PetaLinux Tools Documentation

PetaLinux Command Line Reference

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Revision History

The following table shows the revision history for this document.

Date	Version	Revision
10/25/2016	2016.3	Updated for PetaLinux Tools 2016.3 release
06/08/2016	2016.2	Updated for PetaLinux Tools 2016.2 release
05/06/2016	2016.1	Updated for PetaLinux Tools 2016.1 release

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PetaLinux Tools

Introduction

PetaLinux is a development and build environment which automates many of the tasks required to boot embedded Linux on Xilinx AP SoC's and FPGA's. This document contains detailed information about the various tools that comprise the PetaLinux environment.

There are six independent tools that make up the PetaLinux design flow. They are:

- petalinux-boot
- petalinux-build
- petalinux-config
- petalinux-create
- petalinux-package
- petalinux-util

In most cases, the individual PetaLinux tools are flexible such that the specific options passed to the tools present you with a unique usage model, compared to other options for the same tool.

For the purposes of this document, command line arguments that behave as a modifier for a workflow are referred to as "options". When options can accept user-specified values, these values are shown in italics. In some cases, omitting the user-specified value may result in a built-in default behavior. See the "Default Value" column in the tables for details about relevant default values.

Design Flow Overview

In general, the PetaLinux tools follow a sequential workflow model. The table below provides an example design workflow, demonstrating the order in which the tasks should be completed and the corresponding tool or workflow for that task.

Table 1-1: **Design Flow Overview**

Design Flow Step	Tool / Workflow
Hardware Platform Creation	Vivado
Create PetaLinux Project	`petalinux-create -t project`
Initialize PetaLinux Project	`petalinux-config --get-hw-description`
Configure System-Level Options	`petalinux-config`
Create User Components	`petalinux-create -t COMPONENT`
Configure the Linux Kernel	`petalinux-config -c kernel`
Configure the Root Filesystem	`petalinux-config -c rootfs`
Build the System	`petalinux-build`
Test the System on qemu	`petalinux-boot --qemu`
Deploy the System	`petalinux-package --boot`

petalinux-boot

The `petalinux-boot` tool boots the specified Linux system image files. This tool provides two distinct workflows. In the `petalinux-boot --jtag` workflow, the system image files are downloaded and booted on a physical board via a JTAG cable connection. In the `petalinux-boot --qemu` workflow, the system image files are loaded and booted via the QEMU software emulator. Either the `--jtag` or the `--qemu` is mandatory for the `petalinux-boot` tool.

By default, the `petalinux-boot` tool loads files from the `<plnx-proj-root>/images/linux/` directory.

Table 1-2 details the command line options that are common to all `petalinux-boot` workflows.

Table 1-2: **petalinux-boot Command Line Options**

Option	Functional Description	Value Range	Default Value
`--jtag`	Use the JTAG workflow. Mutually exclusive with the QEMU workflow. This is required.	None	None
`--qemu`	Use the QEMU workflow. Mutually exclusive with the JTAG workflow. This is required.	None	None
`--prebuilt`	Boot a prebuilt image. This is optional.	• 1 (bitstream /FSBL)(1) • 2 (U-Boot) • 3 (Linux Kernel)	None
`--boot-addr, BOOT_ADDR`	Boot address. This is optional.	None	None
`-i,--image IMAGEPATH`	Image to boot. This is optional.	User-specified	None
`--u-boot`	Specify U-Boot elf binary. This is optional.	User-specified	`<plnx-projroot>/images/linux/uboot.elf`

Table 1-2: **petalinux-boot Command Line Options *(Cont'd)***

Option	Functional Description	Value Range	Default Value
`--kernel`	Specify Linux kernel binary. This is optional.	User-specified	• zImage for Zynq-7000 • Image for Zynq UltraScale+ MPSoC • `image.elf` for MicroBlaze. The default image is in `<plnx-projroot>/images/linux`.
`-v,--verbose`	Displays additional output messages. This is optional.	None	None
`-h,--help`	Displays tool usage information. This is optional.	None	None

Notes:

1. `--prebuilt 1` is not a valid option for the QEMU workflow.

petalinux-boot --jtag

The `petalinux-boot --jtag` command boots the MicroBlaze™ or Zynq®-7000 or Zynq UltraScale+™ MPSoC system with a PetaLinux image via a JTAG connection.

Note: The `petalinux-boot --jtag` command may not work as expected when executed within a virtual machine, since virtual machines often have problems with jtag cable drivers.

Options

Table 1-3 contains details of options specific to the JTAG boot workflow.

Table 1-3: **petalinux-boot --jtag Options**

Option	Functional Description	Value Range	Default Value
`--xsdb-conn COMMAND`	Customised XSDB connection command to run prior to boot. This is optional.	User-specified	None
`--hw_server-url URL`	URL of the `hw_server` to connect to. This is optional.	User-specified	None
`--tcl OUTPUTFILE`	Log JTAG Tcl commands used for boot. This is optional.	User-specified	None

Table 1-3: **petalinux-boot --jtag Options *(Cont'd)***

Option	Functional Description	Value Range	Default Value
`--fpga`(1)	Program FPGA bitstream. This is optional.	User-specified	If no bitstream is specified with the `--bitstream` option, it will use the bitstream found in `<plnxproj-root>/images/linux` directory.
`--bitstream BITSTREAM`	Specify a bitstream. This is optional.	User-specified	None
`--pmufw PMUFW-ELF`	PMU Firmware image. This is optional and applicable for ZynqMP. PMU Firmware image is loaded by default, unless it is specified otherwise. To skip loading pmufw use "`--pmufw no`".	None	`<plnx-projroot>/prebuilt/linux/images/pmufw.elf`
`before-bootloader <CMD>`	Extra XSDB command to run before loading the FSBL. This is optional and can be repeated. This is OBSOLETE and will be deprecated in 2016.4 PetaLinux release.	None	None
`before-connect <CMD>`	Extra command to run before XSDB connect command. This is optional and can be used multiple times.	None	None
`after-connect <CMD>`	Extra commands to run after XSDB connect command. This is optional and can be used multiple times.	None	None

Notes:

1. The `--fpga` option looks for `download.bit` in `<plnx-proj-root>/pre-built/linux/implementation` by default.

Examples

The following examples demonstrate proper usage of the `petalinux-boot --jtag` command.

- Download and boot a pre-built bitstream (and FSBL for Zynq-7000 or Zynq UltraScale+ MPSoC) via JTAG to a physical board.

  ```
  $ petalinux-boot --jtag --prebuilt 1
  ```

- Download and boot a pre-built U-Boot elf via JTAG to a physical board.

  ```
  $ petalinux-boot --jtag --prebuilt 2
  ```

  - For MicroBlaze, it downloads

    - `pre-built/linux/implementation/download.bit`
    - `u-boot.`
  - For Zynq-7000, it downloads:
    - `pre-built/linux/implementation/download.bit`
    - `fsbl pre-built/linux/images/zynq_fsbl.elf`
    - `u-boot pre-built/linux/images/u-boot.elf`
  - For Zynq UltraScale+ MPSoC, it downloads:
    - `pre-built/linux/implementation/download.bit`
    - `fsbl pre-built/linux/images/zynqmp_fsbl.elf`
    - `ATF pre-built/linux/images/bl31.elf`
    - `u-boot pre-built/linux/images/u-boot.elf`
- Download and boot a pre-built kernel image via JTAG to a physical board.

  ```
  $ petalinux-boot --jtag --prebuilt 3
  ```

  - For MicroBlaze, it downloads:
    - `bitstream pre-built/linux/implementation/download.bit`
    - `kernel pre-built/linux/images/image.elf`
  - For Zynq-7000, it downloads:
    - `bitstream pre-built/linux/implementation/download.bit`
    - `fsbl pre-built/linux/images/zynq_fsbl.elf`
    - `DTB pre-built/linux/images/system.dtb`
    - `kernel pre-built/linux/images/zImage`
  - For Zynq UltraScale+ MPSoC, it downloads:
    - `bitstream pre-built/linux/implementation/download.bit`
    - `fsbl pre-built/linux/images/zynqmp_fsbl.elf`
    - `kernel pre-built/linux/images/Image`
    - `DTB pre-built/linux/images/system.dtb`
    - `ATF pre-built/linux/images/bl31.elf`
- Download and boot a built u-boot image via JTAG to a physical board.

  ```
  $ petalinux-boot --jtag --u-boot
  ```

  - For MicroBlaze, it downloads `images/linux/u-boot.elf`
  - For Zynq-7000, it boots:

    - `fsbl images/linux/zynq_fsbl.elf`
    - `u-boot images/linux/u-boot.elf.`
  - For Zynq UltraScale+ MPSoC, it boots:
    - `fsbl images/linux/zynqmp_fsbl.elf`
    - `u-boot images/linux/u-boot.elf`
    - `ATF images/linux/bl31.elf`
- Download and boot a built kernel image via JTAG to a physical board.

  ```
  $ petalinux-boot --jtag --kernel
  ```

  - For MicroBlaze, it downloads `images/linux/image.elf`
  - For Zynq-7000, it boots:
    - `fsbl images/linux/zynq_fsbl.elf`
    - `DTB images/linux/system.dtb`
    - `kernel images/linux/zImage`
  - For Zynq UltraScale+ MPSoC, it boots:
    - `fsbl images/linux/zynqmp_fsbl.elf`
    - `kernel images/linux/Image`
    - `DTB images/linux/system.dtb`
    - `ATF images/linux/bl31.elf`

petalinux-boot --qemu

The `petalinux-boot --qemu` command boots the MicroBlaze or Zynq-7000 or Zynq UltraScale+ MPSoC system with a PetaLinux image via the QEMU emulator. Many QEMU options require superuser (root) access to operate properly. The `--root` option enables ROOT MODE and will prompt the user for sudo credentials.

Options

Table 1-4 contains details of options specific to the QEMU boot workflow.

Table 1-4: **petalinux-boot --qemu Options**

Option	Functional Description	Value Range	Default Value
`--dtb DTBFILE`	Use a specified device tree file. This is optional.	User-specified	`system.dtb`

Examples

The following examples demonstrate proper usage of the `petalinux-boot --qemu` command.

- Load and boot a pre-built U-Boot elf via QEMU.

```
$ petalinux-boot --qemu --prebuilt 2
```

- Load and boot a pre-built U-Boot elf via QEMU in root mode.

```
$ petalinux-boot --qemu --root --prebuilt 2
```

petalinux-build

The `petalinux-build` tool builds either the entire embedded Linux system or a specified component of the Linux system. While the tool provides a single workflow, the specifics of its operation can be dictated via the `petalinux-build -c` and `petalinux-build -x` options.

Table 1-5 outlines the valid options for the `petalinux-build` tool.

Table 1-5: **petalinux-build Command Line Options**

Option	Functional Description	Value Range	Default Value
`-p,--project PROJECT`	PetaLinux project directory path. This is optional.	User-specified	None
`-c, --component COMPONENT`	Build specified component. "all" is the implied default. This is optional.	• all • bootloader • kernel • u-boot • rootfs • rootfs/ <USER_CREATE_ROOTFS_COMPONENT> • arm-trusted-firmware, only for ZynqMP • device-tree	all
`-x, --execute STEP`	Execute specified build step. This is optional.	• build • clean • distclean • install • all - It includes build and install • package • mrproper	all
`--makeenv ENVARS`	Additional GNU make environment variables. This is optional.	None	None
`-v,--verbose`	Displays additional output messages. This is optional.	None	None
`-h,--help`	Displays tool usage information. This is optional.	None	None

petalinux-build --component

The `petalinux-build -c` option builds the specified component of the embedded system. When no components are specified, the `petalinux-build` tool operates on the project as a whole. User-created components for the root filesystem can be built by targeting those components by name (e.g., with `-c rootfs/<COMPONENT-NAME>`).

Options

Table 1-6 summarizes the available components that can be targeted with this command.

Table 1-6: **petalinux-build -c Components**

Component	Description
`all`	Build all components of the project and copy them into `<plnx-proj-root>/images/linux/`. This is the default behavior with no options.
`bootloader`	Build only the bootloader elf image and copy it into `<plnx-proj-root>/images/linux/`. For Zynq and Zynq UltraScale+ MPSoC devices, this is FSBL. For MicroBlaze CPUs, this is FS-BOOT.
`device-tree`	Build only the device-tree DTB file and copy it into `<plnx-proj-root>/images/linux/`. The device tree source is in `<plnx-proj-root>/subsystems/linux/configs/device-tree`.
`arm-trusted-firmware`	Build only the ATF image and copy it into `<plnx-proj-root>/images/linux/`. The default ATF source is in `$PETALINUX/components/arm-trusted-firmware/`.
`kernel`	Build only the Linux kernel image and copy it into `<plnx-proj-root>/images/linux/`. The default kernel source is in `$PETALINUX/components/linux-kernel/`
`rootfs`	Build only the root filesystem. It will generate the target rootfs in `<plnx-proj-root>/build/linux/rootfs/targetrootfs` and the sysroot in `<plnx-proj-root>/build/linux/rootfs/stage`.
`u-boot`	Build only the U-Boot elf image and copy it into `<plnx-proj-root>/images/linux/`. The default `u-boot` source is in `$PETALINUX/components/u-boot/`

petalinux-build --execute

The `petalinux-build -x` option allows you to specify a build step to the `petalinux-build` tool to control how the specified components are manipulated.

Options

Table 1-7 summarizes the available Makefile commands that can be used with this option.

Table 1-7: **petalinux-build -x Components**

Component	Description
`clean`	Clean build data for the target component. Must be used with the -c option. Not valid with `-c all`.
`distclean`	Clean the build area. This removes the `<plnx-proj-root>/build/` directory.
`mrproper`	Cleans the build area. This removes the `<plnx-proj-root>/build/` and `<plnx-proj-root>/images/directories`.
`build`	Build the target component.
`install`	Install the target component. For bootloader, ATF, Linux kernel, u-boot and device tree, it will copy the generated binary into `<plnx-proj-root>/images/linux/`. For rootfs and rootfs component, it will copy the generated binary to target rootfs host copy `<plnx-proj-root>/build/linux/rootfs/targetroot`.
`all`	Build and install the target component.
`package`	Valid for `-c all` or no component is specified only. Generate FIT image `image.ub` from build area and copy into `<plnx-proj-root>/images/linux/`.

Examples

The following examples demonstrate proper usage of the `petalinux-build` command.

- Clear the build area of the PetaLinux project for archiving as a BSP or for revision control. This example retains the images directory of the project.

  ```
  $ petalinux-build -x distclean
  ```

- Clean all build collateral from the U-Boot component of the PetaLinux project.

  ```
  $ petalinux-build -c u-boot -x clean
  ```

- Create an updated FIT image from the current contents of the build area.

  ```
  $ petalinux-build -x package
  ```

- Build the entire PetaLinux project.

  ```
  $ petalinux-build -c all
  ```

petalinux-config

The `petalinux-config` tool allows you to customize the specified project. This tool provides two separate workflows. In the `petalinux-config --get-hw-description` workflow, a project is initialized or updated to reflect the specified hardware configuration. In the `petalinux-config -c COMPONENT` workflow, the specified component is customized using a menuconfig interface.

Table 1-8 details the available options for the `petalinux-config` tool.

Table 1-8: **petalinux-config Command Line Options**

Option	Functional Description	Value Range	Default Value
`--get-hw-description PATH`	Initialize or update the hardware configuration for the PetaLinux project. Mutually exclusive with -c. This is required.	User-specified	None
`-c,--component COMPONENT`	Configured the specified system component. Mutually exclusive with `--get-hw-description`. This is required.	• none • kernel • rootfs • u-boot	None
`--searchpath`	Modify the components search path. This is optional.	• --prepend • --append • --replace • --print • --delete	None
`--defconfig DEFCONFIG`	Valid for Linux kernel and u-boot. Use the specified defconfig file to initialize the Linux kernel/u-boot configuration. This is optional.	User-specified. E.g. For Linux kernel, the file name of a file in `<kernel_source>/arch/<ARCH>/configs/ XXX_defconfig`. For u-boot, the file name of a file in `<uboot_source> /configs`.	None
`--oldconfig`	Restore the configuration for the specified component to a prior version. Without -c, restores system-level configuration. This is optional.	None	None

Table 1-8: **petalinux-config Command Line Options *(Cont'd)***

Option	Functional Description	Value Range	Default Value
`-v,--verbose`	Displays additional output messages. This is optional.	None	None
`-h,--help`	Displays tool usage information. This is optional.	None	None

petalinux-config --searchpath

The `petalinux-config --searchpath` option allows you to control how the `--searchpath` option manipulates the SEARCHPATH environment PetaLinux uses for referencing components. This option must be used with one of the modifiers detailed in Table 1-9. Multiple modifiers may be used simultaneously. The table below details the available modifiers and their impact on the SEARCHPATH used by PetaLinux. The path `<PROJECT>/components` is always the highest priority while `<PETALINUX-INSTALL-DIR>/components` is always the lowest priority.

Table 1-9: **petalinux-config --searchpath Modifiers**

Modifier	Description
`--prepend PATH`	Prepends the PATH to project's external search path.
`--append PATH`	Appends the PATH to project's external search path.
`--replace PATH`	Replaces the project's external search path (if any) with PATH.
`--print`	Prints the full project's search path.
`--delete`	Deletes the project's external search path.

petalinux-config --get-hw-description

The `petalinux-config --get-hw-description` command allows you to initialize or update a PetaLinux project with hardware-specific information from the specified Vivado hardware project. The components affected by this process may include FSBL configuration, U-Boot options, Linux kernel options, and the Linux device tree configuration. This workflow should be used carefully to prevent accidental and/or unintended changes to the hardware configuration for the PetaLinux project. The path used with this workflow is the directory that contains the HDF file rather than the full path to the HDF file itself. This entire option can be omitted if run from the directory that contains the HDF file.

Examples:

The following examples demonstrate proper usage of the `petalinux-config --get-hw-description` command.

- Initialize a PetaLinux project within the project directory with an external HDF.

```
$ petalinux-config --get-hw-description=<PATH-TO-HDF-DIRECTORY>
```

- Initialize a PetaLinux project using an externally sourced device tree generator tool.

```
$ petalinux-config --get-hw-description=<PATH-TO-HDF-DIRECTORY> --searchpath
--prepend <PATH-TO-DTG>
```

- Initialize a PetaLinux project from within the directory containing an HDF.

```
$ petalinux-config --get-hw-description -p <PATH-TO-PETALINUX-PROJECT>
```

- Initialize a PetaLinux project from a neutral location.

```
$ petalinux-config --get-hw-description <PATH-TO-HDF> -p <PATH-TO-PETALINUX-PROJECT>
```

petalinux-config -c COMPONENT

The `petalinux-config -c COMPONENT` command allows you to use a standard menuconfig interface to control how the embedded Linux system is built. When `petalinux-config` is executed with no other options, it launches the system-level or "generic" menuconfig. This interface allows you to specify information such as the desired boot device or metadata about the system such as default hostname. The `petalinux-config -c kernel`, `petalinux-config -c u-boot` and `petalinux-config -c rootfs` workflows launch the menuconfig interfaces for customizing the Linux kernel, u-boot and the root filesystem, respectively.

The `--oldconfig` option allows you to restore a prior configuration. Old configurations have the filename `CONFIG.old` within the directory containing the specified component.

Note: Xilinx technical support supports Xilinx-specific options and/or customizations in the Linux kernel rather than general Linux kernel configuration.

Examples

The following examples demonstrate proper usage of the `petalinux-config -c COMPONENT` command.

- Start the menuconfig for the system-level configuration.

```
$ petalinux-config
```

- Load the previous configuration for the root filesystem.

```
$ petalinux-config -c rootfs --oldconfig
```

- Load the Linux kernel configuration with a specific default configuration.

```
$ petalinux-config -c kernel --defconfig xilinx_zynq_base_trd_defconfig
```

- Load the u-boot configuration with a specific default configuration.

```
$ petalinux-config -c u-boot --defconfig xilinx_zynqmp_zcu102_defconfig
```

petalinux-create

The `petalinux-create` tool creates objects that are part of a PetaLinux project. This tool provides two separate workflows. In the `petalinux-create -t project` workflow, the tool creates a new PetaLinux project directory structure. In the `petalinux-create -t COMPONENT` workflow, the tool creates a component within the specified project.

These workflows are executed with `petalinux-create -t` project or `petalinux-create -t COMPONENT`, respectively.

Table 1-10 details the command line options that are common to all `petalinux-create` workflows.

Table 1-10: **petalinux-create Command Line Options**

Option	Functional Description	Value Range	Default Value
`-t,--type TYPE`	Specify the TYPE of object to create. This is required.	• project • apps • libs • modules	None
`-n,--name NAME`	Create object with the specified NAME. This is optional when creating a project from a BSP source. Otherwise, this is required.	User-specified	None
`-p,--project PROJECT`	PetaLinux project directory path. This is optional.	User-specified	Current Directory
`--force`	Overwrite existing files on disk. This is optional.	None	None
`-h,--help`	Display usage information. This is optional.	None	None

petalinux-create -t project

The `petalinux-create -t project` command creates a new PetaLinux project at the specified location with the specified name. By default, the directory structure created by this command is minimal and is not useful for building a complete system until initialized using the `petalinux-config --get-hw-description` command. Projects created using a BSP file as their source are suitable for building immediately.

Options

Table 1-11 details options used specifically when creating a project.

Table 1-11: **petalinux-create -t project Options**

Option	Functional Description	Value Range	Default Value
`--template TEMPLATE`	Assumes the specified CPU architecture, and is only required when `--source` is not provided.	• microblaze • zynq • zynqMP	None
`-s,--source SOURCE`	Create project based on specified BSP file. SOURCE is the full path on disk to the BSP file. This is optional.	User-specified	None
`--out OUTPUTDIR`	Create a project in the specified directory. This is optional.	None	Current Directory

Examples

The following examples demonstrate proper usage of the `petalinux-create -t project` command.

- Create a new project from a reference BSP file.

```
$ petalinux-create -t project -s <PATH-TO-BSP>
```

- Create a new project based on the MicroBlaze template.

```
$ petalinux-create -t project -n <NAME> --template microblaze
```

- Create a new project from a neutral location.

```
$ petalinux-create -t project -n <NAME> --template zynq --out <PATH-TO-CREATE>
```

petalinux-create -t COMPONENT

The `petalinux-create -t COMPONENT` command allows you to create various components within the specified PetaLinux project. These components can then be selectively included or excluded from the final system by toggling them using the `petalinux-config -c rootfs` workflow. There are no component-specific options for the `petalinux-create -t generic` or `petalinux-create -t modules` workflows.

Options

The `petalinux-create -t apps` command allows you to customize how application components are initialized during creation. Table 1-12 details options are common when creating applications within a PetaLinux project.

Table 1-12: **petalinux-create -t apps Options**

Option	Functional Description	Value Range	Default Value
`-s,--source SOURCE`	Create the component from pre-existing content on disk. Valid formats are .tar.gz, .tar.bz2, .tar, .zip, and source directory (uncompressed). This is optional.	User-specified	None
`--template TEMPLATE`	Create the component using a pre-defined application template. This is optional.	• c • c++ • autoconfig, for GNU autoconfig • install, for application which has prebuilt binary only.	c
`--enable`	Upon creating the component, automatically enable it in the project's root filesystem. Else, enable using the `petalinux-config -c rootfs`. This is optional.	None	Disabled

The `petalinux-create -t libs` workflow allows you to customize how library components are initialized during creation. These options allows you to ensure that the created libraries are compiled and included in the final root filesystem properly. The following table details options specific to library components within a PetaLinux project.

Table 1-13: **petalinux-create -t libs Options**

Option	Functional Description	Value Range	Default Value
`--priority`	Specify the build priority (build sequence) for the library. Denoted by an integer suffix on the `Kconfig` file in the library directory. e.g., `Kconfig.n`. Use this option if you have multiple libraries with dependencies, where the output of one library's build is used to build another. This is optional.	1 - 11 1 - The library will be built before the libraries of other priorities. 11 - The library will be built behind the libraries of other priorities.	7

Examples

The following examples demonstrate proper usage of the `petalinux-create -t COMPONENT` command.

- Create an application component that is enabled in the root filesystem.

```
$ petalinux-create -t apps -n <NAME> --enable
```

- Create a new library component that has a compile priority of 1.

```
$ petalinux-create -t libs -n <NAME> --priority 1
```

- Create a new install-only application component. In this flow, nothing is compiled.

```
$ petalinux-create -t apps -n <NAME> --template install
```

petalinux-package

The `petalinux-package` tool packages a PetaLinux project into a format suitable for deployment. The tool provides several workflows whose operation varies depending on the target package format. The supported formats/workflows are `boot`, `bsp`, `firmware`, and `pre-built`.

The `petalinux-package` tool is executed using the package type name to specify a specific workflow in the format `petalinux-package --PACKAGETYPE`.

- The `boot` package type creates a file (.BIN or .MCS) that allows the target device to boot.
- The `bsp` package type creates a .bsp file which includes the entire contents of the target PetaLinux project.
- The `firmware` package type creates a .tar.gz file which includes the needed files to update a PROM device on a board which has already been configured. This package format is only compatible with the `upgrade-firmware` PetaLinux demonstration application.
- The `pre-built` package type creates a new directory within the target PetaLinux project called "pre-built" and contains pre-built content that is useful for booting directly on a physical board. This package type is commonly used as a precursor for creating a `bsp` package type.

By default, the `petalinux-package` tool loads default files from the `<plnx-proj-root>/images/linux/ directory`.

Table 1-14 details the command line options that are common to all of the `petalinux-package` workflows.

Table 1-14: **petalinux-package Command Line Options**

Option	Functional Description	Value Range	Default Value
`-p, --project PROJECT`	PetaLinux project directory path. This is optional.	User-specified	Current Directory
`-h, --help`	Display usage information. This is optional.	None	None

Petalinux-package --boot

The `petalinux-package --boot` command generates a bootable image that can be used directly with a Zynq family device (including both Zynq-7000 and Zynq UltraScale+ MPSoC) or MicroBlaze-based FPGA design. For Zynq family devices, bootable format is `BOOT.BIN` which can be booted from an SD card. For MicroBlaze-based designs, the default format is an MCS PROM file suitable for programming via Vivado or other PROM programmer.

For Zynq family devices, this workflow is a wrapper around the bootgen utility provided with Xilinx SDK. For MicroBlaze-based FPGA designs, this workflow is a wrapper around the corresponding Vivado Tcl commands and generates an MCS formatted programming file. This MCS file can be programmed directly to a target board and then booted.

Options

Table 1-15 details the options that are valid when creating a bootable image with the `petalinux-package --boot` command.

Table 1-15: **petalinux-package --boot Command Options**

Option	Functional Description	Value Range	Default Value
`--format FORMAT`	Image file format to generate. This is optional.	• BIN • MCS	BIN
`--fsbl FSBL`	Path on disk to FSBL elf binary. This is required.	User-specified	• `zynqmp_fsbl.elf` for Zynq UltraScale+ MPSoC • `zynq_fsbl.elf` for Zynq-7000 • `fs-boot.elf` for MicroBlaze. The default image is in `<plnx-proj-root>/images/linux`.
`--force`	Overwrite existing files on disk. This is optional.	None	None
`--fpga BITSTREAM`	Path on disk to bitstream file. This is optional.	User-specified	None
`--atf ATF-IMG`	Path on disk to ARM trusted firmware elf binary. This is optional.	User-specified	`<plnx-projroot>/images/linux/bl31.elf`

Table 1-15: **petalinux-package --boot Command Options**

Option	Functional Description	Value Range	Default Value
`--u-boot UBOOT-IMG`	Path on disk to U-Boot binary. It is U-Boot ELF for Zynq family device and `u-boot-s.bin` for MicroBlaze. This is optional.	User-specified	• `u-boot.elf` for Zynq family device • `u-boot-s.bin` for MicroBlaze. The default image is in `<plnx-proj-root>/images/linux`
`--kernel KERNEL-IMG`	Path on disk to Linux Kernel image. This is optional.	User-specified	`<plnx-projroot>/images/linux/image.ub`
`--pmufw PMUFW-ELF`	Optional and applicable only for Zynq UltraScale+ MPSoC. By default, pre-built pmufw image is packed. Use this option to either specify a path for pmufw image or to skip packing of pmufw. To skip packing pmufw use "`--pmufw no`".	User-specified	`<plnx-proj-root>/pre-built/linux/images/pmufw.elf`
`--add DATAFILE`	Path on disk to arbitrary data to include. This is optional.	User-specified	None
`--offset OFFSET`	Offset at which to load the prior data file. Only the ELF files are parsed. This is optional.	User-specified	None
`--bmm BMMFILE`	Valid for MicroBlaze only. This is optional.	User-specified	BMM in directory with FPGA bitstream
`--flash-size SIZE`	Flash size in MBytes. Must be a power-of-2. Valid for MicroBlaze only. Not needed for parallel flash types. Please make sure you just pass digit value to this option. Please do not include MB in the value. This is optional.	User-specified	16
`--flash-intf INTERFACE`	Valid for MicroBlaze only.This is optional.	• SERIALx1 • SPIx1 • SPIx2 • SPIx4 • BPIx8 • BPIx16 • SMAPx8 • SMAPx16 • SMAPx32	Auto-detect

Table 1-15: **petalinux-package --boot Command Options**

Option	Functional Description	Value Range	Default Value
`-o, --output OUTPUTFILE`	Path on disk to write output image.This is optional.	User-specified	Current Directory
`--cpu DESTINATION CPU`	Zynq Ultrascale+ MPSoC only. The destination CPU of the data file. This is optional.	a53-0 a53-1 a53-2 a53-3	None
`--file-attribute DATA File ATTR`	Zynq-7000 or Zynq Ultrascale+ MPSoC only. Data file file-attribute. This is optional.	User-specified	None
`--bif-attribute-value VALUE`	Zynq-7000 or Zynq Ultrascale+ MPSoC only. The value of the attribute specified by `--file-attribute` argument. This is optional.	User-specified	None
`--bif BIF FILE`	Zynq-7000 or Zynq Ultrascale+ MPSoC only. BIF file. It overrides all other settings: • –fsbl, • –fpga, • –u-boot, • –add, • –fsblconfig, • –file-attribute, • –bif-attribute, • –bif-attribute-value. This is optional.	User-specified	None
`--boot-device BOOT-DEV`	Zynq-7000 or Zynq Ultrascale+ MPSoC only. This is optional.	User-specified	Default value will be the one selected from the system select menu of boot image settings.

Examples

The following examples demonstrate proper usage of the `petalinux-package --boot` command.

- Create a `BOOT.BIN` file for a Zynq family device (including Zynq-7000 and Zynq UltraScale+ MPSoC).

```
$ petalinux-package --boot --format BIN --fsbl --u-boot -o <PATH-TO-OUTPUT>
```

- Create a `BOOT.BIN` file for a Zynq family device that includes a PL bitstream and FIT image.

```
$ petalinux-package --boot --format BIN --fsbl --u-boot\
--fpga <PATH-TO-BITSTREAM> --kernel -o <PATH-TO-OUTPUT>
```

- Create a `x8 SMAP PROM MCS` file for a MicroBlaze design.

```
$ petalinux-package --boot --format MCS --fsbl --u-boot\
--fpga <PATH-TO-BITSTREAM> --flash-size <SIZE> --flash-intf SMAPx8 -o
<PATH-TO-OUTPUT>
```

- Create a `BOOT.BIN` file for a Zynq UltraScale+ MPSoC device that includes a PMU firmware.

```
$ petalinux-package --boot --u-boot --kernel\
--pmufw <PATH_TO_PMUFW>
```

petalinux-package --bsp

The `petalinux-package --bsp` command compiles all contents of the specified PetaLinux project directory into a BSP file with the provided file name. This .bsp file can be distributed and later used as a source for creating a new PetaLinux project. This command is generally used as the last step in producing a project image that can be distributed to other users. All Xilinx reference BSP's for PetaLinux are packaged using this workflow.

Options

Table 1-16 details the options that are valid when packaging a PetaLinux BSP file with the `petalinux-package --bsp` command.

Table 1-16: **petalinux-package --bsp Command Options**

Option	Functional Description	Value Range	Default Value
`-o, --output BSPNAME`	Path on disk to store the BSP file. File name will be of the form `BSPNAME.bsp`. This is required.	User-specified	Current Directory
`-p,--project PROJECT`	PetaLinux project directory path. In the BSP context, multiple project areas can be referenced and included in the output BSP file. This is optional.	User-specified	Current Directory
`--force`	Overwrite existing files on disk. This is optional.	None	None
`--clean`	Clean the hardware implementation results to reduce package size. This is optional.	None	None
`--hwsource HWPROJECT`	Path to a Vivado project to include in the BSP file. This is optional.	None	None

Table 1-16: **petalinux-package --bsp Command Options *(Cont'd)***

Option	Functional Description	Value Range	Default Value
`--no-extern`	Exclude components external to the project referenced using the `--searchpath` option. This may prevent the BSP from building for other users. This is optional.	None	None
`--no-local`	Exclude components referenced in the local PetaLinux project. This may prevent the BSP from building for other users. This is optional.	None	None

Examples

The following examples demonstrate proper usage of the `petalinux-package --bsp` command.

- Clean the project and then build the BSP image.

```
$ petalinux-package --bsp --clean -o <PATH-TO-BSP>
```

- Build a BSP image that includes a reference hardware definition.

```
$ petalinux-package --bsp --hwsource <PATH-TO-HW-EXPORT> -o <PATH-TO-BSP>
```

- Build a BSP image from a neutral location.

```
$ petalinux-package --bsp -p <PATH-TO-PROJECT> -o <PATH-TO-BSP>
```

petalinux-package --image

The `petalinux-package --image` command packages an image for a component. You can use it to generate uImage for kernel.

Options

The table below details the options that are valid when packaging an image with the `petalinux-package -- image` workflow.

Table 1-17: **PetaLinux-package --image Command Options**

Option	Functional Description	Value Range	Default Value
`-p,--project PROJECT`	PetaLinux project directory path. This is optional.	User-specified	Current Directory

Table 1-17: **PetaLinux-package --image Command Options *(Cont'd)***

Option	Functional Description	Value Range	Default Value
`-c,--component COMPONENT`	PetaLinux project component. This is optional.	User-specified	• kernel • rootfs
`--format FORMAT`	Image format. It relies on the component. This is optional.	User-specified	kernel: • uImage • Image for Zynq UltraScale+ MPSoC • zImage for Zynq-7000 rootfs: • initramfs • jffs2 • nfsroot

Example

The following example demonstrate proper usage of the `petalinux-package --image` command.

- Generate uImage.

  ```
  $ petalinux-package --image -c kernel --format uImage
  ```

  The uImage will be in `<plnx-proj-root>/images/linux` directory.

petalinux-package --firmware

The `petalinux-package --firmware` command creates a firmware update package based on the specified PetaLinux project. The firmware package allows you to selectively update components of a deployed system. This package may contain components such as U-Boot, the Linux kernel, a Linux device tree, or a Linux root file system.

Options

Table 1-18 details the options that are valid when packaging a PetaLinux firmware image with the `petalinux-package --firmware` command.

Table 1-18: **petalinux-package --firmware Command Options**

Option	Functional Description	Value Range	Default Value
`-o, --output PACKAGENAME`	Full path and name on disk to store the firmware image. Default location is current directory. This is optional.	User-specified	`firmware.tar.gz`
`-p,--project PROJECT`	PetaLinux project directory path. This is optional.	User-specified	Current Directory
`--linux UBIMAGE`	Update the Linux kernel partition with the specified UBIMAGE. This is optional.	None	`image.ub`
`--dtb DTBFILE`	Update the device tree DTB partition with the specified DTBFILE. This is optional.	None	`system.dtb`
`--fpga BITSTREAM`	Update the FPGA bitstream partition with the specified BITSTREAM. This is optional.	None	None
`--u-boot UBOOT-S`	Update the U-Boot binary partition with the specified UBOOT-S binary. This is optional.	None	`u-boot-s.bin`
`--bootbin BOOT.BIN`	Update the boot partition with the specified `BOOT.BIN` binary. Zynq-7000 only. This is optional.	None	`BOOT.bin`
`--jffs2 JFFS2IMAGE`	Update the user's JFFS2 partition with the specified JFFS2IMAGE image. This is optional.	None	`jffs2.img`
`-a,--add dev:file`	Update the flash partition named dev with the file specified by file. This option can be repeated multiple times. This is optional.	User-specified	None
`--flash FLASHTYPE`	Specify the type of flash device with which the image is compatible. This is optional.	spi parallel	Parallel
`--data-width SIZE`	Specify the bit width of the data bus for the target flash device. This is optional.	• 8 • 16 • 32	None
`--product STRING`	Specify a product compatible string used to validate firmware image. This is optional.	User-specified	None
`--pre SCRIPT`	Specify a SCRIPT that should be run on the target platform prior to updating the flash partitions. This is optional.	User-specified	None

Table 1-18: **petalinux-package --firmware Command Options *(Cont'd)***

Option	Functional Description	Value Range	Default Value
`-v,--verbose`	Displays additional output messages. This is optional.	None	None

Notes:

1. The `--image`, `--dtb`, `--uboot` and `--jffs2` options allows you to override the default file names and partitions using the partition:file syntax of the `--add` option.

Examples

The following examples demonstrate proper usage of the `petalinux-package --firmware` command.

- Install the FIT image (`image.ub`) into the flash partition called safe-image.

```
$ petalinux-package --firmware -a /dev/flash/safe-image:<PATH-TO-FIT-IMAGE>
```

- Package firmware image with bitstream, U-Boot and Linux kernel for MicroBlaze.

```
$ petalinux-package --firmware --fpga <BITSTREAM> --u-boot --linux -o <FILE-TO-CREATE>
```

petalinux-package --prebuilt

The `petalinux-package --prebuilt` command creates a new directory named "pre-built" inside the directory hierarchy of the specified PetaLinux project. This directory contains the required files to facilitate booting a board immediately without completely rebuilding the project. This workflow is intended for users who will later create a PetaLinux BSP file for distribution using the `petalinux-package --bsp` workflow. All Xilinx reference PetaLinux BSP's contain a pre-built directory.

Options

Table 1-19 details the options that are valid when including pre-built data in the project with the `petalinux-package --prebuilt` workflow.

Table 1-19: **petalinux-package --prebuilt Command Options**

Options	Functional Description	Value Range	Default Value
`-p,--project PROJECT`	PetaLinux project directory path. This is optional.	User-specified	Current Directory
`--force`	Overwrite existing files on disk. This is optional.	None	None
`--clean`	Remove all files from the `<plnx-proj-root>/prebuilt` directory. This is optional.	None	None

Table 1-19: **petalinux-package --prebuilt Command Options *(Cont'd)***

Options	Functional Description	Value Range	Default Value
`--fpga BITSTREAM`	Include the BITSTREAM file in the prebuilt directory. This is optional.	User-specified	None
`-a,--add src:dest`	Add the file/directory specified by `src` to the directory specified by `dest` in the pre-built directory. This is optional and can be used multiple times.	User-specified	None

Examples

The following examples demonstrate proper usage of the `petalinux-package --prebuilt` command.

- Include a specific bitstream in the pre-built area.

```
$ petalinux-package --prebuilt --fpga <BITSTREAM>
```

- Include a specific data file in the pre-built area.

```
$ petalinux-package --prebuilt -a <APP>:images/<APP>
```

petalinux-util

The `petalinux-util` tool provides various support services to the other PetaLinux workflows. The tool itself provides several workflows depending on the support function needed.

petalinux-util --gdb

The `petalinux-util --gdb` command is a wrapper around the standard GNU GDB debugger and simply launches the GDB debugger in the current terminal. Executing `petalinux-util --gdb --help` at the terminal prompt provides verbose GDB options that can be used.

Example

The following example demonstrates proper usage of the `petalinux-util --gdb` command.

- Launch the GNU GDB debugger.

```
$ petalinux-util --gdb
```

petalinux-util --xsdb-connect

The `petalinux-util --xsdb-connect` command provides XSDB connection to QEMU, this is for Zynq-7000 and Zynq UltraScale+ MPSoC only.

Options

Table 1-20 details the options that are valid when using the `petalinux-util --xsdb-connect` command.

Table 1-20: **petalinux-util --xsdb-connect Options**

Option	Functional Description	Value Range	Default Value
`--xsdb-connect HOST:PORT`	Host and the port XSDB should connect to. This should be the host and port that QEMU has opened for GDB connections. It can be found in the QEMU command line arguments from: `--gdb tcp:<QEMU_HOST>:<QEMU_PORT>`. This is required.	User-specified	None

petalinux-util --jtag-logbuf

The `petalinux-util --jtag-logbuf` command logs the Linux kernel printk output buffer that occurs when booting a Linux kernel image via JTAG. This workflow is intended for debugging the Linux kernel for review and debug. This workflow may be useful for users when the Linux kernel is not producing output via a serial terminal. For details on how to boot a system via JTAG, see the petalinux-boot --jtag command. For MicroBlaze, the image is `<plnx-proj-root>/image/linux/image.elf`. For ARM, the image is `<plnx-proj-root>/image/linux/vmlinux`.

Options

The table below details the options that are valid when using the `petalinux-util --jtag-logbuf` command.

Table 1-21: **petalinux-util --jtag-logbuf Options**

Option	Functional Description	Value Range	Default Value
`-i,--image IMAGEPATH`	Linux kernel ELF image. This is required.	User-specified	None
`--hw_server-url URL`	URL of the hw_server to connect to. This is optional.	User-specified	None
`-p,--project PROJECT`	PetaLinux project directory path. This is optional.	User-specified	Current Directory
`--noless`	Do not pipe output to the less command. This is optional.	None	None
`-v,--verbose`	Displays additional output messages. This is optional.	None	None
`-h,--help`	Displays tool usage information. This is optional.	None	None
`--dryrun`	Prints the commands required to extract the kernel log buffer, but do not run them.	None	None

Examples

The following examples demonstrate proper usage of the `petalinux-util --jtag-logbuf` command.

- Launch a specific Linux kernel image.

```
$ petalinux-util --jtag-logbuf -i <PATH-TO-IMAGE>
```

- Launch the JTAG logger from a neutral location. This workflow is for Zynq-7000 devices only.

```
$ petalinux-util --jtag-logbuf -i <PATH-TO-IMAGE> -p <PATH-TO-PROJECT>
```

petalinux-util --update-sdcard

The `petalinux-util --update-sdcard` command automates the loading of a root filesystem to a physical partition that exists on an SD card. It is only valid for Zynq family devices. This workflow is flexible such that it can load the VFAT partition (for `BOOT.BIN`), the Linux ext partition (for the root filesystem), or both. The `petalinux-util --update-sdcard` workflow copies the `BOOT.BIN` file from `<plnx-proj-root>/images/linux` to a partition specified by boot:. If this file does not exist in this location, the tool fails.

When the `:rootfs` element is omitted, the tool copies the `<plnx-proj-root>/images/linux/image.ub` file to the VFAT partition as well. When the `:rootfs` component is present, the tool copies the contents of `<plnx-proj-root>/build/linux/rootfs/targetroot/` to the location specified by `:rootfs`. Superuser access is required for this tool to complete successfully unless the target directories for boot and rootfs are mounted with appropriate access permissions.

Options

Table 1-22 details the options that are valid when using the `petalinux-util --update-sdcard` command.

Table 1-22: **petalinux-util --update-sdcard Options**

Option	Functional Description	Value Range	Default Value
`-d,--dir bootfs:rootfs`	Copy files to the SD card. This is required.	User-specified	None
`-p,--project PROJECT`	PetaLinux project directory path. This is optional.	User-specified	Current Directory
`-h,--help`	Display usage information. This is optional.	None	None

Examples

The following examples demonstrate proper usage of the `petalinux-util --update-sdcard` command.

- Copy the `BOOT.BIN` and `image.ub` files for a Zynq family device to the VFAT partition of the SD card. This requires a privileged user or appropriate access permissions for the specified path.

  ```
  $ petalinux-util --update-sdcard --dir </mnt/vfat or /mnt/rootfs>
  ```

- Copy the `BOOT.BIN` (and `image.ub`) and contents of the root filesystem to the ext file system on the SD card. This requires a privileged user or appropriate access permissions for the specified paths.

  ```
  $ petalinux-util --update-sdcard --dir /mnt/vfat:mnt/rootfs
  ```

petalinux-util --find-hdf-bitstream

The `petalinux-util --find-hdf-bitstream` extracts bitstream from hdf.

Options

Table 1-23 details the options that are valid when using the `petalinux-util --find-hdf-bitstream` command.

Table 1-23: **petalinux-util --find-hdf-bitstream Options**

Option	Functional Description	Value Range	Default Value
--hdf-file <HDF>	Argument to specify the HDF file to use. This is optional.	None	system.hdf file in the subsystem directory.

Example

The following examples demonstrate proper usage of the `petalinux-util --find-hdf-bitstream` command:

- To find the default bitstream of a project:

```
petalinux-util --find-hdf-bitstream
```

- To find the bitstream of a hdf:

```
petalinux-util --find-hdf-bitstream --hdf-file <path to hdf file>
```

petalinux-util --webtalk

The `petalinux-util --webtalk` command toggles the Xilinx WebTalk feature ON or OFF. Xilinx WebTalk provides anonymous usage data about the various PetaLinux tools to Xilinx. A working Internet connection is required for this feature.

Options

Table 1-24 details the options that are valid when using the `petalinux-util --webtalk` command.

Table 1-24: **petalinux-util --webtalk Options**

Option	Functional Description	Value Range	Default Value
`--webtalk`	Toggle WebTalk. This is required.	• On • Off	On
`-h,--help`	Display usage information. This is optional.	None	None

Examples

The following examples demonstrate proper usage of the `petalinux-util --webtalk` command.

- Toggle the WebTalk feature off.

```
$ petalinux-util --webtalk off
```

- Toggle the WebTalk feature on.

```
$ petalinux-util --webtalk on
```

Additional Resources and Legal Notices

Xilinx Resources

For support resources such as Answers, Documentation, Downloads, and Forums, see Xilinx Support.

Solution Centers

See the Xilinx Solution Centers for support on devices, software tools, and intellectual property at all stages of the design cycle. Topics include design assistance, advisories, and troubleshooting tips.

References

1. *PetaLinux Tools Documentation (UG1144).*
2. Xilinx Answer Record 55776

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