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# RZ/V2M Linux Package Version 1.2.0

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## Release Note

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### Introduction

This release note describes the contents and usage of the RZ/V2M Linux Package.

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## 1. Release items

RZ/V2M Linux Package provides the following items:

- **Name and version**  
RZ/V2M Linux Package version 1.2.0
- **Target board**  
RZ/V2M Evaluation Board Kit

- **File contents**

This package provides the following file contents listed in Table 1-1.

**Table 1-1. RZ/V2M Linux package file contents**

Contents		File	Explanation
Software	Linux package	rzv2m_bsp_eva_v120.tar.gz	RZ/V2M Linux package. The Yocto version is 2.4.3.
	Build image files	Image	Linux kernel image version 1.2.0.
		r9a09g011gbg-evaluation-board.dtb	Device tree file version 1.2.0.
		core-image-bsp-rzv2m.tar.bz2	rootfs version 1.2.0.
	Loader binaries	loader_1st_128kb.bin	1st loader binary.
		loader_2nd.bin	2nd loader binary.
		loader_2nd_param.bin	Boot parameter for 2nd loader.
		u-boot.bin	U-Boot binary.
		u-boot_param.bin	Boot parameter for U-Boot.
	Board shutdown application	rdk_shutdown	Pre-build binary for shutdown the RZ/V2M Evaluation Board Kit. This runs on rootfs.
rdk_shutdown.c		The source code of rdk_shutdown.	
Option	Script file	eMMC_writer_v120.ttl	Script file to write loader binaries to eMMC with the terminal software (Tera Term).
	Flash writer	B2_intSW.bin	Writing loader binaries to the eMMC on the RZ/V2M Evaluation Board Kit via your PC.
	PCI Express driver	0081-added-pcie-driver-for-rzv2m.patch	Patch files for the PCI Express driver.
		0008-apply-pcie-clock.patch	
Documentation		r01an5971ej0120-rzv2m-linux.pdf	This document.
		r01us0512ej0120-rzv2m-linux-software-manual.pdf	Software manual for the RZ/V2M Linux system. English and Japanese version are available.
		r01us0512jj0120-rzv2m-linux-software-manual.pdf	
		r01tu0360ej0120-rzv2m-linux-component-list.pdf	RZ/V2M Linux package component list. (Hereafter, component list)
		r01us0527ej0120-rzv2m-linux-startup-guide.pdf	Brief usage instructions for RZ/V2M Linux package. (Hereafter, start-up guide)
		r01us0528ej0120-rzv2m-linux-yocto-startup-guide.pdf	Brief usage instructions with Yocto Project.
		r01us0516ej0120-rzv2m-linux-csi.pdf	Usage of CSI device driver on RZ/V2M.
		r01us0517ej0120-rzv2m-linux-gether.pdf	Usage of Gigabit Ether device driver on RZ/V2M.
		r01us0518ej0120-rzv2m-linux-i2c.pdf	Usage of I2C device driver on RZ/V2M.

r01us0519ej0120-rzv2m-linux-pfc.pdf	Usage of PFC device driver on RZ/V2M.
r01us0520ej0120-rzv2m-linux-pwm.pdf	Usage of PWM device driver on RZ/V2M.
r01us0521ej0120-rzv2m-linux-sd-emmc.pdf	Usage of SD/eMMC device driver on RZ/V2M.
r01us0522ej0120-rzv2m-linux-timer.pdf	Usage of Timer device driver on RZ/V2M.
r01us0523ej0120-rzv2m-linux-uart.pdf	Usage of UART device driver on RZ/V2M.
r01us0524ej0120-rzv2m-linux-usbh.pdf	Usage of USB Host device driver on RZ/V2M.
r01us0525ej0120-rzv2m-linux-usbp.pdf	Usage of USB Peripheral device driver on RZ/V2M.
r01us0526ej0120-rzv2m-linux-wdt.pdf	Usage of Watchdog timer device driver on RZ/V2M.
r01us0541ej0120-rzv2m-linux-pcie.pdf	Usage of PCI Express device driver on RZ/V2M.

## 2. Components in RZ/V2M Linux Package

RZ/V2M Linux package mainly uses the following components. Refer to the component list for other components and details.

**Table 2-1. Components of RZ/V2M Linux Package**

Software	Version
Linux kernel	4.19.165-cip41
GCC	linaro+7.3
glibc	2.28
busybox	1.30.1
openssl	1.1.1d

### 3. How to use this package

Refer to the start-up guide to use this Linux package.

The start-up guide gives the following instructions.

- ✓ Building the RZ/V2M Linux package (bitbake)
- ✓ Preparation for use (Board, SD card, and others setting)
- ✓ Boot loader and U-Boot
- ✓ Run on the board
- ✓ Make software development kit (SDK)

**Note:** If you use the previous version RZ/V2M Linux Package, you should rewrite the boot loader and U-Boot to the eMMC. Refer to “RZ/V2M Linux Package Start-Up Guide” for how to write bootloader in detail.

## 4. Application Development Procedure

This chapter explains how to make and run an application for RZ/V2M with this package.

### 4.1 Make Application

Here is an example of how to make an application running on RZ/V2M. The following steps will generate the "Hello World" sample application.

*Note that you must build (bitbake) a core image for the target and prepare SDK before making an application. Refer to the start-up guide on how to make SDK.*

Step 1. Make a work directory for the application.

```
$ mkdir ~/hello_apl
$ cd ~/hello_apl
```

Step 2. Make the following three files (an application file, Makefile, and configure file) in the directory for the application. Here, the application is made by automake and autoconf.

- hello.c

```
#include <stdio.h>

main()
{
    printf("Hello, world!\n");
}
```

- Makefile.am

```
bin_PROGRAMS = hello
hello_SOURCES = hello.c
```

- configure.in

```
AC_INIT(hello.c)
AM_INIT_AUTOMAKE(hello,0.1)
AC_PROG_CC
AC_PROG_INSTALL
AC_OUTPUT(Makefile)
```

Step 3. Generate the configuration scripts, files needed by GNU coding standards, and the configure files. After that, cross-compile the application.

```
$ aclocal
$ autoconf
$ touch NEWS README AUTHORS ChangeLog
$ automake -a
$ ./configure ${CONFIGURE_FLAGS}
```

Step 4. Make the application by the generated makefile.

```
$ make
```

After making, confirm that the execute application (the sample file name is "hello") is generated in the hello\_apl folder. Also, this application must be cross-compiled for AArch64.

## 4.2 Store the Sample Application

The sample application could be written by the following procedure.

The application should be stored in the ext3 partition.

```
$ sudo mount /dev/sdb2 /media/  
$ cd /media/usr/bin  
$ sudo cp <hello_application_stored_path>/hello .  
$ sudo chmod +x hello
```

Notes: 1. "sdb2" (above in red) may depend on using system.

2. <hello\_application\_stored\_path> is an optional directory name to store the application.

## 4.3 Run the Sample Application

Power on the RZ/V2M Evaluation Board Kit and start the system.

After booting, run the sample application with the following command.

```
root@rzv2m:~# hello  
Hello, world!
```

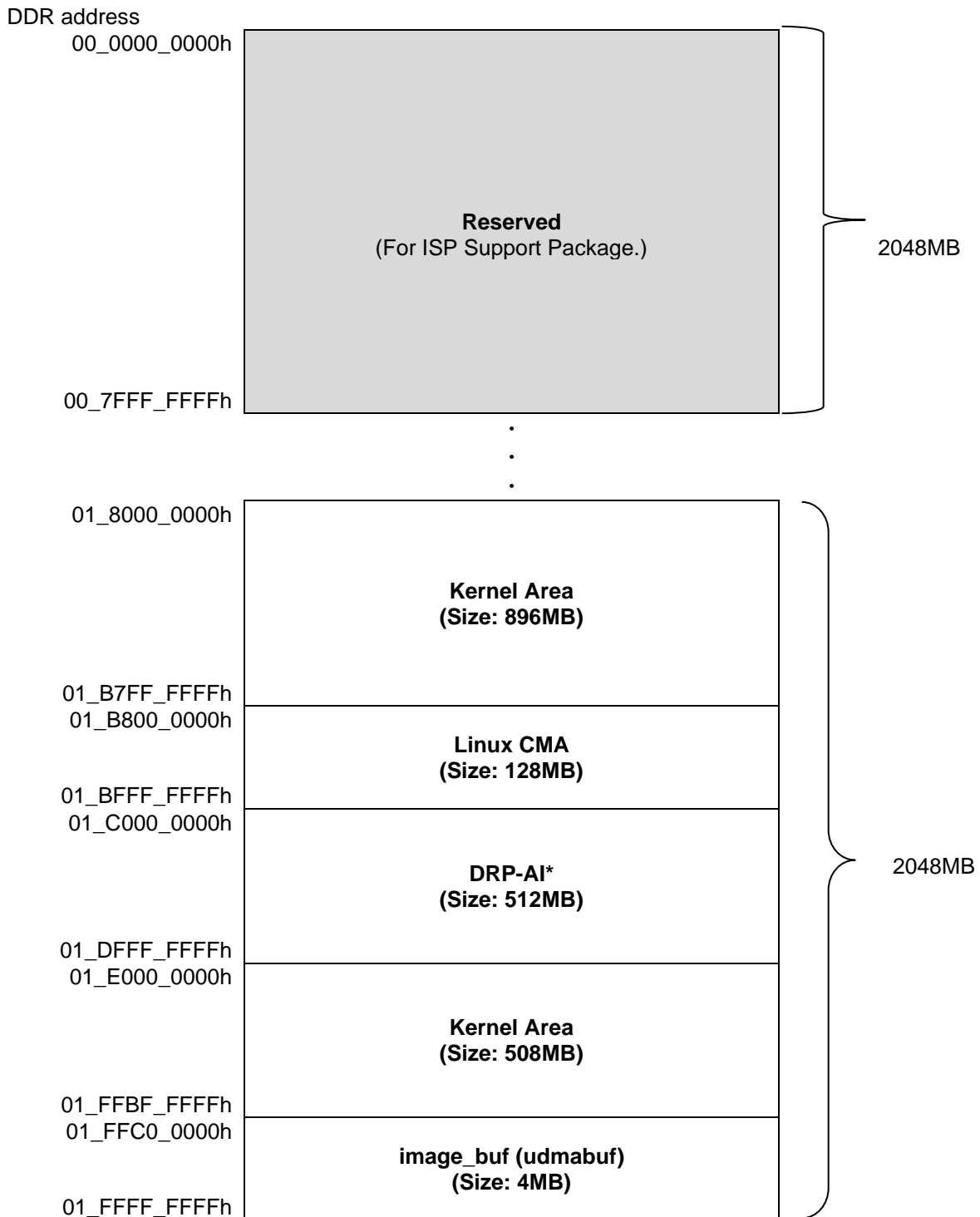
Note: Refer to the start-up guide for the method how to boot the board and system.

## 5. Notes

### 5.1 Memory map

Figure 5-1 shows the DDR memory map in the RZ/V2M.

Note that the memory map for RZ/V2M Linux is set and fixed by U-Boot. Linux should use the area from 0x1\_8000\_0000h to 0x1F\_FFFF\_FFFF.



\*: The area to store DRP-AI Object files.

Figure 5-1. Memory map



**Note**

If you use the data (e.g. images) created by RZ/V2M ISP Support Package on a specific IP (\*1), you should copy the data to the Linux area by CPU. When using DRP-AI, you should copy the data and refer to RZ/V2M DRP-AI Sample Application Note about this process. The copy process with the IPs except for DRP-AI will be executed in the system, and you do not need this process own.

\*1: DRP-AI, SD, eMMC, Ethernet, USB, PCI Express

Refer to RZ/V2M User's Manual: Hardware for details.

## 6. Changes

The following table lists the changes from the previous version.

**Table 6-1. Changes**

Item		Details of changes	
		Previous (V1.1.0)	Now (V1.2.0)
Board Name		RZ/V2M Evaluation Kit	RZ/V2M Evaluation Board Kit
Build environment (Linux OS)		Ubuntu 16.04 LTS 64bit	Ubuntu 18.04 LTS 64bit
Linux kernel (Supported yocto version)		4.19.56	4.19.165-cip41
Memory map	Area size for RZ/V2M Linux	Available 4GB from the address 0x0000_0000h to 0x7FFF_FFFFh, and from 0x1_8000_0000h to 0x1_FFFF_FFFFh in DDR memory.	Linux should use the area from 0x1_8000_0000h to 0x1_FFFF_FFFFh in DDR memory. DRP-AI area expands from 256MB to 512MB.
	Area name	V4L2-DRP-AI	image_buf(udmabuf)
	Kernel Area Linux CMA Area DRP-AI Area image_buf (V4L2-DRP-AI) Area	Linux CMA, DRP-AI, and V4L2-DRP-AI Area must be located as the same as the memory map address. Not locate them in the Kernel Area from 01_8000_0000h to 01_FFFF_FFFFh.	Locate them in the area from 01_8000_0000h to 01_FFFF_FFFFh.
Device driver	SD/eMMC Gigabit Ether USB Host USB Peripheral	Work at the 32bit memory area.	Work at the 34bit memory area due to the change of memory map for RZ/V2M Linux. (Changed the setting of DMA mask and bank address.)
	I2C	Wrong I2C ch2 setting. Wrong the clock setting for I2C ch1-ch3.	Fixed the setting for I2C ch2 correctly. Fixed the wrong clock setting for I2C ch1-ch3.
	USB Peripheral	The supported number of end points in USB 3.1 and 2.0 are 0-5.	The supported number of end points in USB 3.1 and 2.0 are 0-8.
	PCI Express	Not supported in this version.	Supported. <i>* RZ/V2M Evaluation Board Kit does not support PCIe.</i>
Boot loader	version	V1.10	V1.20
U-Boot	Bank addressing	Work at the 32bit area in 0x0000_0000 – 0x7FFFF_FFFF.	Work at the 34bit area in 0x01_8000_0000h – 0x01_FFFF_FFFF.
	Environment variables for the memory map (location of kernel image and device tree)	(Kernel image) fdt_add =0x58000000 (Device tree) loadaddr=0x58080000	(Kernel image) fdt_addr=0x18000000 (Device tree) loadaddr=0x180080000
	Auto booting when not connecting a USB-serial cable	Failed to autobooting.	Autobooting successfully.
	DRAM	2GiB	4GiB
eMMC writer script		Provided for the V1.1.0.	Updated the eMMC writer script for v1.2.0.

Flash writer	Provided for the previous version.	Updated the flash writer for V1.2.0.
Shutdown application (rdk_shutdown)	Provided the application only.	<ul style="list-style-type: none"><li>• Provide the source code of the rdk_shutdown application.</li><li>• Changed the log message when running rdk_shutdown.</li></ul>
OSS Packages	Released on Renesas website for V1.1.0.	Updated due to the kernel updating in V1.2.0. Download the latest version from Renesas website if you build offline. Otherwise, the offline build may be failed when using the previous version.

## 7. Restrictions

There are no restrictions for V1.2.0.

## 8. Appendix

### 8.1 Patch for PCI Express driver

When using the PCI Express (hereafter PCIe) driver, you should apply the patches to the RZ/V2M Linux package. Here describes how to apply patch and setting.

Note: RZ/V2M Evaluation Board Kit does not support PCIe. Therefore, if you implement the PCIe driver, the PCIe link down error occurs when booting Linux on this board. Please contact your Renesas representative if you want to use the PCIe function on RZ/V2M.

Step 1. Store the RZ/V2M Linux Package V1.2.0 (rzv2m\_bsp\_eva\_v120.tar.gz) in your working directory and extract it.

```
$ cd ${WORK}
$ tar zxvf ./rzv2m_bsp_eva_v120.tar.gz
```

Step 2. Store the patch file for kernel (0081-added-pcie-driver-for-rzv2m.patch) in the directory “meta-rzv2m/recipes-kernel/linux/linux-renesas/patches/rzv2m\_patch”.

```
$ cp <the path the kernel patch file stored>/0081-added-pcie-driver-for-rzv2m.patch
${WORK}/meta-rzv2m/recipes-kernel/linux/linux-renesas/patches/rzv2m_patch
```

Step 3. Modify the bb file for the kernel to add the following definition for the kernel patch.

- meta-rzv2m/recipes-kernel/linux/linux-renesas\_4.19.bb

```
SRC_URI_append_r9a09g011gbg += "\
file://patches/rzv2m_patch/0000-Makefile-rzv2m.patch \
file://patches/rzv2m_patch/0000-headS-rzv2m.patch \

...

file://patches/rzv2m_patch/0079-modified-rammap-area-rzv2m-periferal.patch \
file://patches/rzv2m_patch/0080-modified-endpoint-num-rzv2m-periferal.patch \
file://patches/rzv2m_patch/0081-added-pcie-driver-for-rzv2m.patch \ <- Add it.
```

Step 4. Store the patch for U-Boot (0008-apply-pcie-clock.patch) in the directory “meta-rzv2m/recipes-bsp/u-boot/u-boot”.

```
$ cp <the path the U-Boot patch file stored>/0008-apply-pcie-clock.patch ${WORK}/meta-
rzv2m/recipes-bsp/u-boot/u-boot/
```

Step 5. Modify the bbappend file for the kernel to add the following definition for the kernel patch.

- meta-rzv2m/recipes-bsp/u-boot/u-boot\_2018.09.bbappend

```
SRC_URI_append_r9a09g011gbg += "\
file://0001-updated-uboot-rzv2m.patch \
file://0002-chg-l2cache-clear.patch \

...

file://0006-modified-text-section-address.patch \
file://0007-update-memory-map.patch \
file://0008-apply-pcie-clock.patch \ <- Add it.
```

Step 6. Run the bitbake command to build a core image for the target. Refer to the start-up guide for how to build in detail.

**Revision History**

Rev.	Date	Description	
		Page	Summary
1.00	Jan 28, 2022	—	First edition issued.

# General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

## 1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity.

Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

## 2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

## 3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

## 4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

## 5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

## 6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between  $V_{IL}$  (Max.) and  $V_{IH}$  (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between  $V_{IL}$  (Max.) and  $V_{IH}$  (Min.).

## 7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

## 8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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