RZ/G Verified Linux Package for 64bit kernel
Version 1.0.3-RT

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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”).

This document also describes the environment to build VLP64 without using “RZ/G Development Platform”. If you need information about the platform, please refer to “RZ/G Linux Platform Tools User’s Manual for the RZ/G Series”.

Contents

1. Release Items

- **Name and version**
  RZ/G Verified Linux Package for 64bit kernel
  Version 1.0.3-RT

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

  RZ/G Marketplace:

  America: https://mp.renesas.com/en-us/rzg/
  Europe: https://mp.renesas.com/en-eu/rzg/
  Asia: https://mp.renesas.com/en-sg/rzg/
  Japan: https://mp.renesas.com/ja-jp/rzg/

- **Target board**
  Hoperun Technology HiHope RZ/G2M platform (hihope-rzg2m) Rev. 1 and 2
  Hoperun Technology HiHope RZ/G2N platform (hihope-rzg2n) Rev. 1 and 2
  Silicon Linux RZ/G2E evaluation kit (ek874) Rev. 1 − 3

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

  GUI Framework
  - Qt (LGPL version)
  - Gecko

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

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

File	Explanation
rzg2_bsp_eva_v103rt.tar.gz (Evaluation version) rzg2_bsp_pro_v103rt.tar.gz (Product version)	Yocto recipe packages (including multimedia package)
rzg2_bsp_gecko_v103rt.tar.gz	Yocto recipe packages for HTML5
oss_pkg.7z.001 (500MB) oss_pkg.7z.002 (500MB) oss_pkg.7z.003 (500MB) oss_pkg.7z.004 (500MB) oss_pkg.7z.005 (500MB) oss_pkg.7z.006 (500MB) oss_pkg.7z.007 (500MB) oss_pkg.7z.008 (500MB) oss_pkg.7z.009 (500MB) oss_pkg.7z.010 (500MB) oss_pkg.7z.011 (500MB) oss_pkg.7z.012 (500MB) oss_pkg.7z.013 (500MB) oss_pkg.7z.014 (500MB) oss_pkg.7z.015 (54MB)	Open source packages (divided files) This contains all source codes of OSSs except for Linux kernel. These are the same versions of OSSs used when VLP was verified.
oss_pkg_gecko.7z.001 (500MB) oss_pkg_gecko.7z.002 (314MB)	Open source packages for HTML5 (divided files) This contains all source codes of OSSs except for Linux kernel. These are the same versions of OSSs used when VLP was verified.
r01tu0277ej0103-rz-g.pdf	This document
r01tu0278ej0103-rz-g.pdf	Component list
r01tu0279ej0103-rz-g.pdf	Documents describing booting method and the required settings of bootloader

Note) Open source packages are used in “offline” environment. Please refer to the section **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.

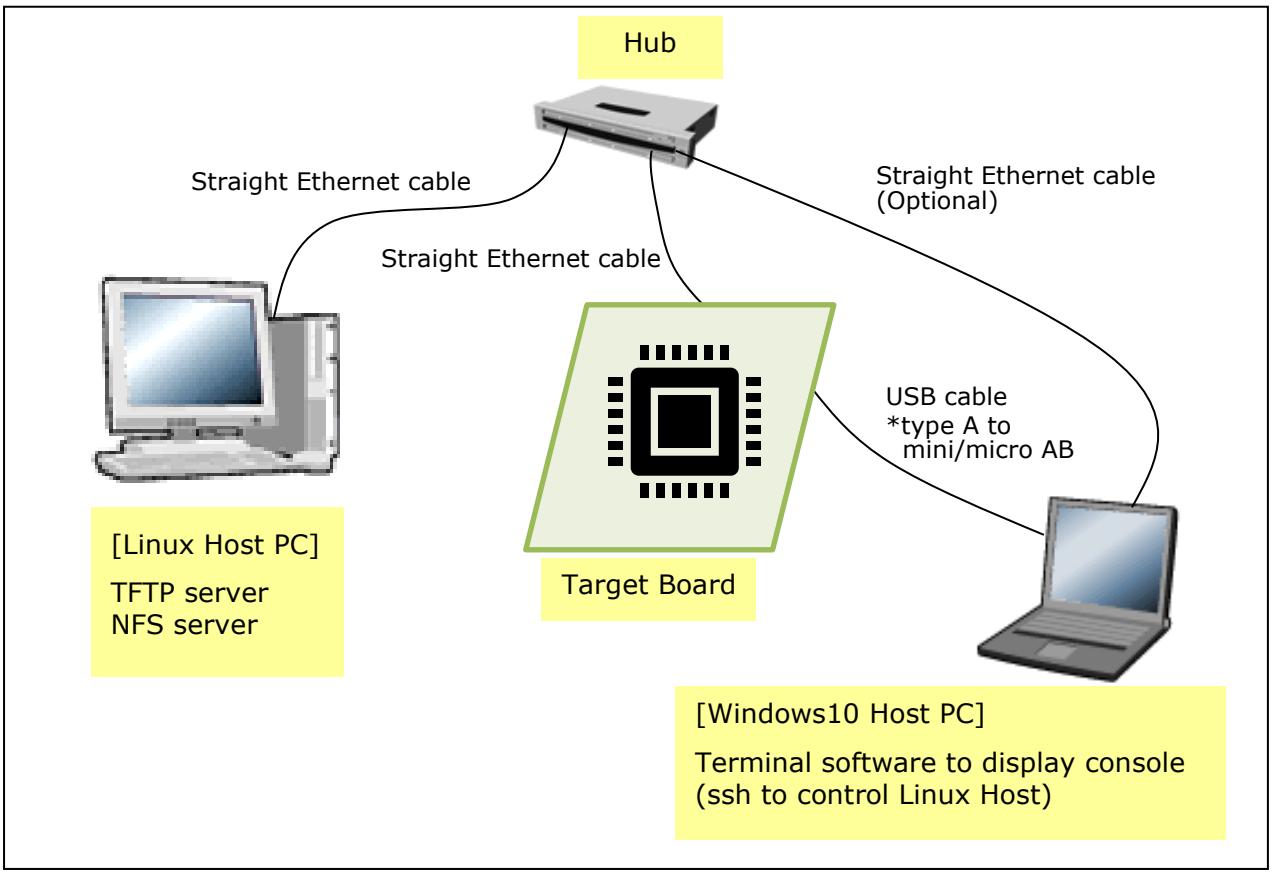

Figure 1. Recommended Environment

Most bootable images VLP supports can be built on an "offline" environment.
The word "offline" means an isolated environment which does not connect to any network. Since VLP includes all necessary source codes of OSSs except for the Linux kernel, VLP can always build images in this "offline" environment without affected from changes of repositories of OSSs. 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 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 Max 100GB free space on HDD is necessary
	OS	Ubuntu 16.04 LTS is recommended 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 is recommended
	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

3. Building Instructions

3.1 Building images to run on the board

VLP supports two GUI frameworks: Qt and HTML5 (Gecko). But these cannot be used at the same time. Please run the commands depending on the GUI framework which will be used.

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 libsdl1.2-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

Additionally, in case to use Gecko, run the command below to install packages used for building Gecko.

```
$ sudo apt-get install autoconf2.13
$ sudo apt install clang llvm clang-3.9 llvm-3.9
```

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"
```

(1) Set the shell variable

```
$ export WORK=/home/user/user_work
$ export PKGS_DIR=$WORK/proprietary
```

(2) Create the working directory (user_work), and decompress Yocto recipe package

```
$ mkdir -p $WORK
$ cd $WORK
$ tar xvzf ./rzg2_bsp_type_v103rt.tar.gz
```

Please replace "*type*" by "*pro*" or "*eva*". Copy the compressed Yocto recipe package files (rzg2_bsp_*pro*_v103rt.tar.gz for product version, rzg2_bsp_*eva*_v103rt.tar.gz for evaluation version) into the current directory prior to this step.

Additionally, in case to use Gecko, run the command below to decompress Yocto recipe package for building Gecko.

```
$ cd $WORK
$ tar xvzf ./rzg2_bsp_gecko_v103rt.tar.gz
```

Note) VLP64 is set video output to LVDS as default setting. In case using HDMI, please refer to **6. Note**.

(3) Execute the copy script for proprietary software

```
$ cd $WORK/meta-rzg2
$ sh docs/sample/copyscript/copy_proprietary_softwares.sh $PKGS_DIR
```

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

(4) Setup the build environment

```
$ cd $WORK
$ source poky/oe-init-build-env
```

Environment to build are set by the source command.

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

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

Please replace "*directory*" to the path to the directory which stores the patch file, and "*board*" by the name below:

HiHope RZ/G2M board: hihope-rzg2m

HiHope RZ/G2N board: hihope-rzg2n

EK874 RZ/G2E board: ek874

Additionally, in case to use Gecko, run the command below to prepare the default configuration files for building Gecko.

```
$ cd $WORK/build
$ cp ./conf/local_gecko.conf ./conf/local.conf
$ cp ./conf/bblayers_gecko.conf ./conf/bblayers.conf
```

(6) Decompress OSS files to "build" directory

```
$ cd $WORK/build
$ 7z x ./oss_pkg.7z.001   (*1)
```

Additionally, in case to use Gecko, run the command below to decompress OSS files for building Gecko.

```
$ cd $WORK/build
$ 7z x ./oss_pkg_gecko.7z.001   (*2)
```

Copy the compressed Yocto recipe package files (oss_pkg.7z.001 - oss_pkg.7z.015, oss_pkg_gecko.7z.001 - oss_pkg_gecko.7z.002) into the "build" directory prior to these steps. All OSS packages will be decompressed at the step marked "*1" and "*2". 7ziped files are not able to decompress individually. All oss_pkg.7z files must be placed at the same directory before running 7z command.

Note) This step is not mandatory in case the "offline" environment is not used.
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 OSSs via the internet when running bitbake command. Please note that there is a possibility to fail a build because of implicit changes of the repository of OSSs.

(7) Download Linux kernel source code

```
$ cd $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 `${WORK}/build/conf/local.conf` as below:

```
BB_NO_NETWORK = "1"
```

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

(8) Start the 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) In case to use Gecko, please build an image of core-image-weston.

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 al
l 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
RZ/G2M	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
RZ/G2N	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
RZ/G2E	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 (8).

Please note that typical HiHope RZ/G2M and RZ/G2N users who use the combination of main and sub boards need to use "Image-r8a774a1-hihope-rzg2m-**ex**.dtb" and "Image-r8a774b1-hihope-rzg2n-**ex**.dtb" respectively 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 (ES1.0) of RZ/G2E**. See the section **6. Note** for details.

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.

For building general applications:

```
$ cd $WORK/build
$ bitbake core-image-weston-sdk -c populate_sdk
```

For building Qt applications:

```
$ cd $WORK/build
$ bitbake core-image-qt-sdk -c populate_sdk
```

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-RT for 32bit kernel and non-RT version of VLP64, VLP64-RT uses different version of Linux kernel and compiler, but many commonly used components are the same versions. Please also refer to the “Component list” for details.

Table 5. Versions of commonly used components

Components	VLP for 32bit kernel v2.1.4-RT	VLP for 64bit kernel v1.0.2	VLP for 64bit kernel v1.0.3-RT
Linux kernel	4.4.190-cip36-rt25	4.19.56-cip5	4.19.72-cip10-rt4
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	2.28-5 (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	60
Docker	−	17.06	17.06

5. Restrictions

5.1 All MPUs

(1) Gecko

In this version, HTML5 (Gecko) is not verified.

(2) MSIOF

Slave mode is not supported in this release.

(3) SDHI

HS400 mode of eMMC is not supported in this release.

(4) Others

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

- MSIOF
- Bluetooth
- Wifi
- IPMMU

5.2 RZ/G2M

(1) I2C

Channel 0, 3 and 5 is not supported in this release (these channels are not used in HiHope G2M board).

(2) ECC

ECC is not supported in this release.

5.3 RZ/G2N

(1) ECC

64bit data/8bit ECC setting is not fully supported in this release. Please contact Renesas for further information.

(2) I2C

Channel 0, 3 and 5 is not supported in this release (these channels are not used in HiHope G2N board).

(3) SATA

SATA is not tested in this release.

5.4 RZ/G2E

(1) ECC

64bit data/8bit ECC setting is not fully supported in this release. Please contact Renesas for further information.

6. Note

(1) Bootloader/Linux kernel

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 $WORK/meta-rzg2
$ patch -p1 < ../extra/0001-BSP-1.0.3-RT-add-support-HDMI.patch
```

Also, this version of software is prepared to run on the boards listed on the first section of this document.

In case to run on the boards below, please apply the patches according to below commands before building BSP. When using HDMI, do not apply the patch above. Instead, follow the below steps.

- Hoperun Technology HiHope RZ/G2M Rev. 3 and 4
- Hoperun Technology HiHope RZ/G2N Rev. 3 and 4

Note) "V3" and "V4" are printed just below the Hoperun logo on Rev. 3 and Rev. 4 boards respectively.

When enabling LVDS or no graphics support required:

```
$ cd $WORK/meta-rzg2
$ patch -p1 < ../extra/0001-BSP-1.0.3-RT-HiHope-Rev3-board-support.patch
```

When enabling HDMI:

```
$ cd $WORK/meta-rzg2
$ patch -p1 < ../extra/0001-BSP-1.0.3-RT-HiHope-Rev3-board-support.patch
$ patch -p1 < ../extra/0001-BSP-1.0.3-RT-HiHope-Rev3-board-add-suport-HDMI.patch
```

After applying above patch, please note to below points.

For writing bootloaders onto the boards, please use the latest Flash Writer. Please also refer to the RZ/G2 Reference Boards Start-up Guide.

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

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 interface on HiHope RZ/G2N board is enabled by using the device tree file and set switches as below.

- Device tree file: `Image-r8a774b1-hihope-rzg2n-ex-sata.dts`
- SW1001-7 on main board: OFF
- SW43 on sub board: ON

(2) 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.

(3) 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

(4) ECC

If the ECC function for DRAM is necessary, please 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

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

(6) VIN

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

(7) 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'
```

(8) Docker

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

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

(9) 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.

(10) 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-uvcvideo "
```

Website and Support

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

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