

PetaLinux Build and Avalanche Patch Integration on AMD Xilinx Versal VCK190

Overview

This application note provides a step-by-step guide for building a PetaLinux image for the AMD Versal VCK190 evaluation board using version 2022.2 and applying the Avalanche patch. It includes instructions on environment setup, hardware platform integration, applying patches, system configuration, image build, and booting procedures.

Environment Setup

Before initiating the PetaLinux build process:

```
source /proj/tools/Xilinx/PetaLinux/2022.2/settings.sh
```

Creating the PetaLinux Project

1. Create a new PetaLinux project:

- Command: `petalinux-create --type project --template versal -name versal2022.2`

2. Prepare hardware platform:

- Create a directory `hw_desc` in the PetaLinux working directory (e.g., `~/petalinux/versal2022.2`)
- Copy the `test_wrapper_50MHz.xsa` file into the `hw_desc` directory
- Command: `petalinux-config --get-hw-description -p <path to .xsa file>`

Applying and Placing Avalanche Patch Files

1. Download and Extract Patch Archive:

- Download `ava_versal_2022.2.patches.tgz` and extract

1.1 U-Boot Patch:

- Copy `ava_u-boot_2022.2` patch to the location `project-spec/meta-user/recipes-bsp/u-boot/files`
- Add the below line in `/project-spec/meta-user/recipes-bsp/u-boot-xlnx_%.bbappend` file
`SCR_URI: append = file://ava_u-boot_2022.2.patch`

1.2 Kernel Patch:

- Copy patch file `ava_u-boot_2022.2.patch` to the location `project-spec/meta-user/recipes-kernel/linux/linux-xlnx`
- Modify the file `project-spec/meta-user/recipes-kernel/linux/linux-xlnx_%.bbappend` to add the patch file
- Add the two lines below to `linux-xlnx_%.bbappend` file

```
SRC_URI:append = " file://ava_kernel_2022.2_p1.patch"
```

```
SRC_URI:append = " file://ava_kernel_2022.2_p2.patch"
```

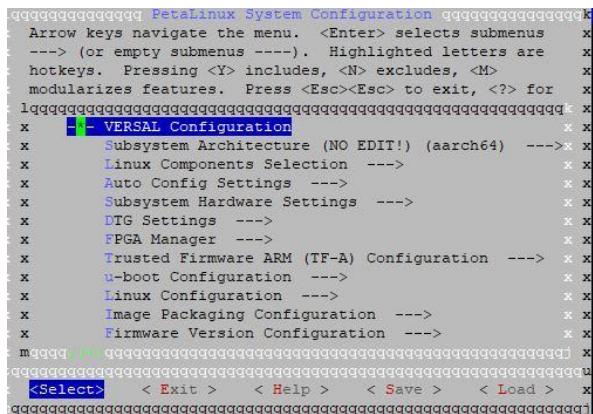
System Configuration

1. PetaLinux System Configuration

Command: `petalinux-config`

1.1 DTG Setting

Enter Machine name: `versal-vck190-reva-x-ebm-01-reva`



Ensure Subsystem AUTO Hardware Settings is selected

Choose Flash settings from Subsystem AUTO Hardware Setting (refer to screenshot below)

Make 5 partitions and specify the size

Qspi-boot 0xF40000

Qspi_kernel 0x7040000

Qspi_bootenv 0x20000

Data_file1 0x1000000

Data_file2 0x10000000

```
qqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqq  
    Primary Flash (psu_qspi_0)  --->  
    [ ] Advanced Flash Auto Configuration  
        *** partition 0 ***  
        (qspi-boot) name (NEW)  
        (0xf40000) size  
            *** partition 1 ***  
            (qspi-kernel) name (NEW)  
            (0x2f40000) size  
                *** partition 2 ***  
                (qspi-bootenv) name (NEW)  
                (0x20000) size  
                    *** partition 3 ***  
                    (data_file1) name  
                    (0x10000000) size  
                        *** partition 4 ***  
                        (data_file2) name  
                        (0x10000000) size  
                            *** partition 5 ***  
                            () name (NEW)
```

1.2 Enable Auto Login

- Command: *petalinux-config -c rootfs*
- Choose Image Features → auto login

2. Please add the spi-max-frequency property to the system-user.dtsi file:

Location: project-spec/meta-user/recipes-bsp/device-tree/files/ system-user.dtsi

```
&qspi {  
    flash@0 {  
        spi-max-frequency = <10000000>;  
    };  
};
```

The example set 10MHz as the SPI frequency. The SPI frequency can be increased for higher performance.

3. Build System

Location: versal2022.2

Command: *petalinux-build*

4. Generate Boot Codes and Images

- Copy the file plm_linux_dual_100.elf to petalinux directory and run the command below
- Command petalinux-package --boot --plm *plm linux_dual_100.elf* --psmfw --u-boot – force

5. Build images will be created in the image →linux directory

Booting Image from SD and Flashing to Avalanche DQSPI MRAM

1. SD Boot Procedure

Copy the following files to an SD card:

- BOOT.BIN
- Boot.scr
- Image.ub

2. Setting the Boot Mode

- Set the SW6 position on the VCK190 to microSD boot mode
- SW1 [4:1] = OFF, OFF, OFF, ON
- BOOT.BIN
- Boot.scr
- Image.ub

3. Power on and verify boot:

Uboot Verification Command: *sf probe 0 0 0*

Avalanche MRAM device details will be shown

Kernel Verification Command: *mtdinfo*

Flash partitions will be displayed

4. Copying the files in SD card to Avalanche MRAM using the following command

- *cd/run/media/mmcblk0p1*
- *flashcp BOOT.BIN /dev/mtd0*
- *flashcp image.ub /dev/mtd1*
- *flashcp boot.scr /dev/mtd2*

5. Power off the VCK190 board

6. Set the QSPI boot mode

SW1 = ON, ON, OFF, ON

7. Power on – the system should boot from Avalanche DQSPI MRAM

Conclusion

This document outlines a complete workflow for applying the Avalanche patch on the VCK190 board using PetaLinux 2022.2. The provided steps ensure the patch is properly integrated and verified across U-Boot and Linux kernel environments.

Revision History

| Revision | Date | Change Summary |
|----------|------------|-----------------|
| REV A | 06/19/2025 | Initial release |