RZ/V Verified Linux Package
Version 3.0.0
Release Note

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Introduction

This release note describes the contents, building procedures and important points of the RZ/V Verified Linux Package (hereinafter referred to as “VLP/V”).

Contents

1. Release Items

- **Name and version**
  RZ/V Verified Linux Package
  Version 3.0.0 (hereinafter referred to as “VLP/V v3.0.0”)

- **Distribution method**
  Please visit the site below and create an account to download the packages. This site is for the entire RZ Family which includes the RZ/V series. Basic packages of VLP/V v3.0.0 which are listed in **Table 1** can be downloaded.

  RZ/V2L product page:
  http:/www.renesas.com/RZV2L

  RZ/V Verified Linux Package[5.10-CIP]:
  https://www.renesas.com/us/en/software-tool/rzv-verified-linux-package-510-cip

- **Target board**
  RZ/V2L Evaluation Board Kit PMIC version (*):
  - RZ/V2L SMARC Module Board
  - RZ SMARC Series Carrier Board

(*) “RZ/V2L Evaluation Board Kit PMIC version” include the RZV2L SMARC Module Board and the RZ SMARC Series Carrier Board.
The CMOS sensor (OV5645) in the Coral camera is no longer available and should not be used for mass production. Any software support provided is for evaluation purposes only.

- **Verified functions**
  Linux BSP
  - Linux Kernel
  - Linux Drivers
  - Graphics Libraries
  - Codec Libraries

  GUI Framework
  - Qt (LGPL version)

- **File contents**
  VLP/V is delivered by the files listed in **Table 1**.

Table 1. RZ/V Verified Linux Package

Basic packages

File	Description
RTK0EF0045Z0024AZJ-v3.0.0.zip	Verified Linux Package. This file includes the **Yocto recipe packages** and the necessary documents.
rzv_bsp_v300.tar.gz	**Yocto recipe packages**
oss_pkg_rzv_v3.0.0.7z (2.1GB)	Open source software packages See the Note below before download
r01us0565ej0101-rz-v(Release Note).pdf	This document
r01us0566ej0100-rz-v(Component List).pdf	Component list
r01us0556ej0102-rz-g(Board_StartUp_Guide_smarcEVK).pdf	Documents describing booting method and the required settings of bootloader for **RZ/V2L**.

Note) Open source software packages contain all source codes of OSSs except for Linux kernel. These are the same versions of OSSs used when VLP/V was verified.
If you are just evaluating VLP/V and RZ/V series, open source software packages are not mandatory to use.
Usually, all the software can be built without using these files if your build machine is connected to the Internet.

Open source software packages are required for an "offline" environment. The word "offline" means an isolated environment which does not connect to any network. VLP/V can always build images in this "offline" environment by using these packages without affected from changes of original repositories of OSSs. Also, this "offline" environment always reproduces the same images as the images which were verified by Renesas. Note that if you build without using open source software packages, there are possibilities to use different source codes than Renesas used due to the implicit changes of the repositories of OSSs.
Most bootable images that VLP/V supports can be built on an "offline" environment. Please refer to **2. Build environment**.

Optional packages (*1)

File ("XX" is replaced by "EN" or "JP".)	Description
RTK0EF0045Z13001ZJ-v1.2_XX.zip (Evaluation version) RTK0EF0045Z14001ZJ-v1.2_XX.zip (Unrestricted version)	RZ MPU Graphics Library for RZ/G2L, RZ/G2LC and **RZ/V2L**. This provides graphics function compliant with the OpenGL ES standard. These libraries are tested with VLP/V v3.0.0.
RTK0EF0045Z15001ZJ-v0.58_XX.zip (Evaluation version) RTK0EF0045Z16001ZJ-v0.58_XX.zip (Unrestricted version)	RZ MPU Video Codec Library for RZ/G2L and **RZ/V2L**. These libraries are tested with VLP/V v3.0.0.

(*1) **Evaluation vs Unrestricted Version**
There are two release versions: Evaluation and Unrestricted. Please note that both of these packages have the same exact functionality. The only difference is that when you execute an application that uses the evaluation version of the libraries, operation will automatically be stopped after a few hours. The unrestricted version does not have this time limitation. To acquire the unrestricted version, please contact Renesas to start the formal process of acquiring those releases.

Additional packages

File	Description
RTK0EF0045Z9006AZJ-v3.0.0.zip	BSP Manual Set for RZ/G2L, RZ/G2LC, RZ/G2UL, and RZ/V2L.

Note) Detailed information regarding the configuration (Device tree) and usage of the device drivers contained in this VLP can be downloaded from Renesas.com. Please download the "BSP Manual Set".

For RZ/G2L and RZ/V2L

https://www.renesas.com/document/oth/rzg2l-group-and-rzv2l-group-bsp-manual-set

2. Build environment

The environment for building the Board Support Package (hereinafter referred to as “BSP”) is listed in **Table 2**. Please refer to the below documents for details about setting up the environment:

SMARC EVK of RZ/G2L, RZ/G2LC, RZ/G2UL, RZ/V2L, and RZ/Five Start-up Guide

A Linux PC is required for building the software.

A Windows PC can be used as the serial terminal interface with software such as TeraTerm.

Table 2. Equipment and Software Necessary for Developing Environments of RZ/V Linux Platform

Equipment		Description
Linux Host PC		Used as build/debug environment 100GB free space on HDD is necessary
	OS	Ubuntu 20.04 LTS 64 bit OS must be used.
Windows Host PC		Used as debug environment, controlling with terminal software
	OS	Windows 10
	Terminal software	Used for controling serial console of the target board Tera Term (latest version) is recommended Available at https://ttssh2.osdn.jp/index.html.en
	VCP Driver	Virtual COM Port driver which enables to communicate Windows Host PC and the target board via USB which is virtually used as serial port. Available at: • http://www.ftdichip.com/Drivers/VCP.htm (for Evaluation Board Kit of RZ/V2L) Please install VCP Driver corresponding to the target board.

Most bootable images VLP/V supports can be built on an “offline” environment.
The word “offline” means an isolated environment which does not connect to any network. Since VLP/V includes all necessary source codes of OSS except for the Linux kernel, VLP/V can always build images in this “offline” environment without affected from changes of repositories of OSS. Also, this “offline” environment reproduces the same images as the images which were verified by Renesas.

Below images can be built “offline”.

- core-image-minimal
- core-image-bsp
- core-image-weston (including the SDK build)
- core-image-qt (including the SDK build)

Below are not available in the “offline” environment. Please connect your Linux Host PC to the internet.

- Preparing a Linux Host PC

3. Build Instructions

3.1 Building images to run on the board

This section describes the instructions to build the Board Support Package.
Before starting the build, run the command below on the Linux Host PC to install packages used for building the BSP.

```
$ sudo apt-get update
$ sudo apt-get install gawk wget git-core diffstat unzip texinfo gcc-multilib \
build-essential chrpath socat cpio python python3 python3-pip python3-pexpect \
xz-utils debianutils iputils-ping libsdl1.2-dev xterm p7zip-full libyaml-dev
```

Please refer to the URL below for detailed information:

- https://docs.yoctoproject.org/3.1.5/brief-yoctoprojectqs/brief-yoctoprojectqs.html

Run the commands below and set the user name and email address before starting the build procedure. **Without this setting, an error occurs when building procedure runs git command to apply patches.**

```
$ git config --global user.email "you@example.com"
$ git config --global user.name "Your Name"
```

Copy all files obtained from Renesas into your home directory prior to the steps below.

(1) Create a working directory at your home directory, and decompress Yocto recipe package

Run the commands below. The name and the place of the working directory can be changed as necessary.

```
$ mkdir ~/rzv_vlp_v3.0.0
$ cd ~/rzv_vlp_v3.0.0
$ unzip ~/RTK0EF0045Z0024AZJ-v3.0.0.zip
$ tar zxvf ./RTK0EF0045Z0024AZJ-v3.0.0/rzv_bsp_v3.0.0.tar.gz
```

Note) Please note that your build environment must have 100GB of free hard drive space in order to complete the minimum build. The Yocto BSP build environment is very large. Especially in case you are using a Virtual Machine, please check how much disk space you have allocated for your virtual environment.

(2) Enable Graphics and Video Codec

The graphics package and the video codec package can be used at the same time. And also, one of the packages can be used.

Note) The video codec package is under development. This is released ASIS with no warranty.

If you want to enable the Graphics on RZ/V2L when building **core-image-weston**, please copy the Graphics package (RTK0EF0045Z13001ZJ-v1.xx_EN.zip or RTK0EF0045Z13001ZJ-v1.xx_JP.zip) to working directory and run the commands below. If you build core-image-minimal, please ignore this step.

```
$ cd ~/rzv_vlp_v3.0.0
$ unzip ~/RTK0EF0045Z13001ZJ-v1.xx_EN.zip
$ tar zxvf ./RTK0EF0045Z13001ZJ-v1.xx_EN/meta-rz-features.tar.gz
```

If you want to enable the video codec when building **core-image-weston** or **core-image-bsp**, please copy the video codec package (RTK0EF0045Z15001ZJ-v0.xx_EN.zip or RTK0EF0045Z15001ZJ-v0.xx_JP.zip) to working directory and run the commands below.

```
$ cd ~/rzv_vlp_v3.0.0
$ unzip ~/RTK0EF0045Z15001ZJ-v0.xx_EN.zip
$ tar zxvf ./RTK0EF0045Z15001ZJ-v0.xx_EN/meta-rz-features.tar.gz
```

(3) Setup a build environment

Run the commands below. The environment to build is set by the source command.

```
$ cd ~/rzv_vlp_v3.0.0
$ source poky/oe-init-build-env
```

(4) Prepare the default configuration files for the target board

Run the commands below.

```
$ cd ~/rzv_vlp_v3.0.0/build
$ cp ../meta-renesas/docs/template/conf/smarc-rzv2l/*.conf  ./conf/
```

(5) Decompress OSS files to “build” directory (Optional)

Run the commands below. This step is not mandatory and able to go to the step (6) in case the “offline” environment is not required. All OSS packages will be decompressed with this '7z' command.

```
$ cd ~/rzv_vlp_v3.0.0/build
$ 7z x ~/oss_pkg_rzv_v3.0.0.7z
```

Note) If this step is omitted and BB_NO_NETWORK is set to “0” in next step, all source codes will be downloaded from the repositories of each OSS via the internet when running bitbake command. Please note that if you do not use an “offline” environment, a build may fail due to the implicit changes of the repositories of OSS.

After the above procedure is finished, the “offline” environment is ready. If you want to prevent network access, please change the line in the “~/rzv_vlp_v3.0.x/build/conf/local.conf” as below:

```
BB_NO_NETWORK = "1"
```

To change BB_NO_NETWORK from “0” to “1”.

(6) Start a build

Run the commands below to start a build. Building an image can take up to a few hours depending on the user's host system performance.

```
$ bitbake core-image-weston
```

After the build is successfully completed, a similar output will be seen, and the command prompt will return.

```
NOTE: Tasks Summary: Attempted 7427 tasks of which 16 didn't need to be rerun and al
l succeeded.
```

All necessary files listed in **Table 4** will be generated by the bitbake command and will be located in the **`build/tmp/deploy/images`** directory.

VLP/V can build a few types of images listed in **Table 3**. Please refer to the "Component list" for details about components of each image.

For the booting method and the required settings, please refer to the "SMARC EVK of RZ/G2L, RZ/G2LC, RZ/G2UL, RZ/V2L, and RZ/Five Start-up Guide (R01US0556)".

The loader files written at the time of mass production may not be the latest. When using EVK for the first time, be sure to write Boot loader files generated by building latest BSP to your board.

Table 3. Supported images of VLP/V

Image name	Purpose
core-image-minimal	Minimal set of components
core-image-bsp	Minimal set of components plus audio support and some useful tools
core-image-weston	Standard image with graphics support
core-image-qt	Enable Qt LGPL version

Table 4. Image files for RZ/V2L

RZ/V2L	**Linux kernel**	Image-smarc-rzv2l.bin
	Device tree file	Image-r9a07g054l2-smarc.dtb
	root filesystem	*<image name>*-smarc-rzv2l.tar.bz2
	Boot loader	・bl2_bp-smarc-rzv2l_pmic.srec ・fip-smarc-rzv2l.srec
	Flash Writer	Flash_Writer_SCIF_RZV2L_SMARC_PMIC_DDR4_2GB_1PCS.mot

3.2 Building SDK

To build Software Development Kit (SDK), run the commands below after the steps (1) – (6) of section **3.1** are finished.

The SDK allows you to build custom applications outside of the Yocto environment, even on a completely different PC. The results of the commands below are 'installer' that you will use to install the SDK on the same PC, or a completely different PC.

For building general applications:

```
$ cd ~/rzv_vlp_v3.0.0/build
$ bitbake core-image-weston -c populate_sdk
```

For building Qt applications:

```
$ cd ~/rzv_vlp_v3.0.0/build
$ bitbake core-image-qt -c populate_sdk
```

The resulting SDK installer will be located in **build/tmp/deploy/sdk/**

The SDK installer will have the extension .sh
To run the installer, you would execute the following command:

```
$ sudo sh poky-glibc-x86_64-core-image-weston-aarch64-smarc-rzv2l-toolchain-3.1.14.s
h
```

Or

```
$ sudo sh poky-glibc-x86_64-core-image-qt-aarch64-smarc-rzv2l-toolchain-3.1.14.sh
```

Note) The SDK build may fail depending on the build environment. At that time, please run the build again after a period of time. Or build it again from scratch with the below commands.

For building general applications:

```
$ cd ~/rzv_vlp_v3.0.0/build
$ bitbake core-image-weston -c cleanall
$ bitbake core-image-weston
$ bitbake core-image-weston -c populate_sdk
```

For building Qt applications:

```
$ cd ~/rzv_vlp_v3.0.0/build
$ bitbake core-image-qt -c cleanall
$ bitbake core-image-qt
$ bitbake core-image-qt -c populate_sdk
```

4. Components

This version uses different version of Linux kernel. Please also refer to the “Component list” for details.

Table 5. Versions of commonly used components

Components	VLP/V v3.0.0
Linux kernel	5.10.83-cip1
GCC	8.3.0 (Arm GCC 8.3-2019.03)
Glibc	2.28
Busybox	1.31.1
Openssl	1.1.1n

5. Restrictions

None.

6. Notes

6.1 Common Notes for all RZ Platforms

(1) GPLv3 packages

In this release, the GPLv3 packages are disabled as default in *build/conf/local.conf*:

```
INCOMPATIBLE_LICENSE = "GPLv3 GPLv3+"
```

If you want to use GPLv3, just hide this line:

```
#INCOMPATIBLE_LICENSE = "GPLv3 GPLv3+"
```

(2) Disable libraries of GPU and video codec

When you want to disable the functions of the video codec, please add lines in *build/conf/local.conf*:

- Disable OpenGL ES library in the graphics package (*1)

```
USE_RENESAS_GLES = "0"
```

- Disable OpenCL library in the graphics package (*1)

```
USE_RENESAS_OPENCL = "0"
```

- Disable OpenMAX library for decode in the video codec package (*2)

```
USE_CODEC_DEC = "0"
```

- Disable OpenMAX library for encode in the video codec package (*2)

```
USE_CODEC_ENC = "0"
```

(*1) This library is included in RTK0EF0045Z13001ZJ-v1.xx_EN.zip and RTK0EF0045Z13001ZJ-v1.xx_JP.zip
(*2) This library is included in RTK0EF0045Z15001ZJ-v0.xx_EN.zip and RTK0EF0045Z15001ZJ-v0.xx_JP.zip

(3) Docker

Docker is disabled in the default settings of VLP/V. To enable Docker, please uncomment the below line inside the file "~/rzv_vlp_v3.0.0/build/conf/local.conf" before building images.

```
#MACHINE_FEATURES_append = " docker"
```

(4) USB Video Class

USB Video Class (UVC) driver is not installed with the default settings of VLP/V due to its big size.

In case UVC devices such as USB cameras are necessary, please install the driver by adding the line below to `local.conf`.

```
IMAGE_INSTALL_append = " kernel-module-uvcvideo "
```

(5) CIP Core Packages

VLP/V includes Debian 10 (Buster) based CIP Core Packages and is enabled by the default settings. These packages can be replaced with other versions of packages.

Note that network access is required to start the build process when you enable these packages except for Buster which is set as the default setting.

CIP Core Packages are going to be maintained by the Civil Infrastructure Platform project. For more technical information, please contact Renesas.

1. Buster (default):

The following lines are added as default in the `local.conf`:

```
# Select CIP Core packages
CIP_CORE = "1"
```

2. No CIP Core Packages:

If the CIP Core Packages are unnecessary, comment out and add the following lines to disable CIP Core Packages in the `local.conf`:

```
# Select CIP Core packages
#CIP_CORE = "1"
```

Note) The above 4 settings disable GPLv3 packages as default. In case the GPLv3 packages are required, please comment out the following line in the `local.conf`.

```
# INCOMPATIBLE_LICENSE = "GPLv3 GPLv3+"
```

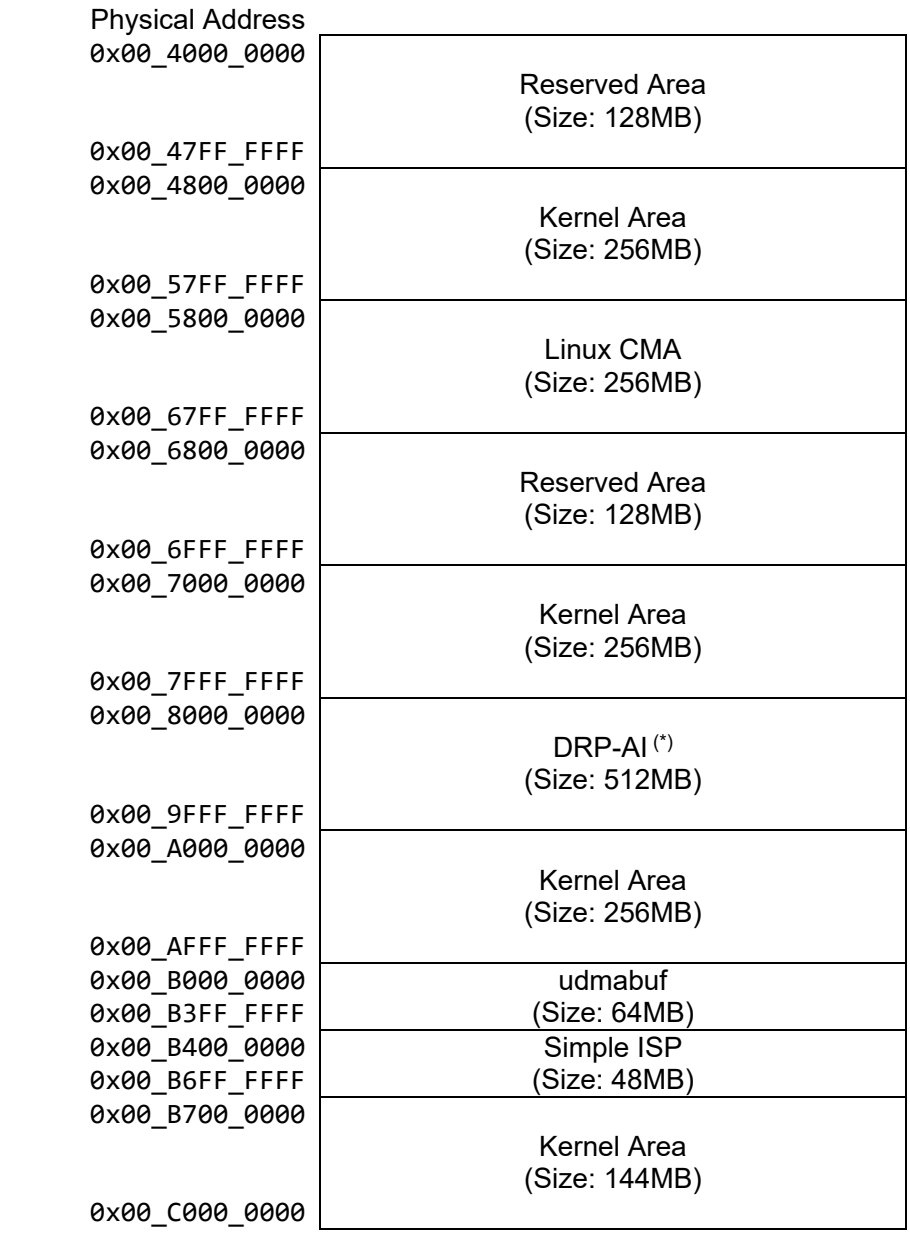
By building the BSP, the packages will be replaced as below in the table.

Table 6. Versions of all Buster Debian packages

Package	Buster Debian
Attr	2.4.48
Busybox	1.31.1
Coreutils	6.9
Gcc	8.3.0
glib-2.0	2.58.3
Glibc	2.28
Gnupg	1.4.7
Kbd	2.0.4
libassuan0	2.5.2
Libgcrypt	1.8.4
Libunistring	0.9.10
Libnss	0.14.1
Openssh	7.9p1
Perl	5.30.1
Pkgconfig	0.29
Quilt	0.65

6.2 Memory Map

RZ/V2L SMARC board memory map is shown in Figure 1.



*: The area to store DRP-AI Object files. This area must be set to an address of 8bytes or less.

Figure 1. Memory map

7. Revision History

		Description	
Rev.	**Date**	**Page**	**Summary**
1.00	Jun. 30, 2022	-	First edition issued.
1.01	Jul. 6, 2022	3	Modify Optional packages to describe the information for the latest libraries of the Graphics and the Video Codec.
		6	Modify the step 3.1(2) according to the latest libraries of the Graphics and the Video Codec.

Website and Support

Renesas Electronics Website
http://www.renesas.com/

Inquiries
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