

# RZ/G Verified Linux Package for 64bit kernel

## Version 1.0.4

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### Release Note

#### Introduction

This release note describes the contents, building procedures and important points of the RZ/G Verified Linux Package for 64bit kernel (hereinafter referred to as “VLP64”).

If you need information to build Linux BSPs including a GUI Framework of HTML5 (Gecko), please refer to “RZ/G Verified Linux Package for 64bit kernel Version 1.0.4 Release Note for HTML5”.

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## 1. Release Items

- **Name and version**

RZ/G Verified Linux Package for 64bit kernel  
Version 1.0.4

- **Distribution method**

Provided via the RZ/G Marketplace. Please visit the sites below and create an account to download the packages.

**RZ/G Marketplace:**

English: <https://www.renesas.com/us/en/products/rzg-linux-platform/rzg-marketplace.html>

Japanese: <https://www.renesas.com/jp/ja/products/rzg-linux-platform/rzg-marketplace.html>

- **Target board**

Hoperun Technology HiHope RZ/G2H platform (hihope-rzg2h)  
Hoperun Technology HiHope RZ/G2M platform (hihope-rzg2m)  
Hoperun Technology HiHope RZ/G2N platform (hihope-rzg2n)  
Silicon Linux RZ/G2E evaluation kit (ek874)

- **Verified functions**

Linux BSP

- Linux Kernel
- Linux Drivers
- Graphics Libraries

GUI Framework

- Qt (LGPL version)
- Gecko

- **Evaluation vs Product Version**

Because the package that contains the VLP64 Yocto recipes also contains the multimedia packages, there are two release versions: Evaluation (eva) and Product (pro). 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 multimedia libraries, operation will automatically be stopped after a few hours. The product version does not have this time limitation. To acquire the product version, please contact Renesas to start the formal process of acquiring those releases.

- **File contents**

VLP64 is delivered by the files listed in **Table 1**.

**Table 1. RZ/G Verified Linux Package for 64bit kernel****Common files**

File	Explanation
rzg2_bsp_eva_v104.tar.gz (Evaluation version) rzg2_bsp_pro_v104.tar.gz (Product version)	Yocto recipe packages (including multimedia package)
oss_pkg_v104.7z.001 (500MB)    oss_pkg_v104.7z.009 (500MB) oss_pkg_v104.7z.002 (500MB)    oss_pkg_v104.7z.010 (500MB) oss_pkg_v104.7z.003 (500MB)    oss_pkg_v104.7z.011 (500MB) oss_pkg_v104.7z.004 (500MB)    oss_pkg_v104.7z.012 (500MB) oss_pkg_v104.7z.005 (500MB)    oss_pkg_v104.7z.013 (500MB) oss_pkg_v104.7z.006 (500MB)    oss_pkg_v104.7z.014 (500MB) oss_pkg_v104.7z.007 (500MB)    oss_pkg_v104.7z.015 (61MB) oss_pkg_v104.7z.008 (500MB)	Open source packages  <b>See the Note below before download</b>
r01tu0277ej0104-rz-g.pdf	This document
r01tu0278ej0104-rz-g.pdf	Component list
r01tu0279ej0104-rz-g.pdf	Documents describing booting method and the required settings of bootloader

**Optional files for HTML5 (Gecko) environment**

File	Explanation
rzg2_bsp_gecko_v104.tar.gz	Yocto recipe packages for HTML5
oss_pkg_gecko_v104.7z.001 (500MB) oss_pkg_gecko_v104.7z.002 (500MB) oss_pkg_gecko_v104.7z.003 (500MB) oss_pkg_gecko_v104.7z.004 (316MB)	Open source packages for HTML5 (Gecko 68)
r01tu0311ej0100-rz-g.pdf	Build instruction for HTML5

**Optional files for updating from VLP64 1.0.2**

File	Explanation
r01tu0283ej0102-rz-g.pdf	Update guide for v1.0.2 users
v102-to-v104.patch.tar.gz	Diff files of Yocto recipes compared with VLP64 v1.0.2
V102-to-v104.oss_packages.7z	Diff files of OSS packages compared with VLP64 v1.0.2

Note) Open source packages contain all source codes of OSSs except for Linux kernel. These are the same versions of OSSs used when VLP was verified.

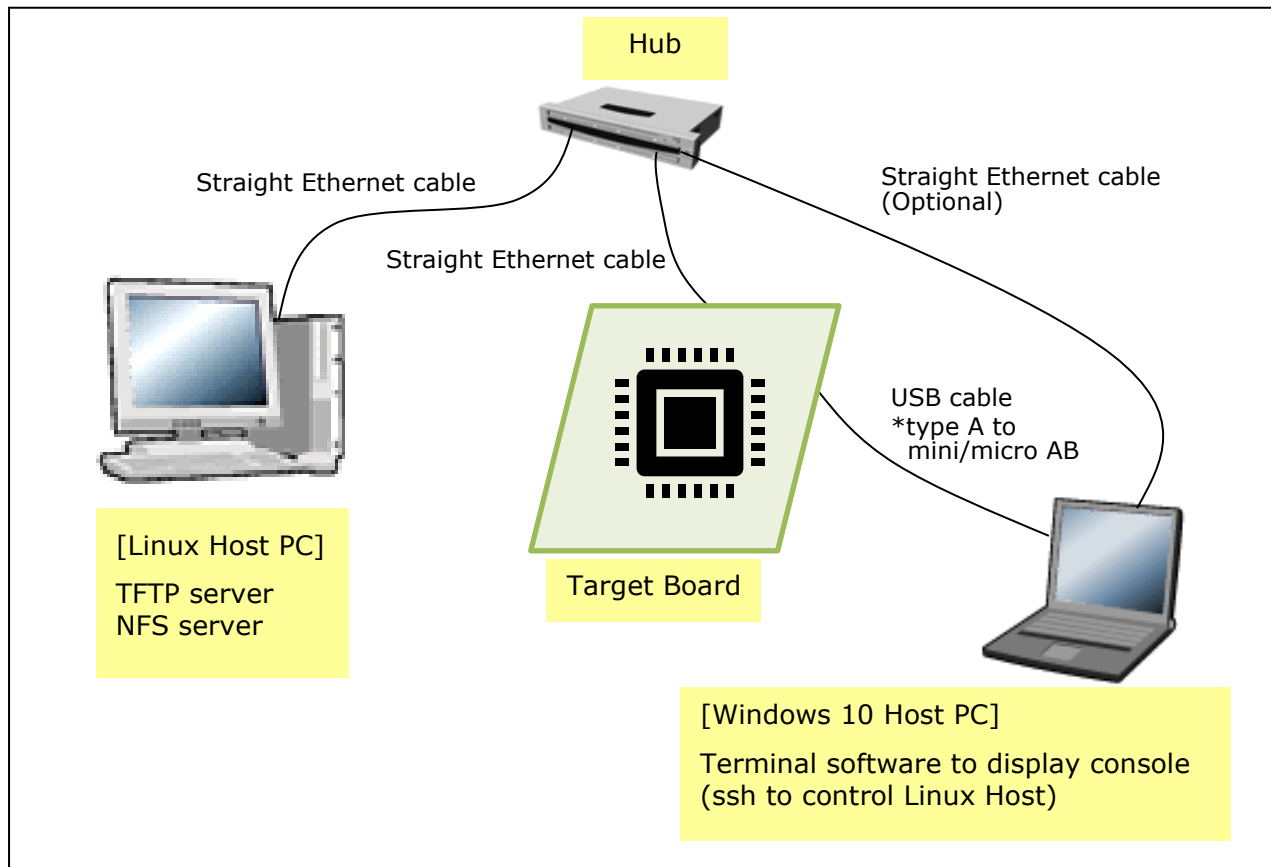
If you are just evaluating VLP and RZ/G series, open source packages are not mandatory to use. Usually, all the software can be built without using these files if your build machine is connected to the Internet.

Open source packages are required for an “offline” environment. The word “offline” means an isolated environment which does not connect to any network. VLP 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 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 supports can be built on an “offline” environment. Please refer to **2. Build environment**.

## 2. Build environment

**Figure 1** shows an overall constitution of the recommended environment of VLP64. This environment uses the equipment and the software listed in **Table 2**. Please refer to “RZ/G Verified Linux Package Start-Up Guide” for details about setting up the environment.



**Figure 1. Recommended Environment**

Please connect the Linux Host PC to the internet when downloading Linux kernel source code, or building without using the open source packages files that Renesas provides.

Below images can be built “offline”.

- core-image-minimal
- core-image-bsp
- core-image-weston (including the case using Gecko)
- core-image-qt
- core-image-weston-sdk
- core-image-qt-sdk

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

- Preparing a Linux Host PC
- Building an image of core-image-hmi

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

Equipment	Description
Linux Host PC	Used as build/debug environment 100GB free space on HDD is necessary
OS	<b>Ubuntu 16.04 LTS</b> 64 bit OS must be used.
TFTP server	Used for downloading the Linux kernel to the board
NFS server	Used for mounting rootfs via NFS
Windows Host PC	Used as debug environment, controlling with terminal software
OS	Windows 10
Terminal software	Used for controlling serial console of the target board Tera Term (latest version) is recommended Available at <a href="https://tssh2.osdn.jp/index.html.en">https://tssh2.osdn.jp/index.html.en</a>
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 <a href="http://www.ftdichip.com/Drivers/VCP.htm">http://www.ftdichip.com/Drivers/VCP.htm</a>

Note) Build may fail if Ubuntu 14, 18 or 20 is used.

### 3. Building Instructions

#### 3.1 Building images to run on the board

Before starting the build, run the command below on the Linux Host PC to install packages used for building BSP.

```
$ 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 libssl1.2-dev xterm p7zip-full
```

Please refer to the URL below for detailed information:

- <https://www.yoctoproject.org/docs/2.4.3/yocto-project-qs/yocto-project-qs.html>

If the Git has not configured yet, set user name and email address before starting 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 the all files obtained from Renesas into your home directory prior to the steps below.**

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

```
$ mkdir ~/user_work
$ cd ~/user_work
$ tar xvf ~/rzg2_bsp_eva_v104.tar.gz
```

The name and the place of the working directory can be changed, as necessary.

Please replace “*eva*” with “*pro*” for the product version.

Note) Please note that your build environment must have 100GB of free hard drive space in order to complete the 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.

Note) VLP64 is set video output to LVDS as default setting. In case using HDMI, please refer to **Section 6 Notes - (2) Video output**.

#### (2) Execute the copy script for proprietary software

```
$ cd ~/user_work/meta-rzg2
$ sh docs/sample/copyscript/copy_proprietary_softwares.sh ~/user_work/proprietary
```

Note) Both product and evaluation version use the same script.

#### (3) Setup a build environment

```
$ cd ~/user_work
$ source poky/oe-init-build-env
```

Environment to build are set by the source command.

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

```
$ cd ~/user_work/build
$ cp ../meta-rzg2/docs/sample/conf/board/linaro-gcc/*.conf ./conf/
```

Please replace “*board*” by the name below:

```
HiHope RZ/G2H board:  hihope-rzg2h
HiHope RZ/G2M board:  hihope-rzg2m
HiHope RZ/G2N board:  hihope-rzg2n
EK874 RZ/G2E board:   ek874
```

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

This step is not mandatory and able to go to the step (7) in case the “offline” environment is not used.

```
$ cd ~/user_work/build
$ 7z x ~/oss_pkg_v104.7z.001 (*1)
```

All OSS packages will be decompressed at the step marked “\*1”. 7zipped files are not able to decompress individually. All oss\_pkg\_v104.7z files must be placed at the same directory before running 7z command.

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.

**(6) Download Linux kernel source code**

```
$ cd ~/user_work/build
$ bitbake linux-renesas -c fetch
```

The procedure so far is finished, the “offline” environment is ready. If you want to prevent network access, please change the line in the “~/user\_work/build/conf/local.conf” as below:

```
BB_NO_NETWORK = "1"
```

To change BB\_NO\_NETWORK from “0” to “1”.

**(7) Start a build**

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

VLP64 can build a few types of images listed in **Table 3**. Please refer to the “Component list” for details about components of each images.

**Table 3. Supported images of VLP64**

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

Note) Another image named “core-image-hmi” can also be used. This image provides some HMI demo applications. Please connect the Linux Host PC to the network when building it. Also, please note that the image of core-image-hmi is provided AS IS without full verification.

Building an image can take up to a few hours depending on the user’s host system performance.

After the build is successfully completed, a similar output will be seen:

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

and the command prompt will return.

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

**Table 4. Image files**

	Linux kernel	Device tree file	root filesystem	Boot loader
<b>RZ/G2H</b>	Image-hihope-rzg2h.bin	Image-r8a774e1-hihope-rzg2h-ex.dtb (for main+sub board)  Image-r8a774e1-hihope-rzg2h.dtb (for main board only)	<image name>- hihope- rzg2h.tar.bz2	u-boot-elf-hihope-rzg2h.srec bootparam_sa0.srec bl2-hihope-rzg2h.srec bl31-hihope-rzg2h.srec tee-hihope-rzg2h.srec cert_header_sa6.srec
<b>RZ/G2M</b>	Image-hihope-rzg2m.bin	Image-r8a774a1-hihope-rzg2m-ex.dtb (for main+sub board)  Image-r8a774a1-hihope-rzg2m.dtb (for main board only)	<image name>- hihope- rzg2m.tar.bz2	u-boot-elf-hihope-rzg2m.srec bootparam_sa0.srec bl2-hihope-rzg2m.srec bl31-hihope-rzg2m.srec tee-hihope-rzg2m.srec cert_header_sa6.srec
<b>RZ/G2N</b>	Image-hihope-rzg2n.bin	Image-r8a774b1-hihope-rzg2n-ex.dtb (for main+sub board)  Image-r8a774b1-hihope-rzg2n.dtb (for main board only)	<image name>- hihope- rzg2n.tar.bz2	u-boot-elf-hihope-rzg2n.srec bootparam_sa0.srec bl2-hihope-rzg2n.srec bl31-hihope-rzg2n.srec tee-hihope-rzg2n.srec cert_header_sa6.srec
<b>RZ/G2E</b>	Image-ek874.bin	Image-r8a774c0-ek874.dtb (for main+sub board)  Image-r8a774c0-cat874.dtb (for main board only)	<image name>- ek874.tar.bz2	u-boot-elf-ek874.srec bootparam_sa0.srec bl2-ek874.srec bl31-ek874.srec tee-ek874.srec cert_header_sa6.srec

<image name> will be the name used in the step (7).

Please note that typical HiHope boards users who use the combination of main and sub boards need to use “Image-r8a774xx-hihope-rzg2x-ex.dtb” as a device tree file. **If the dtb files of “for main board only” are used, interfaces on the sub board such as Ethernet are not able to be used.**

For the booting method and the required settings, please refer to the “RZ/G2 Reference Boards Linux Start-up Guide”.

Also note that the dtb files listed in the **Table 4 cannot be used for the early version of boards**. See the section **6 Notes**.



### 3.2 Building SDK

To build Software Development Kit (SDK), run the commands below after the steps (1) – (7) 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 ~/user_work/build
$ bitbake core-image-weston-sdk -c populate_sdk
```

For building Qt applications:

```
$ cd ~/user_work/build
$ bitbake core-image-qt-sdk -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 poky-glibc-x86_64-core-image-weston-sdk-aarch64-toolchain-2.4.3.sh
```

Please refer to “RZ/G2 Group Application Note” and “Verified Linux Package Start-up Guide” for the usage of SDK.

## 4. Components

Compared to VLP for 32bit kernel and previous version of VLP64, this version uses different version of Linux kernel and supports newer HTML5 rendering engine. Please also refer to the “Component list” for details.

**Table 5. Versions of commonly used components**

Components	VLP for 32bit kernel v2.1.5	VLP for 64bit kernel v1.0.2	VLP for 64bit kernel v1.0.4
Linux kernel	4.4.199-cip39	4.19.56-cip5	4.19.106-cip21
GCC	7.2.1 (Linaro GCC 7.2-2017.11)	7.3.1 (Linaro GCC 7.3-2018.05)	7.3.1 (Linaro GCC 7.3-2018.05)
glibc	2.19 (CIP)	2.19 (CIP)	2.19 (CIP)
binutils	2.25 (CIP)	2.25 (CIP)	2.25 (CIP)
busybox	1.22.0 (CIP)	1.22.0 (CIP)	1.22.0 (CIP)
openssl	1.0.1t (CIP)	1.0.1t (CIP)	1.0.1t (CIP)
gstreamer1.0	1.12.2	1.12.2	1.12.2
wayland	1.13.0	1.13.0	1.13.0
weston	2.0.0	2.0.0	2.0.0
python2	2.7.17	2.7.13	2.7.13
python3	3.5.3	3.5.3	3.5.3
Qt (LGPL version)	5.6.3	5.6.3	5.6.3
Gecko	60	60	68
Docker	-	17.06	17.06

Note) Some components can be replaced with newer versions that are provided by CIP. Please refer to **6 Notes** for details.

## 5. Restrictions

### 5.1 All MPUs

#### (1) Drivers

Below drivers can be used but are not fully tested in this release.

- Bluetooth
- Wifi
- IPMMU

#### (2) core-image-hmi

Due to the change of the original OSS repository, build of `core-image-hmi` fails.

Please apply the change below as a workaround before executing a bitbake command.

```
meta-rzg2/recipes-demos/hmi/opengl-apps_3.5.bb
```

```
SRCREV = "d042dd42d9cd205b621402a99a636da6d00b8c79"  
SRC_URI = " \  
    git://github.com/powervr-graphics/Native_SDK;nobranch=1 \  
    file://build_64_wl.patch \  
    file://0003-Wayland-patch-setting-position.patch \  
    file://0002-prevent-error-convert-bool-to-void.patch \  
"
```

Note that the image of `core-image-hmi` is provided AS IS without full verification.

## 6. Notes

### (1) Bootloader/Linux kernel

The dtb files listed in the **Table 4** cannot be used for the early revision of Hoperun boards. If you are using revision 2 boards, please use below files. These are automatically generated at the same place as the other image files when building a BSP.

#### HiHope RZ/G2M board:

- Image-r8a774a1-hihopec-rzg2m-ex-**rev2**.dtb (for main+sub board)
- Image-r8a774a1-hihopec-rzg2m-**rev2**.dtb (for main board only)

#### HiHope RZ/G2N board:

- Image-r8a774b1-hihopec-rzg2n-ex-**rev2**.dtb (for main+sub board)
- Image-r8a774b1-hihopec-rzg2n-**rev2**.dtb (for main board only)

#### Silicon Linux RZ/G2E board (EK874):

- Please refer to **(8) GPU** in this section.

Note) Board revision is printed below the Hoperun logo on boards.

### (2) Video output

VLP64 is set video output to LVDS as default setting. In case to use HDMI as a video output, please apply the patch with this command.

```
$ cd ~/user_work/meta-rzg2
$ patch -p1 < ../extra/0001-BSP-1.0.4-add-support-HDMI.patch
```

After applying above patch, please note to below points.

#### Audio

In case 48kHz audio, please set SW2404 to P1 side.

#### Wifi

Firmware of Bluetooth is integrated into the kernel. Therefore, this step is not necessary.

```
hciattach /dev/ttySC1 texas 3000000
```

Instead, this step is required.

```
rftkill unblock bluetooth
```

#### SATA

SATA interface on HiHope RZ/G2N or RZ/G2H board is enabled by setting switches as below.

- SW1001-7 on main board: OFF
- SW43 on sub board: ON

### (3) Weston

Due to the specification of opensource software (Weston 2.0.0), it is not recommended to resize application windows. Please consider designing the application to use fixed sized windows.

### (4) Video playback

Due to the specification of opensource software (GStreamer and others) and drivers, multiple GStreamer pipelines with hardware scale cannot run.

Also, below formats of video are not supported.

- NV61
- YUV420
- YUV422
- YUV444
- H.264, 80Mbps

### (5) ECC

The ECC function for DRAM has two modes: 8bit data/5bit ECC mode and 64bit data/8bit ECC mode. 8bit data/5bit ECC mode can be evaluated by the following method. When applying the ECC function to products or need other details including the method to enable 64bit data/8bit ECC mode, please contact Renesas.

Enable the function by changing the lines below in the `local.conf`.

Disable:

```
# MACHINE_FEATURES_append = " ecc"
# ECC_MODE = "Partial"
```

Enable:

```
MACHINE_FEATURES_append = " ecc"
ECC_MODE = "Full"
```

This sets 8bit data/5bit ECC mode for all DRAM region. After building, please replace all images including boot loaders.

### (6) SDHI

Early revision of EK874 boards cannot detect insertion of SD card. Please plugged in a card before turning on the power.

### (7) VIN

One camera input is enabled in default settings. Two camera inputs can be enabled in RZ/G2N and H. Please refer to the Video Capture Driver User's Manual that is included in the RZ/G2 Group BSP Manual Set for more details.

VIN on early revision of HiHope RZ/G2M and N boards fails to work. Please use newer boards in case VIN is necessary.

### (8) GPU

The dtb files listed in the **Table 4** cannot be used for the early version (ES1.0) of RZ/G2E.

If the board prints the messages below when turn on the power, ES1.0 of RZ/G2E is implemented on the board.

```
[ 0.000096] NOTICE: BL2: RZ G2E Initial Program Loader(CA53)
[ 0.004373] NOTICE: BL2: Initial Program Loader(Rev.1.0.23)
[ 0.009991] NOTICE: BL2: PRR is RZG G2E Ver.1.0
```

```
CPU: Renesas Electronics R8A774C0 rev 1.0
```

In this case, please use below dtb files instead. These are built simultaneously when building normal dtb files.

- Image-r8a774c0-es10-ek874.dtb (for main+sub board)
- Image-r8a774c0-es10-cat874.dtb (for main board only)

In case both old and new RZ/G2E LSIs are used in your laboratory at the same time, dtb files can automatically be selected using the environment variable `cut_ver` which is set by u-boot program according to the LSI's information. Please store multiple dtb files in an SD card and set `bootcmd` of u-boot like this.

```
setenv bootcmd 'fatload mmc 0:1 0x48080000 Image; if test "${cut_ver}" = "10"; then
fatload mmc 0:1 0x48000000 Image-r8a774c0-es10-ek874.dtb; else fatload mmc 0:1 0x480
00000 Image-r8a774c0-ek874.dtb ; fi ; booti 0x48080000 - 0x48000000'
```

## (9) Docker

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

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

## (10) Wifi

Wifi is disabled in default settings but modules necessary for Wifi functions are installed into rootfs. In case Wifi is necessary, please enable it from a console as below.

```
$ rfkill list
```

If this command shows `Soft blocked: yes`, run `unblock` command like this.

```
$ rfkill unblock wlan
```

Then, continue below.

```
$ connmanctl
connmanctl> scan wifi
connmanctl> services
connmanctl> agent on
connmanctl> connect <network_name>
    <input password>
connmanctl> quit
```

You may need to retry the `connect` command few times.

Note that some settings relating about radio waves should be adjusted according to the laws of each region. Please refer to general information in books and websites about Linux networking.

## (11) USB Video Class

USB Video Class (UVC) driver is not installed with the default settings of VLP 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-uvccvideo "
```

**(12) Gecko**

In this release, HTML5 (Gecko) is verified on Silicon Linux RZ/G2E evaluation kit (ek874).

**(13) CIP Core Packages**

VLP includes Debian 8 (jessie) based CIP Core Packages indicated as “(CIP)” in the **Table 5** and enabled in the default settings. In this release, these packages can be replaced with Debian 10 (buster) based CIP Core Packages. Please follow below procedures to enable buster based packages. For more technical information, please contact Renesas.

Apply the patch to your build environment

```
$ cd ~/user_work/poky
$ patch -p 1 < ../extra/0001-poky-classes-workaround-to-build-buster-limited.patch
```

Uncomment the line below in the `local.conf`

```
MACHINE_FEATURES_append = " Buster-limited"
```

Comment out the line below in the `local.conf`

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

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

Package	Buster version	Jessie version
glibc	2.28	2.19
binutils	2.31.1	2.25
busybox	1.30.1	1.22.0
openssl	1.1.1d	1.0.1t

More buster packages will be available in VLP in future.

Note) In this release, this method to enable buster based packages is preliminary and provided AS IS with no warranty.

## Website and Support

Renesas Electronics Website

<http://www.renesas.com/>

Inquiries

<http://www.renesas.com/contact/>

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