QDS Board

3. Check the default switch positions and verify if the board is operational, before changing the switches.

   The BSC9132 QDS board has dedicated switches controlling whether the StarCore and Power Architecture cores are exposed as separate JTAG chains, or through a single unified chain.



- For a single unified JTAG chain, set the on-board dip switch `SW10[7:8]` to `ON/ON` (`CFG_JTAG_MODE_0:1 = 00`). The JTAG connector will be `J3` (`COP HEADER`).
- For single TAP mode through primary JTAG header (`J3, COP Header`), set the on-board dip switch `SW10[7:8]` to `ON/OFF` (`CFG_JTAG_MODE_0:1 = 01`).
- For single TAP mode through secondary JTAG header (`J2, ONCE Header`), set the on-board dip switch `SW10[7:8]` to `OFF/OFF` (`CFG_JTAG_MODE_0:1 = 11`).

NOTE

See *BSC9132QDS Hardware Getting Started Guide* document to learn how to specify the switches and jumper header settings.

- Assemble and connect the board.
  1. Ensure that all power is turned off.
  2. Connect 12-volt power supply, power cable, and country-specific wall plug.
  3. Connect the power-supply jack cable to the board power connector `P4`.
  4. Plug power supply into the surge-protected strip.
  5. Connect the surge-protected strip to the AC outlet.
  6. Connect R232 9-pin cable to connector `J25`, if you intend to use an UART connection.

7. Connect R232 9-pin cable to COM1 cable end. Note that the R232 9-pin cable is not included in hardware kit.
8. Connect the CodeWarrior TAP (over USB) to your development machine and to the JTAG/COP (`J3, 16-pin`) or JTAG/ONCE (`J2, 14-pin`) of the BSC9132 QDS board, depending on selection from `SW10[7:8]`.

NOTE

If you are using an Ethernet TAP, see *Ethernet TAP Quick Start* available in the `<CodeWarrior-Install-Dir>\PA\` folder for set up instructions.

9. Move the power switch to the ON position.
10. Check for completion of the reset sequence indicated by the LEDs.
11. Move the power switch to the OFF position to power off the system.

NOTE

See *BSC9132QDS Hardware Getting Started Guide* and *BSC9132QDS Reference Manual* for more information about the BSC9132 QDS board.

Chapter 3
Working with Projects

This chapter explains how to use CodeWarrior tools to create and work with projects.

NOTE

The scope of this chapter is limited to the use of the CodeWarrior IDE to write and debug applications for the target platform.

This chapter explains:

- Launching CodeWarrior IDE
- Creating Projects
- Building Projects
- Debugging Projects
- Deleting a Project

3.1 Launching CodeWarrior IDE

This section provides the steps required to launch CodeWarrior IDE.

To launch the CodeWarrior IDE, perform these steps:

1. Select **Start > All Programs > Freescale CodeWarrior > CW for Power Architecture v*number* > CodeWarrior IDE**, where *number* is the version number of your product.

   The **Workspace Launcher** dialog box appears, prompting you to select a workspace to use.

NOTE

Click **Browse** to change the default location for workspace folder. You can also select the **Use this as the default and do not ask again** checkbox to set default or selected path as the default location for storing all your projects.

2. Click **OK**.

   The default workspace is accepted. The CodeWarrior IDE launches and the **Welcome** page appears.

NOTE

The **Welcome** page appears only if the CodeWarrior IDE or the selected workspace is opened for the first time. Otherwise, the Workbench window appears.

3. Click **Go to Workbench**, on the **Welcome** page.

   The Workbench window appears.

The CodeWarrior IDE is ready for use. You can now create, build, debug, or customize your project to match your requirements.

3.2 Creating Projects

This section explains how to use the CodeWarrior Bareboard Project Wizard and the CodeWarrior Linux Project Wizard to quickly create new projects with default settings (build and launch configurations).

After the project has been created, you can easily change any default setting to suit your needs.

NOTE

For detailed information on various wizard options, see *CodeWarrior Development Studio for Power Architecture Processors Targeting Manual*.

In this section:

- Creating CodeWarrior Bareboard Application Project
- Creating CodeWarrior Bareboard Library Project
- Creating CodeWarrior Linux Application Project

3.2.1 Creating CodeWarrior Bareboard Application Project

You can create a CodeWarrior bareboard application project using the **CodeWarrior Bareboard Project Wizard**.

To create a CodeWarrior bareboard application project, perform the following steps:

1. Launch the CodeWarrior IDE. For details, see Launching CodeWarrior IDE.
2. Select **File > New > CodeWarrior Bareboard Project Wizard** from the CodeWarrior IDE menu bar.

   The **CodeWarrior Bareboard Project Wizard** launches and the **Create a CodeWarrior Bareboard Project** page appears.

3. Specify a name for the new project in the **Project name** text box.

   For example, enter the project name as `application_project`.

4. If you do not want to create your project in the default workspace:
   a. Clear the **Use default location** check box.
   b. Click **Browse** and select the desired location for your project from the **Browse For Folder** dialog box.

      The selected location gets added to the **Location** text box.

5. Click **Next**.

   The **Processor** page appears.

6. Select the target processor for the new project from the **Processor** list.
7. Select **Application** from the **Project Output** group, to create an application with `.elf` extension that includes information required to debug the project.
8. Click **Next**.

   The **Debug Target Settings** page appears.

9. Select a supported connection type (hardware, simulator, or emulator), from the **Debugger Connection Types** group. Your selection determines the launch configurations that you can include in your project.
10. Select the board you are targeting, from the **Board** drop-down list.

NOTE

Hardware or simulators that support the target processor selected on the **Processors** page are only available for selection.

If you are using the Simics simulator, see https://www.simics.net/ for latest version and installation instructions for Simics.

11. Select the launch configurations, you want to include in your project, and the corresponding connection, from the **Launch** group.
12. Select the interface to communicate with the hardware, from the **Connection Type** drop-down list.
13. Enter the IP address of the TAP device in the **TAP address** text box. This option is disabled and cannot be edited, if you select **USB TAP** from the the **Connection Type** drop-down list.
14. Click **Next**.

    The **Build Settings** page appears.

15. Select the programming language, you want to use, from the **Language** group.

    The language you select determines the libraries that are linked with your program and the contents of the main source file that the wizard generates.

16. Select the architecture type used by the new project, from the **Build Tools Architecture** group.

    NOTE

    For projects created for QorIQ_P5 processors, both the **32 bit** and **64 bit** options are enabled and can be selected. This option may not be available for some target processors selected on the **Processors** page.

17. Select a toolchain from the **Toolchain** group.

    Selected toolchain sets up the default compiler, linker, and libraries used to build the new project. Each toolchain generates code targeted for a specific platform.

    NOTE

    The current release does not include toolchains for Linux applications, by default. To add the required Linux build tools support, you should install the corresponding service pack for the required target.

    For more information on installing service packs, see the *Service Pack Updater Quickstart* available in the `<CodeWarrior-Install-Dir>\PA\` folder.

18. Select an option from the **Floating Point** drop-down list, to prompt the compiler to handle the floating-point operations by generating instructions for the selected floating-point unit.
19. Click **Next**.

    The **Configurations** page appears.

20. Select a processing model option from the **Processing Model** group.

    NOTE

    The SMP option is available for selection only while creating projects for some e500mc, e5500, and e6500 core targets.

    - Select **SMP** (one build configuration for all the cores) to generate a single project for all the cores.
    - Select **AMP (One project per core)** to generate a separate project for each selected core. The option will also set the core index for each project based on the core selection.
    - Select **AMP (One build configuration per core)** to generate one project with multiple targets, each containing an `.lcf` file for the specified core.

      NOTE

      Selecting the **AMP (One build configuration per core)** option displays a check box, **Set up build references for build configurations of all cores**, just below this option. If you select the **Set up build references for build configurations of all cores** check box, then building the project for one core will automatically build the project for other cores as well. If you do not select this check box, then you would need to manually build the project for each core.

21. Select the processor core that executes the project, from the **Core index** list.
22. Click **Next**.

    The **Trace Configuration** page appears.

23. If you plan to collect the trace details:
    a. Select the **Start a trace session on debug launch** check box, to start a trace session automatically on debug launch.
    b. Select the source used for collecting trace data, from the **Generate trace configurations** group.
        - Select the **DDR Buffer** check box, to send the trace data to a DDR memory buffer.

- Select the **NPC Buffer** check box, to send the trace data to a small dedicated trace buffer.
- Select the **Gigabit TAP + Trace** check box, to collect trace data on a Gigabit Tap + Trace probe.

c. Select the **Enable circular collection** check box, from the **Enable circular collection (DDR and NPC only)** group, to treat the trace buffer as a 'circular buffer.' Selection of this check box ensures continuation of trace collection, even after the buffer is full, by replacing the older entries.

24. Click **Finish**.

    The wizard creates an application project according to your specifications. You can access the project from the **CodeWarrior Projects** view on the workbench.

The new project is ready for use. You can now customize the project by adding your own source code files, changing debugger settings, and adding libraries.

3.2.2 Creating CodeWarrior Bareboard Library Project

You can create a CodeWarrior bareboard library project using the **CodeWarrior Bareboard Project Wizard**.

To create a CodeWarrior bareboard library project, perform the following steps:

1. Launch the CodeWarrior IDE. For details, see Launching CodeWarrior IDE.
2. Select **File > New > CodeWarrior Bareboard Project Wizard** from the CodeWarrior IDE menu bar.

   The **CodeWarrior Bareboard Project Wizard** launches and the **Create a CodeWarrior Bareboard Project** page appears.
3. Specify a name for the new project in the **Project name** text box.

   For example, enter the project name as `library_project`.
4. If you do not want to create your project in the default workspace:
   a. Clear the **Use default location** check box.
   b. Click **Browse** and select the desired location for your project from the **Browse For Folder** dialog box.

      The selected location gets added to the **Location** text box.
5. Click **Next**.

The **Processor** page appears.

6. Select the target processor for the new project from the **Processor** list.
7. Select **Static Library** from the **Project Output** group, to create a library with `.a` extension that can be included in other projects. Library files created using this option do not include board specific details.
8. Click **Next**.

   The **Build Settings** page appears.

9. Select the programming language, you want to use, from the **Language** group.

   The language you select determines the libraries that are linked with your program and the contents of the main source file that the wizard generates.

10. Select a toolchain from the **Toolchain** group.

    Selected toolchain sets up the default compiler, linker, and libraries used to build the new project. Each toolchain generates code targeted for a specific platform.

    NOTE

    The current release does not include toolchains for Linux applications, by default. To add the required Linux build tools support, you should install the corresponding service pack for the required target.

    For more information on installing service packs, see the *Service Pack Updater Quickstart* available in the `<CodeWarrior-Install-Dir>\PA\` folder.

11. Select an option from the **Floating Point** drop-down list, to prompt the compiler to handle the floating-point operations by generating instructions for the selected floating-point unit.
12. Click **Finish**.

    The wizard creates a library project according to your specifications. You can access the project from the **CodeWarrior Projects** view on the workbench.

The new library project is ready for use. You can now customize the project to match your requirements.

3.2.3 Creating CodeWarrior Linux Application Project

You can create a CodeWarrior Linux application project using the **CodeWarrior Linux Project Wizard**.

To create a CodeWarrior Linux application project, perform the following steps:

1. Launch the CodeWarrior IDE. For details, see Launching CodeWarrior IDE.
2. Select **File > New > CodeWarrior Linux Project Wizard** from the CodeWarrior IDE menu bar.

   The **CodeWarrior Linux Project Wizard** launches and the **Create a CodeWarrior Linux Project** page appears.

3. Specify a name for the new project in the **Project name** text box.

   For example, enter the project name as `linux_application_project`.

4. If you do not want to create your project in the default workspace:
   a. Clear the **Use default location** check box.
   b. Click **Browse** and select the desired location for your project from the **Browse For Folder** dialog box.

      The selected location gets added to the **Location** text box.

5. Click **Next**.

   The **Processor** page appears.

6. Select the target processor for the new project from the **Processor** list.
7. Select **Application** from the **Project Output** group, to create an application with `.elf` extension that includes information required to debug the project.
8. Click **Next**.

   The **Build Settings** page appears.

9. Select a toolchain from the **Toolchain** group.

   Selected toolchain sets up the default compiler, linker, and libraries used to build the new project. Each toolchain generates code targeted for a specific platform.

NOTE

The current release does not include toolchains for Linux applications, by default. To add the required Linux build tools support, you should install the corresponding service pack for the required target.

For more information on installing service packs, see the *Service Pack Updater Quickstart* available in the `<CodeWarrior-Install-Dir>\PA\` folder.

10. Select the programming language, you want to use, from the **Language** group.

    The language you select determines the libraries that are linked with your program and the contents of the main source file that the wizard generates.

11. Select the architecture type used by the new project, from the **Build Tools Architecture** group.

    NOTE

    For projects created for QorIQ_P5 processors, both the **32 bit** and **64 bit** options are enabled and can be selected. This option may not be available for some target processors selected on the **Processors** page.

12. Click **Next**.

    The **Linux Application** page appears.

13. Select **CodeWarrior TRK** to use the CodeWarrior Target Resident Kernel (TRK) protocol, to download and control application on the Linux host system.

    NOTE

    When debugging a Linux application, you must use the CodeWarrior TRK to manage the communication interface between the debugger and Linux system.

14. Specify a **Remote System Configuration** option.
15. In the **IP Address** text box, enter the IP Address of the Linux host system, the project executes on.
16. In the **Port** text box, enter the port number that the debugger will use to communicate to the Linux host system.
17. In the **Remote Download Path** text box, enter the absolute path for the host directory, into which the debugger downloads the application.
18. Click **Finish**.

    The wizard creates a Linux application project according to your specifications. You can access the project from the CodeWarrior Projects view on the workbench.

The new CodeWarrior Linux application project is ready for use. You can now customize the project to match your requirements.

3.3 Building Projects

CodeWarrior IDE supports two modes of building projects, manual-build mode and auto-build mode.

3.3.1 Manual-Build Mode

In large workspaces, building the entire workspace can take a long time if users make changes with a significant impact on the dependent projects. Often there are only a few projects that really matter to a user at a given time.

To build only the selected projects, and any prerequisite projects that need to be built in order to correctly build the selected projects, select **Project > Build Project** from the CodeWarrior IDE menu bar. Alternatively, select **Project > Build All**.

Tip

You can also right-click on the selected project in the **CodeWarrior Projects** view and select **Build Project** from the context menu.

3.3.2 Auto-Build Mode

CodeWarrior IDE takes care of compiling source files automatically. Builds occur automatically in the background every time you change files in the workspace (for example, saving an editor), if auto-build is enabled.

To automatically build all the projects in a workspace, select **Project > Build Automatically** from the CodeWarrior IDE menu bar.

If auto-build is taking too long and is interfering with ongoing development, it can be turned off. Select **Project > Build Automatically** from the CodeWarrior IDE menu bar to disable auto-build mode.

NOTE

It is advised that you do not use the **Build Automatically** option for C/C++ development. Using this option will result in building the entire project whenever you save a change to the makefile or source files. This can take a significant amount of time for very large projects.

3.4 Debugging Projects

This section explains how to use the CodeWarrior development tools to debug both bareboard and embedded Linux® software for Power® Architecture processors.

- Debugging Bareboard Application Projects
- Debugging Linux Application Projects
- Debugging Guest LWEs Using Hypervisor
- Debugging Guest Linux Kernels Using Hypervisor
- Debugging U-Boot

3.4.1 Debugging Bareboard Application Projects

This section explains how to change the debugger settings and how to debug a CodeWarrior bareboard application project.

The **CodeWarrior Bareboard Project** wizard sets the debugger settings of the project's launch configurations to default values. You can change these default values based on your requirements.

To modify the debugger settings and start debugging a CodeWarrior project, perform these steps:

1. Launch the CodeWarrior IDE.
2. From the CodeWarrior IDE menu bar, select **Run > Debug Configurations**. The CodeWarrior IDE uses the settings in the launch configuration to generate debugging information and initiate communication with the target board.

   The **Debug Configurations** dialog box appears. The left side of this dialog box has a list of debug configurations that apply to the current application.

   NOTE

   For more information on how to use the debugger, see *CodeWarrior Development Studio Common Features Guide* and *CodeWarrior Development Studio for Power*

Architecture Processors Targeting Manual available in the `<CodeWarrior-Install-Dir>\PA\` folder.

3. Expand the **CodeWarrior** configuration.
4. From the expanded list, select the debug configuration that you want to modify.

   The **Main** page appears in the right panel.

5. Click **Debug** to start the debugging session.
   a. The **Debug** perspective appears and the execution halts at the first statement of `main()`.
   b. Click a thread in the **Debug** view.

      The program counter icon on the marker bar points to the next statement to be executed.

   c. In the **Debug** view, click **Step Over** .

      The debugger executes the current statement and halts at next statement.

6. Set breakpoint and execute program to breakpoint.
   a. In the editor area, scroll to a line of command statement.
   b. Double-click the marker bar next to the statement.

      The breakpoint indicator (blue dot) appears next to the statement.

   c. In the **Debug** view, click **Resume** .

      The debugger executes all statements up to but not including the breakpoint statement.

7. Control the program:
   a. In the **Debug** view, click **Step Over** .

      The debugger executes the breakpoint statement and halts at the next statement.

   b. In the **Debug** view, click **Resume** .

      The program outputs to the Console window at the bottom.

   c. In the **Debug** view, click **Terminate** .

      The debug session ends.

8. Close the **Console** window:
   a. Select **File > Exit**.

      The CodeWarrior IDE window closes.

3.4.2 Debugging Linux Application Projects

This section explains how to configure a Linux system and how to debug a CodeWarrior Linux application project.

To configure a Linux system for debugging a Linux application, follow these steps:

1. Build the AppTRK package.
2. Include the AppTRK package in the RAM disk.

   NOTE
   For detailed instructions on how to install the SDK and work with the AppTRK package, see the SDK user manual. The document is available in the `iso/help/documents/pdf` folder of the SDK layout.

3. Start the Linux BSP:
   a. After the kernel boot is finished, start the apptrk agent

   ```
   apptrk :12345 &
   ```

   b. Test if the network configuration is working as expected:
      - Ping the Linux host machine IP from the simulated Linux. Ping the simulated IP from the Linux machine.
      - From the Windows machine, try `telnet <IP address> 1234` where `<IP address>` is the address of the Linux alias Ethernet device and `1234` is the port on which apptrk is running.

      NOTE
      You will see some AppTRK information after issuing the telnet command. If no information shows up, then there might be a problem with the whole network configuration.

4. Launch CodeWarrior.

   The **Workspace Launcher** dialog box appears, prompting you to select a workspace to use.

   NOTE
   Click **Browse** to change the default location for workspace folder. You can also select the Use this as the default and do not ask again check box to set default or selected path as the default location for storing all your projects.

5. Click **OK**.

   The default workspace is accepted.

6. Select **File > New > CodeWarrior Linux Project Wizard**, from the CodeWarrior IDE menu bar.

   The **CodeWarrior Linux Project Wizard** launches and the **Create a CodeWarrior Linux Project** page appears.

7. Specify a name for the new project in the **Project name** text box.

   For example, enter the project name as `linux_project`.

8. If you do not want to create your project in the default workspace:
   a. Clear the **Use default location** check box.
   b. Click **Browse** and select the desired location from the **Browse For Folder** dialog box.
   c. In the **Location** text box, append the location with the name of the directory in which you want to create your project.

   NOTE
   An existing directory cannot be specified for the project location.

9. Click **Next**.

   The **Processor** page appears.

10. Select the target processor for the new project, from the **Processor** list.
11. Select **Application** from the **Project Output** group, to create an application with `.elf` extension that includes information required to debug the project.
12. Click **Next**.

    The **Build Settings** page appears.

13. Select a toolchain for Linux applications from the **Toolchain** group.

    Selected toolchain sets up the default compiler, linker, and libraries used to build the new project. Each toolchain generates code targeted for a specific platform.

    NOTE
    The current release does not include toolchains for Linux applications, by default. To add the required Linux build tools support, you should install the corresponding service pack for the required target.

For more information on installing service packs, see the *Service Pack Updater Quickstart* available in the `<CodeWarrior-Install-Dir>\PA\` folder.

14. Select the programming language, you want to use, from the **Language** group.

    The language you select determines the libraries that are linked with your program and the contents of the main source file that the wizard generates.

15. Select the architecture type used by the new project, from the **Build Tools Architecture** group.
16. Click **Next**.

    The **Linux Application** page appears.

17. Select **CodeWarrior TRK** to use the CodeWarrior Target Resident Kernel (TRK) protocol, to download and control application on the Linux host system.

    NOTE

    When debugging a Linux application, you must use the CodeWarrior TRK to manage the communications interface between the debugger and Linux system.

18. Specify a **Remote System Configuration** option.
19. In the **IP Address** text box, enter the IP Address of the Linux host system, the project executes on.
20. In the **Port** text box, enter the port number that the debugger will use to communicate to the Linux host system.
21. In the **Remote Download Path** text box, enter the absolute path for the host directory, into which the debugger downloads the application.
22. Click **Finish**.

    The wizard creates a Linux application project according to your specifications. You can access the project from the CodeWarrior Projects view on the workbench.

23. From the CodeWarrior IDE menu bar, select **Run > Debug Configurations**.

    The **Debug Configurations** dialog box appears. The left side of this dialog box has a list of debug configurations that apply to the current application.

24. Expand the **CodeWarrior** configuration.
25. From the expanded list, select the debug configuration that you want to modify.

    The **Main** page appears in the right pane.

26. Edit the AppTRK connection to the address of the auxiliary Ethernet adapter from the Linux machine.
27. Click **Debug** to debug the Linux application project.

    The **Debug** perspective appears with the control stopped at `main()`.

3.4.3 Debugging Guest LWEs Using Hypervisor

This section describes how to configure and build hypervisor support on a Linux machine and debug bareboard applications using hypervisor.

The steps are given below:

1. Compile the embedded-hv package. The package should be compiled with HyperTRK enabled.

   NOTE

   See the SDK user manual for instructions on how to install the SDK and work with the HyperTRK. The document is available in the `iso/help/documents/pdf` folder of the SDK layout.

2. Configure HyperTRK debug support in the Hypervisor Device Tree.
   a. In the hypervisor configuration file (the .dts file), ensure that a muxer device is defined and is connected to a physical UART. For example, see the listing below:

Listing 3-1. Defining and connecting a muxer device

```
uartmux: uartmux {
  compatible = "byte-channel-mux";

  endpoint = <&serial0>;

};
```

   b. Identify the partition for which you want to add the HyperTRK debug support. A HyperTRK stub DTS entry must be added for each virtual CPU you want to debug. Listing below shows an example of how you identify the partition to add HyperTRK debug stub support.

Listing 3-2. Identifying the partition for adding debug support

```
// =====================================================
// Partition 1

// =====================================================
part1 {

// Indicates that it is a partition node

compatible = "partition";

label = "p1-linux";

// CPU #0 and #1 is assigned to this partition

cpus = <0 2>;

guest-image = <0xf 0xe8020000 0 0 0 0x00f00000>;

linux-rootfs = <0xf 0xe9300000 0 0x01300000 0 0x02800000>;

dtb-window = <0 0x1000000 0 0x12000>;
```

c. When using the **Download** debug session type, ensure that the debugged partition does not have the **no-auto-start** option set in the device tree. After the reset, the partition must be in the running state. In addition, comment any **no-auto-start** options. For example:

```
// partition is not to be started by hypervisor.
// no-auto-start;
```

d. Compile the DTS file into a DTB file after adding the debug support. Ensure that the DTC package was properly compiled and installed for the x86 Linux machine, and that the **dtc** command is included in the **PATH** environment variable.

```
dtc -p 1024 -O dtb hv_conf_source.dts -o hv_conf_new.dtb
```

The above command creates the new **hv_conf_new.dtb** file.

NOTE

For more detailed instructions, see *CodeWarrior Development Studio for Power Architecture Processors Targeting Manual* available in the `<CodeWarrior-Install-Dir>\PA\` folder.

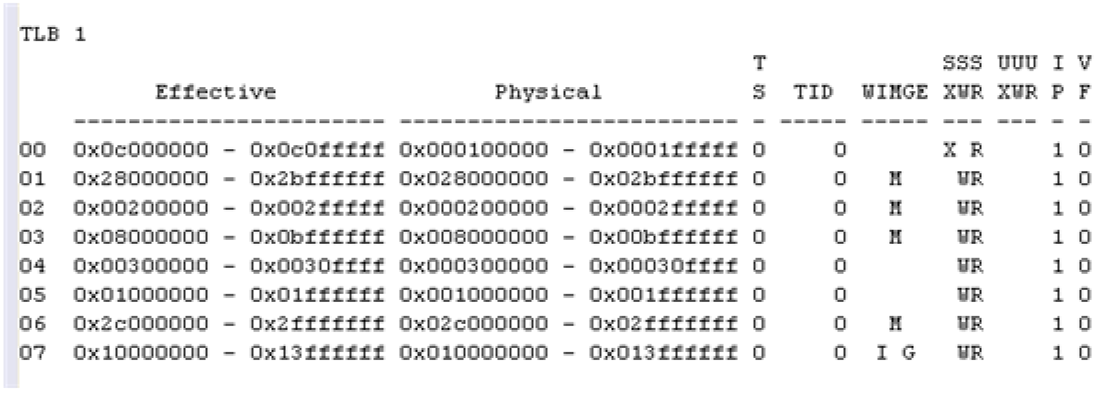
e. Create a memory configuration file for the whole SMP LWE partition.

NOTE

For debugging any LWE application, create a memory configuration file according to the MMU that the LWE application uses. In addition, ensure that you create an initial configuration file to be used for Download launch configuration.You can create either one memory configuration file for the whole SMP LWE partition, or a single configuration file for each core from the SMP partition.

1. Check the TLB entries for the partition you want to debug.

2. Pause the partition. For example, `pause 3`.
3. Display the guest `tlb` for a core, for example, `gtlb 3 0`, and check TLB 1.



```
TLB 1
                                                             T                   SSS UUU I V
          Effective                    Physical              S   TID   WIMGE XWR XWR P F
    ----------------------- ------------------------- - ----- ----- --- --- - -
00  0x0c000000 - 0x0c0fffff 0x000100000 - 0x0001fffff 0     0         X R       1 0
01  0x28000000 - 0x2bffffff 0x028000000 - 0x02bffffff 0     0    M     WR       1 0
02  0x00200000 - 0x002fffff 0x000200000 - 0x0002fffff 0     0    M     WR       1 0
03  0x08000000 - 0x0bffffff 0x008000000 - 0x00bffffff 0     0    M     WR       1 0
04  0x00300000 - 0x0030ffff 0x000300000 - 0x00030ffff 0     0          WR       1 0
05  0x01000000 - 0x01ffffff 0x001000000 - 0x001ffffff 0     0          WR       1 0
06  0x2c000000 - 0x2fffffff 0x02c000000 - 0x02fffffff 0     0    M     WR       1 0
07  0x10000000 - 0x13ffffff 0x010000000 - 0x013ffffff 0     0   I G    WR       1 0
```

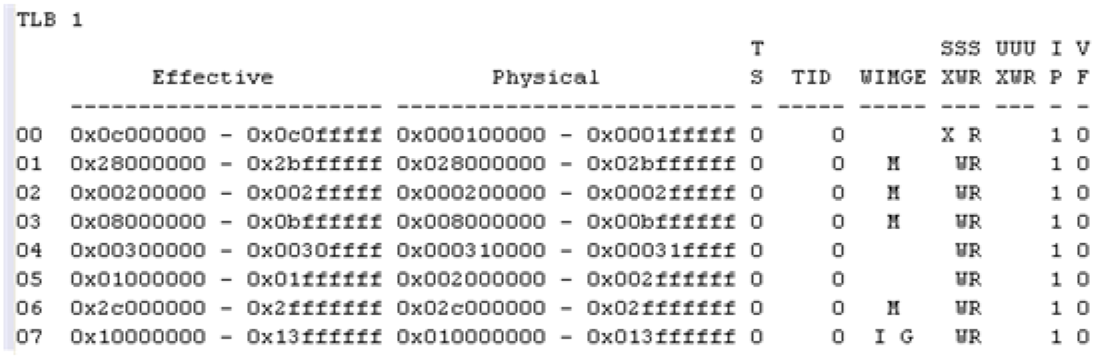
Figure 3-1. Guest TLB for a core

4. Observe that the first translation entry is not 1-1, 0x0c000000 -> 0x000100000. Therefore, add the following command in the memory configuration file:

   ```
   translate v:0x0c000000 p:0x00100000 0x00100000
   ```

   Note that you do not need to add the translation entries that are already 1-1.

5. In case you find that TLB 0 also has non 1-1 translations and you want to access the respective memory, go ahead and add the required `translate` command in the memory configuration file.
6. Display the guest `tlb` for another core, for example, `gtlb 3 1`, and check TLB 1.



```
TLB 1
                                                             T                   SSS UUU I V
          Effective                    Physical              S   TID   WIMGE XWR XWR P F
    ----------------------- ------------------------- - ----- ----- --- --- - -
00  0x0c000000 - 0x0c0fffff 0x000100000 - 0x0001fffff 0     0         X R       1 0
01  0x28000000 - 0x2bffffff 0x028000000 - 0x02bffffff 0     0    M     WR       1 0
02  0x00200000 - 0x002fffff 0x000200000 - 0x0002fffff 0     0    M     WR       1 0
03  0x08000000 - 0x0bffffff 0x008000000 - 0x00bffffff 0     0    M     WR       1 0
04  0x00300000 - 0x0030ffff 0x000310000 - 0x00031ffff 0     0          WR       1 0
05  0x01000000 - 0x01ffffff 0x002000000 - 0x002ffffff 0     0          WR       1 0
06  0x2c000000 - 0x2fffffff 0x02c000000 - 0x02fffffff 0     0    M     WR       1 0
07  0x10000000 - 0x13ffffff 0x010000000 - 0x013ffffff 0     0   I G    WR       1 0
```

Figure 3-2. TLB 1 for another core

7. Observe that the first translation entry is the same that you added in the memory configuration file in the previous steps. In addition, observe the non 1-1 entry 0x01000000 -> 0x002000000. Note that this is the stack and is present in other SMP secondary cores. However, in this case, instruct the debugger to access the 0x01000000 - 0x01ffffff range by using virtual addresses. For example:

```
range v:0x01000000 v:0x01ffffff 4 ReadWrite LogicalData
```

8. Follow the same procedure to access the 0x00300000 - 0x0030ffff range. For example:

```
range v:0x00300000 v:0x0030ffff 4 ReadWrite LogicalData
```

9. Ensure that after checking the TLBs of all the cores, the required memory configuration file looks like this:

```
AutoEnableTranslations   true
range v:0x0c000000 v:0x0c0fffff 4 ReadWrite LogicalData
range v:0x00300000 v:0x0030ffff 4 ReadWrite LogicalData
range v:0x01000000 v:0x01ffffff 4 ReadWrite LogicalData
```

NOTE

To create a memory configuration file per core for the specific scenario described in this section, replace the memory ranges on which you want the debugger to access virtual memory with translated sections from virtual to physical for these ranges, as explained in previous steps for the first core, `gtlb 3 0`.

f. Create an initial configuration file to be used for Download launch configuration.
   1. Consider an LWE, `hello.elf`.
   2. Run this command: `readelf -h hello.elf`.

      The ELF header and the entry point address 0xc010000 are printed.

   3. Having the MMU translation as 0x0c000000 - 0x0c0fffff 0x000100000 - 0x0001fffff and the entry point as 0xc010000, the initial configuration file must contain alternatePC 0x110000 (the physical entry point of the application).

g. Create a launch configuration to debug an LWE application:
   1. Select **File** > **Import** to import the `hello.elf` LWE application. The **Import** wizard launches and the **Select** page appears.
   2. Expand the **CodeWarrior** group and select **CodeWarrior Executable Importer**.
   3. Click **Next**. The wizard name changes to **Import a CodeWarrior Executable file** and the **Import a CodeWarrior Executable file** page appears.
   4. Specify a new project name.
   5. Click **Next**. The **Import C/C++/Assembler Executable Files** page appears.
   6. Select the executable **vmlinux.elf** built with -gdwarf from the `images` directory.
   7. Click **Next**. The **Processor** page appears.
   8. Select a processor, toolchain, and target OS.

9. Click **Next**. The **Debug Target Settings** page appears.
10. Select a supported connection type from the **Debugger Connection Types** group. Your selection determines the launch configurations that you can include in your project.
11. Select the hardware or simulator, you plan to use, from the **Board** drop-down list.
12. Select the launch configurations, you want to include in your project, and the corresponding connection.
13. Select the interface to communicate with the hardware, from the **Connection Type** drop-down list.
14. Enter the IP address of the TAP device in the **TAP address** text box. This option is disabled and cannot be edited, if you select **USB TAP** from the the **Connection Type** drop-down list.
15. Click **Next**. The **Configurations** page appears.
16. Specify the core index for the project.
17. Click **Finish**. The **Import a CodeWarrior Executable file** wizard ends.
18. Select **Run** > **Debug Configurations** to open the **Debug Configurations** dialog box.

h. Create a **CodeWarrior Attach** launch configuration.

1. From the **CodeWarrior** group, select the newly imported launch configuration.
2. On the **Main** tab, select **Attach** from the **Debug session type** group.
3. On the **Main** tab, from the **Target settings** panel, click **New** next to the **Connection** drop-down list.

   The **New Connection** wizard launches and the **Select Remote System Type** page appears.

4. Select **TRK Connection** from the **CodeWarrior Bareboard Debugging** group in the **System type** list.
5. Click **Next**. The **Select Remote System Type** page closes and the **TRK Connection** page appears.
6. Specify settings, such as name and description of the new connection.
7. Click **New** next to **Target** list. The **TRK Target** page appears.
8. Specify settings, such as name and description.
9. Click **Edit** next to **Target type** list. The **Target Types** dialog box appears.
10. Click **Import**. The **Import Target Type** dialog box appears.
11. Import the hypervisor `.dtb` file.
12. Click **OK** to save the changes and close the **Import Target Type** dialog box.
13. Click **OK** to close the **Target Types** dialog box.
14. Select a target from the **Target type** list.

15. Configure the followings settings in the **Initialization** and **Memory** tabs.

    In the **Initialization** tab:

    - Do not select or add anything
    - Ensure that **Execute target reset** check box is not selected
    - No init files exist for the debugged Linux partition cores

    In the **Memory** tab:

    - Add the memory configuration file that you created to the LWE partition you want to debug
16. Click **Finish** to close the **TRK Target** page.
17. Select **Trk Muxer** in the **Connection type** drop-down list of the **TRK Connection** page.
    - Select **Use existing host muxer process**, and type the IP address of the Linux host on which the mux_server is running.
    - Alternatively, for Linux host only, you can select **Launch host muxer process** for automatically launching the muxer process. If you follow this step, you need to select the mux_server executable, and a TCP/IP target muxer with an IP address and a starting port on which you want to launch the mux_server.
    - For TRK muxer ports, click **Sequence** and type the first port on which the mux_server was started. The channels and ports on which the debugger accesses the cores appear.

      The channels must correspond to the trk-stub's mux channels added in the hypervisor .dts file.

      NOTE

      The debugger currently does not support adding a single memory configuration file for each core from the LWE SMP partition. Using one memory configuration file for the whole SMP partition is sufficient.

18. Click **Finish**.

    The **New Connection** wizard closes and the new remote system that you just created appears in the **Connection** drop-down list in the **Target settings** panel.

19. Select all the cores that you want to debug from the LWE partition.

    You have successfully created the Attach launch configuration. Click **Debug** and attach the configuration to the running LWE.

i. Create a **CodeWarrior** launch configuration.

1. From the **CodeWarrior** group, select the newly imported launch configuration.
2. On the **Main** tab, select **Download** from the **Debug session type** group.
3. On the **Main** tab, from the **Target settings** panel, click **New** next to the **Connection** drop-down list.

   The **New Connection** wizard launches and the **Select Remote System Type** page appears.

4. Select **TRK Connection** from the **CodeWarrior Bareboard Debugging** group in the **System type** list.
5. Click **Next**. The **Select Remote System Type** page closes and the **TRK Connection** page appears.
6. Specify settings, such as name and description of the new connection.
7. Click **New** next to **Target** list. The **TRK Target** page appears.
8. Specify settings, such as name and description.
9. Click **Edit** next to **Target type** list. The **Target Types** dialog box appears.
10. Click **Import**. The **Import Target Type** dialog box appears.
11. Import the hypervisor `.dtb` file.
12. Click **OK** to save the changes and close the **Import Target Type** dialog box.
13. Click **OK** to close the **Target Types** dialog box.
14. Select a target from the **Target type** list.
15. Configure the following settings in the **Initialization** and **Memory** tabs.

    In the **Initialization** tab:

    - Select the **Execute target reset** check box
    - Add the initial configuration file that you created to the first core from LWE partition you want to debug

    In the **Memory** tab:

    - Add the memory configuration file that you created to the LWE partition you want to debug
16. Click **Finish** to close the **TRK Target** page.
17. Select **Trk Muxer** in the **Connection type** drop-down list of the **TRK Connection** page.
    - Select **Use existing host muxer process**, and type the IP address of the Linux host on which the mux_server is running.
    - Alternatively, for Linux host only, you can select Launch host muxer process for automatically launching the muxer process. If you follow this step, you need to select the mux_server executable, and a TCP/IP

target muxer with an IP address and a starting port on which you want to launch the mux_server.
- For TRK muxer ports, click **Sequence** and type the first port on which the mux_server was started. The channels and ports on which the debugger accesses the cores appear.

  The channels must correspond to the trk-stub's mux channels added in the hypervisor .dts file.

18. Click **Finish**.

    The **New Connection** wizard closes and the new remote system that you just created appears in the **Connection** drop-down list in the **Target settings** panel.

j. Debug an LWE application.
   1. Select all the cores that you want to debug from the Linux partition.
   2. Click the **Debugger** tab.
   3. In the **Debugger options** group, select the **Debug** tab.
   4. Select the **Stop on startup at** check box in the **Program execution** group.
      - Select the **Program entry point** option, if you want the debugging session to start from 0x0
      - Specify the function name in the **User specified** field, if you want the debugging session to start from a specific kernel function.
   5. In the **Debugger options** group, select the **Download** tab.
   6. If you have the same .elf file on the host and on the target, clear the **Perform standard download** check box.

      You have successfully created the **CodeWarrior** launch configuration.

k. Click **Debug** to debug the LWE application using hypervisor.

3.4.4 Debugging Guest Linux Kernels Using Hypervisor

This section describes how to configure and build hypervisor support on a Linux machine and debug Linux kernels using hypervisor.

The steps are given below:

1. Compile the embedded-hv package. The package should be compiled with HyperTRK enabled.

NOTE

See the SDK user manual for instructions on how to install the SDK and work with the HyperTRK. The document is available in `iso/help/documents/pdf` folder of the SDK layout.

2. Configure HyperTRK debug support in the Hypervisor Device Tree.
   a. In the hypervisor configuration file (the .dts file), ensure that a muxer device is defined and is connected to a physical UART. For example, see the listing below:

Listing 3-3. Defining and connecting a muxer device

```
uartmux: uartmux {
  compatible = "byte-channel-mux";

  endpoint = <&serial0>;

};
```

   b. Identify the partition for which you want to add the HyperTRK debug support. A HyperTRK stub DTS entry must be added for each virtual CPU you want to debug. Listing below shows an example of how you can identify the partition to add HyperTRK debug stub support.

Listing 3-4. Identifying the partition for adding debug support

```
// =====================================================
// Partition 1

// =====================================================

part1 {

// Indicates that it is a partition node

compatible = "partition";

label = "p1-linux";

// CPU #0 and #1 is assigned to this partition

cpus = <0 2>;

guest-image = <0xf 0xe8020000 0 0 0 0x00f00000>;

linux-rootfs = <0xf 0xe9300000 0 0x01300000 0 0x02800000>;

dtb-window = <0 0x1000000 0 0x12000>;
```

   c. When using the **Download** debug session type, ensure that the debugged partition does not have the **no-auto-start** option set in the device tree. After the reset, the partition must be in the running state. In addition, comment any **no-auto-start** options. For example:

```
// partition is not to be started by hypervisor.
// no-auto-start;
```

   d. Compile the DTS file into a DTB file after adding the debug support. Ensure that the DTC package was properly compiled and installed for the x86 Linux machine, and that the **dtc** command is included in the **PATH** environment variable.

```
dtc -p 1024 -O dtb hv_conf_source.dts -o hv_conf_new.dtb
```

The above command creates the new **hv_conf_new.dtb** file.

3. Start the muxer server by issuing the command: `mux_server`

NOTE

Ensure that there is no telnet or terminal session connected to the debug ports.

4. Create a launch configuration to debug a Linux partition after kernel boot.
   a. Select **File** > **Import** to import the `vmlinux.elf` file. The **Import** wizard launches and the **Select** page appears.
   b. Expand the **CodeWarrior** group and select **CodeWarrior Executable Importer**.
   c. Click **Next**. The wizard name changes to **Import a CodeWarrior Executable file** and the **Import a CodeWarrior Executable file** page appears.
   d. Specify a new project name.
   e. Click **Next**. The **Import C/C++/Assembler Executable Files** page appears.
   f. Select the executable **vmlinux.elf** built with -gdwarf from the `images` directory.
   g. Click **Next**. The **Processor** page appears.
   h. Select a processor, toolchain, and target OS.
   i. Click **Next**. The **Debug Target Settings** page appears.
   j. Select a supported connection type from the **Debugger Connection Types** group. Your selection determines the launch configurations that you can include in your project.
   k. Select the hardware or simulator, you plan to use, from the **Board** drop-down list.
   l. Select the launch configurations, you want to include in your project, and the corresponding connection.
   m. Select the interface to communicate with the hardware, from the **Connection Type** drop-down list.
   n. Enter the IP address of the TAP device in the **TAP address** text box. This option is disabled and cannot be edited, if you select **USB TAP** from the the **Connection Type** drop-down list.
   o. Click **Next**. The **Configurations** page appears.
   p. Specify the core index for the project.
   q. Click **Finish**. The **Import a CodeWarrior Executable file** wizard ends.
   r. Select **Run** > **Debug Configurations** to open the **Debug Configurations** window.
5. Create a **CodeWarrior Attach** launch configuration.

a. From the **CodeWarrior** group, select the newly imported launch configuration.
b. On the **Main** tab, select **Attach** from the **Debug session type** group.
c. On the **Main** tab, from the **Target settings** panel, click **New** next to the **Connection** drop-down list.

   The **New Connection** wizard launches and the **Select Remote System Type** page appears.

d. Select **TRK Connection** from the **CodeWarrior Bareboard Debugging** group in the **System type** list.
e. Click **Next**. The **Select Remote System Type** page closes and the **TRK Connection** page appears.
f. Specify settings, such as name and description of the new connection.
g. Click **New** next to **Target** list. The **TRK Target** page appears.
h. Specify settings, such as name and description.
i. Click **Edit** next to **Target type** list. The **Target Types** dialog box appears.
j. Click **Import**. The **Import Target Type** dialog box appears.
k. Import the hypervisor `.dtb` file.
l. Click **OK** to save the changes and close the **Import Target Type** dialog box.
m. Click **OK** to close the **Target Types** dialog box.
n. Select a target from the **Target type** list.
o. Configure the following settings in the **Initialization** and **Memory** tabs.

   In the **Initialization** tab:

   - Do not select or add anything
   - Ensure that **Execute target reset** check box is not selected
   - No init files exist for the debugged Linux partition cores

   In the **Memory** tab:

   - Do not add any memory configuration files for the debugged Linux partition cores

p. Click **Finish** to close the **TRK Target** page.
q. Select **Trk Muxer** from the **Connection type** drop-down list of the **TRK Connection** page.
   - Select **Use existing host muxer process**, and type the IP address of the Linux host on which the mux_server is running.
   - Alternatively, for Linux host only, you can select **Launch host muxer process** for automatically launching the muxer process. If you follow this step, you need to select the mux_server executable, and a TCP/IP target

muxer with an IP address and a starting port on which you want to launch the mux_server.
    - For TRK muxer ports, click **Sequence** and type the first port on which the mux_server was started. The channels and ports on which the debugger accesses the cores appear.

r. Add the sequence for the starting debug port number.

NOTE

In this example, the debug port starts at Byte Channel 10.

s. Click **Sequence** and enter the port number as 8010.

   The channels must correspond to the trk-stub's mux channels added in the hypervisor .dts file.

t. Click **Finish**.

   The **New Connection** wizard closes and the new remote system that you just created appears in the **Connection** drop-down list in the **Target settings** panel.

u. Select all the cores that you want to debug from the Linux partition.
v. Click the **Debugger** tab.
w. In the **Debugger options** group, select the **OS Awareness** tab.
x. Select **Linux** in the **Target OS** drop-down list. Note that it is mandatory to select Linux for the specific scenario described in this section.

   The Boot Parameters, Debug, and Modules tabs appear.

   In the **Boot Parameters** tab:

   - Ensure that you disable all the options available on this tab

   In the **Debug** tab:

   - Select the **Enable Memory Translation** check box, and configure it according to the Linux MMU settings. For example:

```
Physical Base Address          0x0
Virtual Base Address           0xc0000000
Memory Size                    0x20000000
```

   - Select the **Enable Threaded Debugging Support** check box.
   - The Update Background Threads on Stop option is used to remove the dead threads, which were debugged at some point during the debugging session, but later, were terminated or killed.

NOTE

This option might cause a decrease in speed because a big amount of memory must be read at every stop.

y. Do not select the Enable Delayed Software Breakpoint Support check box.

You have successfully created the Attach launch configuration.

z. Click **Debug** and attach the configuration to the running Linux kernel.

6. Create a **CodeWarrior Download** launch configuration to debug a Linux partition from an entry point or a user-defined function:
   a. From the **CodeWarrior** group, select the newly imported launch configuration.
   b. On the **Main** tab, select **Download** from the **Debug session type** group.
   c. On the **Main** tab, from the **Target settings** panel, click **New** next to the **Connection** drop-down list.

      The **New Connection** wizard launches and the **Select Remote System Type** page appears.

   d. Select **TRK Connection** from the **CodeWarrior Bareboard Debugging** group in the **System type** list.
   e. Click **Next**. The **Select Remote System Type** page closes and the **TRK Connection** page appears.
   f. Specify settings, such as name and description of the new connection.
   g. Click **New** next to **Target** list. The **TRK Target** page appears.
   h. Specify settings, such as name and description.
   i. Click **Edit** next to **Target type** list. The **Target Types** dialog box appears.
   j. Click **Import**. The **Import Target Type** dialog box appears.
   k. Import the hypervisor `.dtb` file.
   l. Click **OK** to save the changes and close the **Import Target Type** dialog box.
   m. Click **OK** to close the **Target Types** dialog box.
   n. Select a target from the **Target type** list.
   o. Configure the following settings in the **Initialization** and **Memory** tabs.

      In the **Initialization** tab:

      - Select the **Execute target reset** check box
      - No init files exist for the debugged Linux partition cores

      In the **Memory** tab:

      - Do not add any memory configuration files for the debugged Linux partition cores
   p. Click **Finish** to close the **TRK Target** page.

q. Select **Trk Muxer** in the **Connection type** drop-down list of the **TRK Connection** page.
    - Select **Use existing host muxer process**, and type the IP address of the Linux host on which the mux_server is running.
    - Alternatively, for Linux host only, you can select Launch host muxer process for automatically launching the muxer process. If you follow this step, you need to select the mux_server executable, and a TCP/IP target muxer with an IP address and a starting port on which you want to launch the mux_server.
    - For TRK muxer ports, click **Sequence** and type the first port on which the mux_server was started. The channels and ports on which the debugger accesses the cores appear.

      The channels must correspond to the trk-stub's mux channels added in the hypervisor .dts file.

r. Click **Finish**.

   The **New Connection** wizard closes and the new remote system that you just created appears in the **Connection** drop-down list in the **Target settings** panel.

s. Select all the cores that you want to debug from the Linux partition.
t. Click the **Debugger** tab.
u. In the **Debugger options** group, select the **OS Awareness** tab.
v. Select **Linux** in the **Target OS** drop-down list. Note that it is mandatory to select Linux for the specific scenario described in this section.

   The Boot Parameters, Debug, and Modules tabs appear.

   In the **Boot Parameters** tab:

    - Ensure that you disable all the options available on this tab.

   In the **Debug** tab:

    - Select the **Enable Memory Translation** check box, and configure it according to the Linux MMU settings. For example:

      ```
      Physical Base Address          0x0

      Virtual Base Address           0xc0000000

      Memory Size                    0x20000000
      ```
    - Select the **Enable Threaded Debugging Support** check box.
    - The Update Background Threads on Stop option is used to remove the dead threads, which were debugged at some point during the debugging session, but later, were terminated or killed.

NOTE

This option might cause a decrease in speed because a big amount of memory must be read at every stop.

w. Select the **Enable Delayed Software Breakpoint Support** check box.
x. In the **Debugger options** group, select the **Debug** tab.
y. Select the **Stop on startup at** check box in the **Program execution** options group.
   - Select the **Program entry point** option, if you want the debugging session to start from 0x0
   - Specify the function name in the **User specified** field, if you want the debugging session to start from a specific kernel function.

z. In the **Debugger options** group, select the **Download** tab.
aa. Ensure that the Perform standard download check box is not selected. The hypervisor transfers the required kernel images for partition boot to memory.

You have successfully created the Download launch configuration. Click **Debug** and observe the Linux partition restarting, hypervisor loading the kernel images, and the debug session stopping at the Stop on startup at point/function, if specified.

NOTE

For more detailed instructions, see *CodeWarrior Development Studio for Power Architecture Processors Targeting Manual* available in the `<CodeWarrior-Install-Dir>\PA\` folder.

3.4.5 Debugging U-Boot

This section explains how to create, configure, and debug a U-Boot project on a Linux system.

The steps are given below:

1. Configure and build U-Boot on Linux.

NOTE

See the SDK user manual for instructions on how to install the SDK and build U-Boot. The document is available in the `iso/help/documents/pdf` folder of the SDK layout.

2. Create a U-Boot project.

a. Launch the CodeWarrior IDE.
b. Select **File** > **Import**. The **Import** wizard launches and the **Select** page appears.
c. Expand the **CodeWarrior** group and select **CodeWarrior Executable Importer**.
d. Click **Next**. The wizard name changes to **Import a CodeWarrior Executable file** and the **Import a CodeWarrior Executable file** page appears.
e. Specify a new project name.
f. Click **Next**. The **Import C/C++/Assembler Executable Files** page appears.
g. Click **Browse** next to the **File to import** field.
h. Select the U-Boot .elf file generated after compilation, in the SDK.
i. Click **Next**. The **Processor** page appears.
j. Select a processor, toolchain, and target OS.
k. Click **Next**. The **Debug Target Settings** page appears.
l. Select a supported connection type from the **Debugger Connection Types** group. Your selection determines the launch configurations that you can include in your project.
m. Select the hardware or simulator, you plan to use, from the **Board** drop-down list.
n. Select the launch configurations, you want to include in your project, and the corresponding connection.
o. Select the interface to communicate with the hardware, from the **Connection Type** drop-down list.
p. Enter the IP address of the TAP device in the **TAP address** text box. This option is disabled and cannot be edited, if you select **USB TAP** from the the **Connection Type** drop-down list.
q. Click **Next**. The **Configurations** page appears.
r. Specify the core index for the project.
s. Click **Finish**. The **Import a CodeWarrior Executable file** wizard ends.

   The project appears in the **CodeWarrior Projects** view.

t. Select **Run** > **Debug Configurations**.

   The **Debug Configurations** window appears. Select the CodeWarrior Attach launch configuration from the left pane.

3. Enter the launch configuration settings.
   a. Select the **Main** tab.
   b. Select a suitable system that can be used for the selected launch configuration, from the **Connection** drop-down list. Otherwise, define a new remote system.
      - Click **New**. The **New Connection** wizard launches and the **Select Remote System Type** page appears.

- Select **Hardware or Simulator Connection** from the **CodeWarrior Bareboard Debugging** group in the **System type** list.
- Click **Next**. The **Hardware or Simulator Connection** page appears.
- Select a profile from the **Parent profile** drop-down list.
- Specify a connection name, description, and template for the connection.
- Select a system configuration from the **Target** drop-down list or click New to create a new configuration.
- Select the type of connection you plan to use from the **Connection type** drop-down list.
- Based on the selected connection type, configure the settings in the **Connection** tab.
- Click **Finish**.

c. Ensure that the **Alternate Load Address** check box is not selected on the **Debugger > PIC** page.
d. If required, enter the source mapping configuration in the **Source** page.

4. Click **Debug** to check the launch configuration.

   The **Debug** perspective appears with the core 0 stopped at the reset vector.

During a typical U-Boot start-up sequence, the target processor starts executing U-Boot in flash memory. U-Boot then enables the Memory Management Unit (MMU), and relocates itself to RAM.

NOTE

For more detailed instructions, see *CodeWarrior Development Studio for Power Architecture Processors Targeting Manual* available in the `<CodeWarrior-Install-Dir>\PA\` folder.

3.5 Deleting a Project

This section provides the steps required to delete a CodeWarrior project.

To delete a project, follow these steps:

1. Select the project you want to delete in the **CodeWarrior Projects** view.
2. Select **Edit > Delete**.

   The **Delete Resources** dialog box appears.

NOTE

Alternatively, you can also select **Delete** from the context menu that appears when you right-click the project.

3. Select the **Delete project contents on disk (cannot be undone)** checkbox to delete the project contents permanently.
4. Click **OK**.

   The **Unreferenced Remote Systems** dialog box appears, displaying a list of remote systems used by the deleted project.

5. Click **Remove** to delete the unreferenced remote systems. Alternatively, click **Cancel** to reuse the remote systems.

You just finished deleting a project and the unreferenced remote systems using the CodeWarrior IDE.

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