RZ MPU HTML5 (Gecko91) Package V1.3.0 for Verified Linux Package V3.0.3

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Release Note for HTML5

Introduction

This release note describes the contents, building procedures for HTML5 (Gecko91) and important points of the RZ MPU HTML5 (Gecko91) Package V1.3.0 for Verified Linux Package (hereinafter referred to as "VLP/G").

If you need information to build Linux BSPs without a GUI Framework of HTML5, please refer to "RZ/G Verified Linux Package Version 3.0.3 Release Note" (r01us0553ej0107-rz-g(Release Note).pdf).

Contents

1.   Release Items

- **Name and version**

    RZ MPU HTML5 (Gecko91) Package V1.3.0 for RZ/G Verified Linux Package Version 3.0.3 (hereinafter referred to as "HTML5 (Gecko91) Package v1.3.0" and "VLP/G v3.0.3")

- **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/G series. Basic packages of VLP/G v3.0.3 which are listed in **Table 1** can be downloaded.

    RZ Family:

    https://www.renesas.com/products/microcontrollers-microprocessors/rz-arm-based-high-end-32-64-bit-mpus

    You can also download the basic packages of VLP/G v3.0.3 which are listed in **Table 1** from the site below.

    RZ/G Marketplace:

    https://www.renesas.com/products/microcontrollers-microprocessors/rz-cortex-a-mpus/rzg-linux-platform

- **Target board for HTML5 (Gecko91)**

    Hoperun Technology HiHope RZ/G2H platform (hihope-rzg2h) Rev 4.0
    Hoperun Technology HiHope RZ/G2M platform (hihope-rzg2m) Rev 4.0 (*1)
    Hoperun Technology HiHope RZ/G2N platform (hihope-rzg2n) Rev 4.0
    Silicon Linux RZ/G2E evaluation kit (ek874) Rev E

    RZ/G2L Evaluation Board Kit PMIC version (*2):
    o   RZ/G2L SMARC Module Board v2.1
    o   RZ SMARC Series Carrier Board v4.0

    RZ/G2LC Evaluation Board Kit (*3):
    o   RZ/G2LC SMARC Module Board v1.0
    o   RZ SMARC Series Carrier Board v4.0

- (*1)   There are 2 versions of RZ/G2M LSI devices. There are version 3.0 and 1.3 (hereinafter referred to as "RZ/G2M v3.0" and "RZ/G2M v1.3").
- (*2)   "RZ/G2L Evaluation Board Kit" and "RZG2L Evaluation Board Kit PMIC version" includes the RZ/G2L SMARC Module Board and the RZ SMARC Series Carrier Board.
- (*3)   "RZG2LC Evaluation Board Kit" includes the RZ/G2LC SMARC Module Board and the RZ SMARC Series Carrier Board.

- **Verified functions**

    Linux BSP
    -     Linux Kernel
    -     Linux Drivers
    -     Graphics Libraries
    -     Codec Libraries

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

Table 1. RZ/G Verified Linux Package

Basic files of VLP/G v3.0.3

File	Description
RTK0EF0045Z0021AZJ-v3.0.3.zip (*1)	Verified Linux Package. This file includes the **Yocto recipe packages** and the necessary documents.
Rzg_bsp_v3.0.3.tar.gz	**Yocto recipe packages**
oss_pkg_v3.0.3.7z	Open source software packages See the Note below before download.
R01us0553ej0107-rz-g(Release Note).pdf	Release Note for building Linux BSPs without a GUI Framework of HTML5.
R01us0554ej0105-rz-g(Component List).pdf	Component List
r01us0555ej0101-rz-g(Board_StartUp_Guide_RZG2H,M,N,E).pdf	Documents describing booting method and the required settings of bootloader for **RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E**.
r01us0556ej0103-rz-g(Board_StartUp_Guide_smarcEVK).pdf	Documents describing booting method and the required settings of bootloader for **RZ/G2L, RZ/G2LC, and RZ/G2UL**.

Basic files of HTML5 (Gecko91) Package v1.3.0

File	Description
RTK0EF0045Z40001ZJ_v1.3.0.zip	Verified Linux Package for HTML5 (Gecko91). This file includes the **Yocto recipe packages** for HTML5 (Gecko91) and the necessary documents.
rzg_bsp_gecko91_v1.3.0.tar.gz	**Yocto recipe packages**
oss_pkg_gecko91_v1.3.0.7z (*1)	Open source software packages for HTML5 (Gecko91). Please use this file instead of oss_pkg_v3.0.3.7z when building HTML5 (Gecko91). See the Note below before download.
R01us0572ej0103-rz-g(Release Note HTML5).pdf	This document
r01us0573ej0103-rz-g(Component List HTML5).pdf	Component List of HTML5

(*1)　These packages are provided "AS IS" with no warranty and the license which is described in the source code. Please check the contents of the license, then consider the applicability to the product carefully.

Note)　Open source software packages contain all source codes of OSSs. These are the same versions of OSSs used when VLP/G was verified.
If you are just evaluating VLP/G and RZ/G 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/G 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/G supports can be built on an "offline" environment. Please refer to **2. Build environment**.

Optional packages (*1, 2)

	File ("XX" is replaced by "EN" or "JP".)	Description
RZ MPU Graphics Library	RTK0EF0045Z13001ZJ-v1.0.5_XX.zip (Evaluation version) RTK0EF0045Z14001ZJ-v1.0.5_rzg_XX.zip (Unrestricted version)	For **RZ/G2L** and **RZ/G2LC**. This provides graphics function compliant with the OpenGL ES standard.
RZ MPU Video Codec Library	RTK0EF0045Z15001ZJ-v1.1.0_XX.zip (Evaluation version) RTK0EF0045Z16001ZJ-v1.1.0_rzg_XX.zip (Unrestricted version)	RZ MPU Video Codec Library for **RZ/G2L**.
Multimedia Packages	RTK0EF0045Z0022AZJ-v1.0.2_XX.zip (Evaluation version) RTK0EF0045Z0023AZJ-v1.0.2_XX.zip (Unrestricted version)	Multimedia Packages for **RZ/G2H,M,N,E**. This includes the graphics library and the video codec library.

(*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.

(*2) HTML5 (Gecko91) Package v1.3.0 supports the below combination:
- rzg_bsp_v3.0.3.tar.gz + rzg_bsp_gecko91_v1.3.0.tar.gz + RTK0EF0045Z13001ZJ-v1.0.5_XX.zip + RTK0EF0045Z15001ZJ-v1.1.0_XX.zip
- rzg_bsp_v3.0.3.tar.gz + rzg_bsp_gecko91_v1.3.0.tar.gz + RTK0EF0045Z14001ZJ-v1.0.5_XX.zip + RTK0EF0045Z16001ZJ-v1.1.0_XX.zip
- rzg_bsp_v3.0.3.tar.gz + rzg_bsp_gecko91_v1.3.0.tar.gz + RTK0EF0045Z0022AZJ-v1.0.2_XX.zip

Additional packages

File	Description
RTK0EF0045Z9006AZJ-v3.0.3.zip	BSP Manual Set for RZ/G2L, RZ/G2LC, and RZ/G2UL.
RTK0EF0045Z9002AZJ-v3.0.3.zip	BSP Manual Set for RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E.

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

For RZ/G2L

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

For RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E

https://www.renesas.com/document/rzg2-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

Reference Boards of RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E 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 Tera Term.

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	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 ek874, Evaluation Board Kit of RZ/G2L) • https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers (for hihope-rzg2h, hihope-rzg2m, and hihope-rzg2n) Please install the VCP Driver corresponding to the target board.

Most bootable images VLP/G supports can be built on an "offline" environment.
The word "offline" means an isolated environment which does not connect to any network. Since VLP/G includes all necessary source codes of OSS except for the Linux kernel, VLP/G 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-weston

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 \
libssl-dev
```

Please refer to the URL below for detailed information:

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

Run the command**s** 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 Linux Host PC prior to the steps below. The directory which you put the files in is described as <package download directory> **in the build instructions.**

(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 ~/rzg_vlp_v3.0.3
$ cd ~/rzg_vlp_v3.0.3
$ cp ../<package download directory>/*.zip .
$ unzip ./RTK0EF0045Z0021AZJ-v3.0.3.zip
$ tar zxvf ./RTK0EF0045Z0021AZJ-v3.0.3/rzg_bsp_v3.0.3.tar.gz
$ unzip ./RTK0EF0045Z40001ZJ_v1.3.0.zip
$ tar zxvf ./RTK0EF0045Z40001ZJ_v1.3.0/rzg_bsp_gecko91_v1.3.0.tar.gz
$ touch ./meta-browser/classes/{distutils,pythonnative,setuptools}.bbclass
```

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.

Note)   If you have a board with the early silicon version, please refer to the **Section 6.1 - 0** and apply the patch files during this step. Please also confirm how to check which version you use.

(2)   Enable Graphics and Video Codec

For RZ/G2L

Please copy the below packages to the working directory and run the commands below to enable the Graphics and the video codec on RZ/G2L when building **core-image-weston**.

- Graphics package (RTK0EF0045Z13001ZJ-v1.0.5_EN.zip or RTK0EF0045Z13001ZJ-v1.0.5_JP.zip)
- Video codec package (RTK0EF0045Z15001ZJ-v1.1.0_EN.zip or RTK0EF0045Z15001ZJ-v1.1.0_JP.zip)

```
$ unzip ./RTK0EF0045Z13001ZJ-v1.0.5_EN.zip

$ tar zxvf RTK0EF0045Z13001ZJ-v1.0.5_EN/meta-rz-features_graphics_v1.0.5.tar.gz

$ unzip ./RTK0EF0045Z15001ZJ-v1.1.0_EN.zip

$ tar zxvf RTK0EF0045Z15001ZJ-v1.1.0_EN/meta-rz-features_codec_v1.1.0.tar.gz

$ sed -i '10s/^/#/' ./meta-rz-features/meta-rz-graphics/include/rzg2h-graphics.inc
```

For RZ/G2LC

Please copy the below package to the working directory and run the commands below to enable the Graphics on RZ/G2L when building **core-image-weston**.

- Graphics package (RTK0EF0045Z13001ZJ-v1.0.5_EN.zip or RTK0EF0045Z13001ZJ-v1.0.5_JP.zip)

```
$ unzip ./RTK0EF0045Z13001ZJ-v1.0.5_EN.zip

$ tar zxvf RTK0EF0045Z13001ZJ-v1.0.5_EN/meta-rz-features_graphics_v1.0.5.tar.gz

$ sed -i '10s/^/#/' ./meta-rz-features/meta-rz-graphics/include/rzg2h-graphics.inc
```

For RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E

Please copy the Multimedia package (RTK0EF0045Z0022AZJ-v1.0.2_EN.zip or RTK0EF0045Z0022AZJ-v1.0.2_JP.zip) to the working directory and run the commands below.

```
$ unzip ./RTK0EF0045Z0022AZJ-v1.0.2_EN.zip

$ tar zxvf ./RTK0EF0045Z0022AZJ-v1.0.2_EN/meta-rz-features.tar.gz

$ sed -i '10s/^/#/' ./meta-rz-features/meta-rz-graphics/include/rzg2h-graphics.inc
```

VLP/G is set video output to LVDS as default setting. In case to use HDMI as a video output, please apply the patch with these commands. This step is only for **RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E**.

```
$ cd ./meta-renesas

$ patch -p1 < ../extra/0001-Add-HDMI-support-for-RZ-G2.patch

$ cd ..
```

After applying above patch, please note the limitations for Audio, Bluetooth and SATA in section 6.2 (1).

(3)   Setup a build environment

Initialize a build using the 'oe-init-build-env' script in Poky and point TEMPLATECONF to platform conf path.

```
$ TEMPLATECONF=$PWD/meta-renesas/meta-<platform>/docs/template/conf/ source \
poky/oe-init-build-env build
```

<platform> and <board> can be selected in the below table.

Table 3. List of the platforms and the boards

Renesas MPU	Platform	Board
RZ/G2H	rzg2h	hihope-rzg2h
RZ/G2M	rzg2h	hihope-rzg2m
RZ/G2N	rzg2h	hihope-rzg2n
RZ/G2E	rzg2h	ek874
RZ/G2L	rzg2l	smarc-rzg2l
RZ/G2LC	rzg2l	smarc-rzg2lc

(4)   Add layers

Please follow the below steps to add the layers you need. The steps add the settings to bblayers.conf.

```
$ bitbake-layers add-layer ../meta-rz-features/meta-rz-graphics

$ bitbake-layers add-layer ../meta-rz-features/meta-rz-codecs

$ bitbake-layers add-layer ../meta-rust

$ bitbake-layers add-layer ../meta-clang

$ bitbake-layers add-layer ../meta-browser

$ bitbake-layers add-layer ../meta-rz-browser
```

(5)   Enable HTML5 (Gecko91)

Please follow the following instructions to edit the configuration file and enable HTML5 (Gecko91).

- Add the below lines to "~/rzg_vlp_v3.0.3/build/conf/local.conf".

```
IMAGE_INSTALL_append = " packagegroup-rz-browser"

PACKAGECONFIG_append_pn-firefox = " openmax "

PACKAGECONFIG_append_pn-firefox = " webgl "

PACKAGECONFIG_append_pn-firefox = " gpu "

TARGET_CXXFLAGS_remove_toolchain-clang = " --stdlib=libc++"

TUNE_CCARGS_remove_toolchain-clang = " --rtlib=compiler-rt --unwindlib=libunwind --stdlib=libc++"

TUNE_FEATURES_remove_toolchain-clang = "cortexa57-cortexa53"

DISTRO_FEATURES_append = " x11"

PACKAGECONFIG_remove = " libedit "

PACKAGECONFIG_remove_pn-xserver-xorg = " dri3 glamor "

IMAGE_INSTALL_remove = " matchbox-terminal "
```

- Comment out the below line in "~/rzg_vlp_v3.0.3/build/conf/local.conf".

```
#DISTRO_FEATURES_remove = " x11"
```

(6)   Decompress OSS files to "build" directory (Optional)

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

```
$ cp ../../<package download directory>/*.7z .
$ 7z x ~/oss_pkg_gecko91_v1.3.0.7z
```

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 "~/rzg_vlp_v3.0.3/build/conf/local.conf" as below:

```
BB_NO_NETWORK = "1"
```

To change BB_NO_NETWORK from "0" to "1".

(7)   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.

Build the target file system image using bitbake

```
$ MACHINE=<board> bitbake core-image-weston
```

<board> can be selected by referring to the Table 3. Example: MACHINE=smarc-rzg2l

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 all succeeded.
```

All necessary files listed in **Table 4** and **Table 5** will be generated by the bitbake command and will be located in the **build/tmp/deploy/images** directory.

Table 4 is for RZ/G2L. Table 5 is for RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E.

For the booting method and the required settings, please refer to the below documents:

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

- Reference Boards of RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E Start-up Guide

After booting your board, please refer to from the section 6.3 (1) to 6.3 (3) to know how to use the browser application on your board.

Table 4. Image files for RZ/G2L

RZ/G2L PMIC ver	Linux kernel	Image-smarc-rzg2l.bin
	Device tree file	Image-r9a07g044l2-smarc.dtb
	root filesystem	*<image name>*-smarc-rzg2l.tar.bz2
	Boot loader	・bl2_bp-smarc-rzg2l_pmic.srec ・fip-smarc-rzg2l_pmic.srec
	Flash Writer	Flash_Writer_SCIF_RZG2L_SMARC_PMIC_DDR4_2GB_1PCS.mot
RZ/G2LC	Linux kernel	Image-smarc-rzg2lc.bin
	Device tree file	Image-r9a07g044c2-smarc.dtb
	root filesystem	*<image name>*-smarc-rzg2lc.tar.bz2
	Boot loader	・bl2_bp-smarc-rzg2lc.srec ・fip-smarc-rzg2lc.srec
	Flash Writer	・Flash_Writer_SCIF_RZG2LC_SMARC_DDR4_1GB_1PCS.mot

Table 5. Image files for RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E

	Linux kernel	root filesystem	Boot loader
RZ/G2H	Image-hihope-rzg2h.bin	core-image-weston-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
RZ/G2M v3.0 (*1) v1.3 (*1)	Image-hihope-rzg2m.bin	*<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
RZ/G2N	Image-hihope-rzg2n.bin	*<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
RZ/G2E	Image-ek874.bin	*<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).

Device tree files for RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E

	Type 1	Type 2	Type 3	Type 4
RZ/G2H	Image-r8a774e1-hihope-rzg2h.dtb	Image-r8a774e1-hihope-rzg2h-ex.dtb	Image-r8a774e1-hihope-rzg2h-ex-idk-1110wr.dtb	Image-r8a774e1-hihope-rzg2h-ex-mipi-2.1.dtb
RZ/G2M v1.3 (*1)	Image-r8a774a1-hihope-rzg2m.dtb	Image-r8a774a1-hihope-rzg2m-ex.dtb	Image-r8a774a1-hihope-rzg2m-ex-idk-1110wr.dtb	Image-r8a774a1-hihope-rzg2m-ex-mipi-2.1.dtb

RENESAS

RZ/G2M **v3.0 (*1)**	Image-r8a774a3-hihope-rzg2m.dtb	Image-r8a774a3-hihope-rzg2m-ex.dtb	Image-r8a774a3-hihope-rzg2m-ex-idk-1110wr.dtb	Image-r8a774a3-hihope-rzg2m-ex-mipi-2.1.dtb
RZ/G2N	Image-r8a774b1-hihope-rzg2n.dtb	Image-r8a774b1-hihope-rzg2n-ex.dtb	Image-r8a774b1-hihope-rzg2n-ex-idk-1110wr.dtb	Image-r8a774b1-hihope-rzg2n-ex-mipi-2.1.dtb
RZ/G2E **EK874** **Rev E (*2)**	Image-r8a774c0-cat874.dtb	Image-r8a774c0-ek874.dtb	Image-r8a774c0-ek874-idk-2121wr.dtb	Image-r8a774c0-ek874-mipi-2.1.dtb

There are 4 types of the device tree files. Available devices are different depending on them. Please refer to the following description:

- **Type1**: Main board only
- **Type2**: Main board + Sub board
- **Type3**: Main board + Sub board + LVDS panel
- **Type4**: Main board + Sub board + MIPI/CSI2 cameras

Please note that users who use the combination of main and sub boards need to use type2-4 as a device tree file. **If the dtb files of type1 are used, interfaces on the sub board such as Ethernet are not able to be used.**

(*1) There are 2 types of RZ/G2M LSI ("RZ/G2M v3.0" and "RZ/G2M v1.3"). In case you use the hihope-rzg2m board which has one of them, the same image files can be used, but the same device tree files cannot be used. Please refer to the above table. If the board prints the messages below when turn on the power, RZ/G2M v3.0 is used on your board. In case of RZ/G2M v1.3, "R8A774A1" will be displayed.

```
CPU: Renesas Electronics R8A774A3
```

(*2) In case you use the RZ/G2E EK874 revision C board, please see the section 6.2 (1).

3.2   Building SDK

The HTML5 contents which are written with HTML/CSS/JavaScript can be displayed in the browser application without compiling with Software Development Kit (SDK), so it is possible to skip this section.

The SDK allows you to build custom applications outside of the Yocto environment, even on a completely different PC. If you need it, run the commands below after the steps (1) – (7) of section **3.1** are finished. 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 ~/rzg_vlp_v3.0.3/build
$ MACHINE=<board> bitbake core-image-weston -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-<board>-toolchain-3.1.21.sh
```

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

RZ/G2L Evaluation Board Kit PMIC version: smarc-rzg2l

RZ/G2LC Evaluation Board Kit: smarc-rzg2lc

4. Components

Please note that the packages in the Table 5 are installed. Please also refer to the "Component list" for details.

Table 6. Versions of commonly used components

Components	VLP/G v3.0.1 For HTML5 (Gecko)	VLP/G v3.0.3 For HTML5 (Gecko91)
Linux kernel	5.10.131-cip13	5.10.158-cip22
GCC	8.3.0 (Arm GCC 8.3-2019.03)	8.3.0 (Arm GCC 8.3-2019.03)
glibc	2.28	2.28
busybox	1.31.1	1.31.1
openssl	1.1.1n	1.1.1n
gstreamer1.0	1.16.3	1.16.3
wayland	1.18.0	1.18.0
weston	8.0.0	8.0.0
Python3	3.8.14	3.8.14
Gecko	91.0.0	**91.13.0**

5. Restrictions

(1) USB camera 3.0

RZ/G2E cannot stream with higher resolution than Full HD when you use a camera with USB 3.0.

(2) CSI40

Disable CSI40 in RZ/G2H, N and G2M v3.0 by default due to SW limitation.

(3) Wifi and Bluetooth

Low performance while using 2.4GHz Wifi/Bluetooth and USB 3.0 device in Hihope RZ/G2H, M, and N at the same time due to noise. If using USB3.0 device, should connect to 5GHz Wifi network.

(4) Video Play

Renesas has confirmed that some videos cannot be played by the browser application on the evaluation board. For example, the video of the "30 Filesize (MB) 1920x1080" in https://test-videos.co.uk/bigbuckbunny/mp4-h264 cannot be played.

6. Notes

There are 3 groups of notes in this section. They are listed below. Please refer to them according to your boards.

- Notes for RZ/G2L
- Notes for RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E
- Common Notes for all RZ Platforms

6.1   Notes for RZ/G2L

(1)   Early version of RZ/G2L Evaluation Board Kit

When you use the **early** version of the RZ/G2L LSI, please run the commands below to apply the patch files after step (1) in the section 3.1.

```
$ cd ~/rzg_vlp_v3.0.3/meta-renesas
$ patch -p1 < ../extra/0002-trusted-firmware-a-add-rd-wr-64-bit-reg-workaround.patch
$ patch -p1 < ../extra/0003-recipes-rzg2l-linux-renesas-add-WA-GIC-access-64bit\
.patch
```

Note)   If you want to know which version of the RZ/G2L LSI you use, please check the LSI on the board. When "2050KC002" is printed on the LSI, you use the early version.

6.2   Notes for RZ/G2H, RZ/G2M, RZ/G2N and RZ/G2E

(1)   Device tree for RZ/G2M, RZ/G2N and RZ/G2E

The dtb files listed in the Table 4 cannot be used for the early revision of Hoperun and Silicon Linux boards. If you are using revision 2 of Hoperun and revision C of Silicon Linux 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-hihope-rzg2m-**rev2**.dtb (main board only)
- Image-r8a774a1-hihope-rzg2m-**rev2**-ex.dtb (main + sub board)
- Image- r8a774a1-hihope-rzg2m-**rev2**-ex-idk-1110wr.dtb (main + sub board + LVDS-IF)
- Image-r8a774a1-hihope-rzg2m-**rev2**-ex-mipi-2.1.dtb (main + sub board + MIPI/CSI2 cameras)

HiHope RZ/G2N board:

- Image-r8a774b1-hihope-rzg2n-**rev2**.dtb (main board only)
- Image-r8a774b1-hihope-rzg2n-**rev2**-ex.dtb (main + sub board)
- Image- r8a774b1-hihope-rzg2n-**rev2**-ex-idk-1110wr.dtb (main + sub board + LVDS-IF)
- Image-r8a774b1-hihope-rzg2n-**rev2**-ex-mipi-2.1.dtb (main + sub board + MIPI/CSI2 cameras)

Silicon Linux RZ/G2E board (EK874):

- Image-r8a774c0-cat874-**revc**.dtb (main board only)
- Image-r8a774c0-ek874-**revc**.dtb (main + sub board)
- Image-r8a774c0-ek874-**revc**-idk-2121wr.dtb (main + sub board + LVDS-IF)
- Image-r8a774c0-ek874-**revc**-mipi-2.1.dtb (main + sub board + MIPI/CSI2 cameras)

Note)   Board revision is printed on boards. It is printed below the Hoperun logo on boards and directly printed on the Silicon Linux boards.

(2)   **Video output**

VLP/G is set video output to LVDS as default setting. In case to use HDMI as a video output, please apply the patch with these commands. This step is only for RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E.

```
$ cd ~/rzg_vlp_v3.0.3/meta-renesas
$ patch -p1 < ../extra/0001-Add-HDMI-support-for-RZ-G2.patch
```

After applying above patch, please note to below points.

Audio

  In case 48kHz audio, please set SW2404 to P1 side in HiHope Rev4 Boards of RZ/G2H, M, and N.

Bluetooth

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

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

  Instead, this step is required.

```
rfkill unblock bluetooth
```

SATA

  SATA interface on HiHope Rev4 Boards of RZ/G2H, N is enabled by setting switches as below. (SATA cannot be supported in the RZ/G2N Rev2 board due to HW limitation).

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

(3)   **Video playback**

Due to the specification of open source 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

(4)   **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.

(5) SDHI

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

(6) VIN

One camera input is enabled in default settings. Two camera inputs can be enabled in RZ/G2H, N and M v3.0. Please refer to the Video Capture Driver User's Manual that is included in the RZ/G2 Group BSP Manual Set for more details.

(7) 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>
  <imput 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.

6.3   Common Notes for all RZ Platforms

(1)   Test Status of the HTML5 (Gecko91) package

The HTML5 (Gecko91) package is tested. Two types of tests are conducted.
- web-platform-tests:
  This is to test all functions which the browser application have in detail.
- Performance tests:
  This is to test the performance of the browser application with the test benches in
  https://github.com/webdino/gecko-embedded/wiki/QA.

web-platform-tests is run on the RZ/G2L evaluation board.

(2)   Launch the browser application on the evaluation board

After the build is successfully completed, please connect an USB hub, a mouse, and a keyboard to your evaluation board. Then please refer to the below documents to boot your boards:

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

- Reference Boards of RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E Start-up Guide

After booting your board, please run the below steps according to the device. "https://~~~" means a website URL, so please enter the URL of the site you want to open. "/home/root/xxx.html" means a html content in the root file system, so please enter the path of the file you want to open.

For RZ/G2L, LC

Please add the below lines in "/etc/environment" to set the variables.

```
MOZ_ENABLE_WAYLAND=1

MOZ_OMX_RZG2L=1

MOZ_WEBRENDER=1

MOZ_DISABLE_CONTENT_SANDBOX=1

MOZ_WAYLAND_GL_LIBRARY=libGLESv2.so

MOZ_GLXTEST_RESULT=VENDOR\nProprietary\nRENDERER\nHardware\nVERSION\nN/A\nTFP\nTRUE
\nSCREEN_INFO\n1920x1080:1;\nTEST_TYPE\nEGL
```

Please make sure each variable is added correctly, especially MOZ_GLXTEST_RESULT. After that, please reboot and login again. The variables are set, and it is not necessary to set any more. The variables can be checked with the "env" command.

```
$ reboot
```

Then please run the below command on the Weston terminal instead of Tera Term.

```
$ firefox https://~~~
$ firefox /home/root/xxx.html
```

For RZ/G2H, RZ/G2M, RZ/G2N, RZ/G2E

Please add the below lines in "/etc/environment" to set the variables.

```
MOZ_ENABLE_WAYLAND=1
MOZ_WEBRENDER=1
MOZ_DISABLE_CONTENT_SANDBOX=1
MOZ_WAYLAND_GL_LIBRARY=libGLESv2.so
MOZ_GLXTEST_RESULT=VENDOR\nProprietary\nRENDERER\nHardware\nVERSION\nN/A\nTFP\nTRUE
\nSCREEN_INFO\n1920x1080:1;\nTEST_TYPE\nEGL
```

In case you use RZ/G2E, please set MOZ_GLXTEST_RESULT as below:

```
MOZ_GLXTEST_RESULT=VENDOR\nProprietary\nRENDERER\nHardware\nVERSION\nN/A\nTFP\nTRUE
\nSCREEN_INFO\n1280x720:1;\nTEST_TYPE\nEGL
```

Please make sure each variable is added correctly, especially MOZ_GLXTEST_RESULT. After that, please reboot and login again. The variables are set, and it is not necessary to set any more. The variables can be checked with the "env" command.

```
$ reboot
```

Then please run the below command on the Weston terminal instead of Tera Term.

```
$ firefox https://~~~
$ firefox /home/root/xxx.html
```

Note)   The browser application "Firefox" can be used on the evaluation boards of RZ/G2L, RZ/G2H as "reference". Please note that it cannot be used on your own products to be launched in the market.

(3)   Sample browser application "Web Viewer"

Web Viewer is a sample browser application and is developed on OSS. (https://github.com/webdino/amethyst) You can customize it as you want and can use on your own products to be launched in the market according to the OSS license. When you want to evaluate it, please edit "~/rzg_vlp_v3.0.x/build/conf/local.conf" after the step (5) in the section 3.1:

From:

```
PACKAGECONFIG_append_pn-firefox = " openmax "
PACKAGECONFIG_append_pn-firefox = " webgl "
PACKAGECONFIG_append_pn-firefox = " gpu "
```

To:

```
IMAGE_INSTALL_append = " webviewer "
PACKAGECONFIG_append_pn-webviewer = " openmax "
PACKAGECONFIG_append_pn-webviewer = " webgl "
PACKAGECONFIG_append_pn-webviewer = " gpu "
```

After that, please build VLP with the step (7) in the section 3.1

After the build is successfully completed, please connect an USB hub, a mouse, and a keyboard to your evaluation board. Then please refer to the below documents to boot your boards:

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

- Reference Boards of RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E Start-up Guide

After booting your board, please run the steps in the section 6.3 (2) and run the "webviewer" command instead of the "firefox" command on the Weston terminal instead of Tera Term. "https://~~~" means a website URL, so please enter the URL of the site you want to open. "/home/root/xxx.html" means a html content in the root file system, so please enter the path of the file you want to open.

```
$ webviewer https://~~~
$ webviewer /home/root/xxx.html
```

(4)   Settings of Browser Application

There are a lot of settings in the browser application. Please refer to the below settings as references. When you change some settings, please run the command below. After that, the setting list is displayed, so please change the settings. Please refer to the section 6.3 (2) prior to this step.

```
$ firefox about:config
```

Settings:

- Setting to improve the performance of pinch zoom (*)

```
webrender.low-quality-pinch-zoom = true
```

- Display "FPS" on the browser application

```
gfx.webrender.debug.profiler = true
gfx.webrender.debug.profiler-ui = "FPS"
```

(*) This feature is currently under development by Mozilla, so please test it carefully.

(5)   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+"
```

(6)   Disable libraries of Graphics and Video Codec

When you want to disable the functions of the libraries of the graphics and the video codec, please add the following 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-v1.3_EN.zip and RTK0EF0045Z13001ZJ-v1.3_JP.zip
(*2) This library is included in RTK0EF0045Z15001ZJ-v1.0_EN.zip and RTK0EF0045Z15001ZJ-v1.0_JP.zip

(7) **USB Video Class**

USB Video Class (UVC) driver is not installed with the default settings of VLP/G due to its large 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 "
```

7. Revision History

		Description	
Rev.	**Date**	**Page**	**Summary**
1.00	Jun. 30, 2022	-	First edition for VLP/G v3.0.0.
1.01	Sep. 30, 2022	11	Newly support the boards of RZ/G2H and RZ/G2E.
1.02	Nov. 30, 2022	-	Update the notes
1.03	Jul. 31, 2023	-	Newly support the Gecko91.13.0.

Website and Support

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

Inquiries
   http://www.renesas.com/contact/

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