RZ/G Verified Linux Package for 64bit kernel
Version 1.0.1

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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 1.0.1

- **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)
  Silicon Linux RZ/G2E evaluation kit (ek874)

- **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_v101.tar.gz (Evaluation version, 52MB) rzg2_bsp_pro_v101.tar.gz (Product version, 52MB)	Yocto recipe packages (including multimedia package)
oss_pkg.7z.001 (500MB) oss_pkg.7z.008 (500MB) oss_pkg.7z.002 (500MB) oss_pkg.7z.009 (500MB) oss_pkg.7z.003 (500MB) oss_pkg.7z.010 (500MB) oss_pkg.7z.004 (500MB) oss_pkg.7z.011 (500MB) oss_pkg.7z.005 (500MB) oss_pkg.7z.012 (500MB) oss_pkg.7z.006 (500MB) oss_pkg.7z.013 (497MB) oss_pkg.7z.007 (500MB)	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.
0001-BSP-1.0.1-add-support-HDMI.patch	Patch file to enable HDMI output
r01tu0277ej0101-rz-g.pdf	This document
r01tu0278ej0101-rz-g.pdf	Component list
r01tu0279ej0101-rz-g.pdf	Documents describing booting method and the required settings of bootloader

Optional files for updating from VLP64 1.0.0

File	Explanation
r01tu0271ej0101-rz-g.pdf	This document
v100-to-v101.patch.tar.gz	Diff files of Yocto recipes compared with VLP64 1.0.0
v100-to-v101.oss_packages.7z	Diff files of OSS packages compared with VLP64 1.0.0

Note) Open source packages are not mandatory to download from the Marketplace in case connecting Linux Host PC to the internet when building.

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.

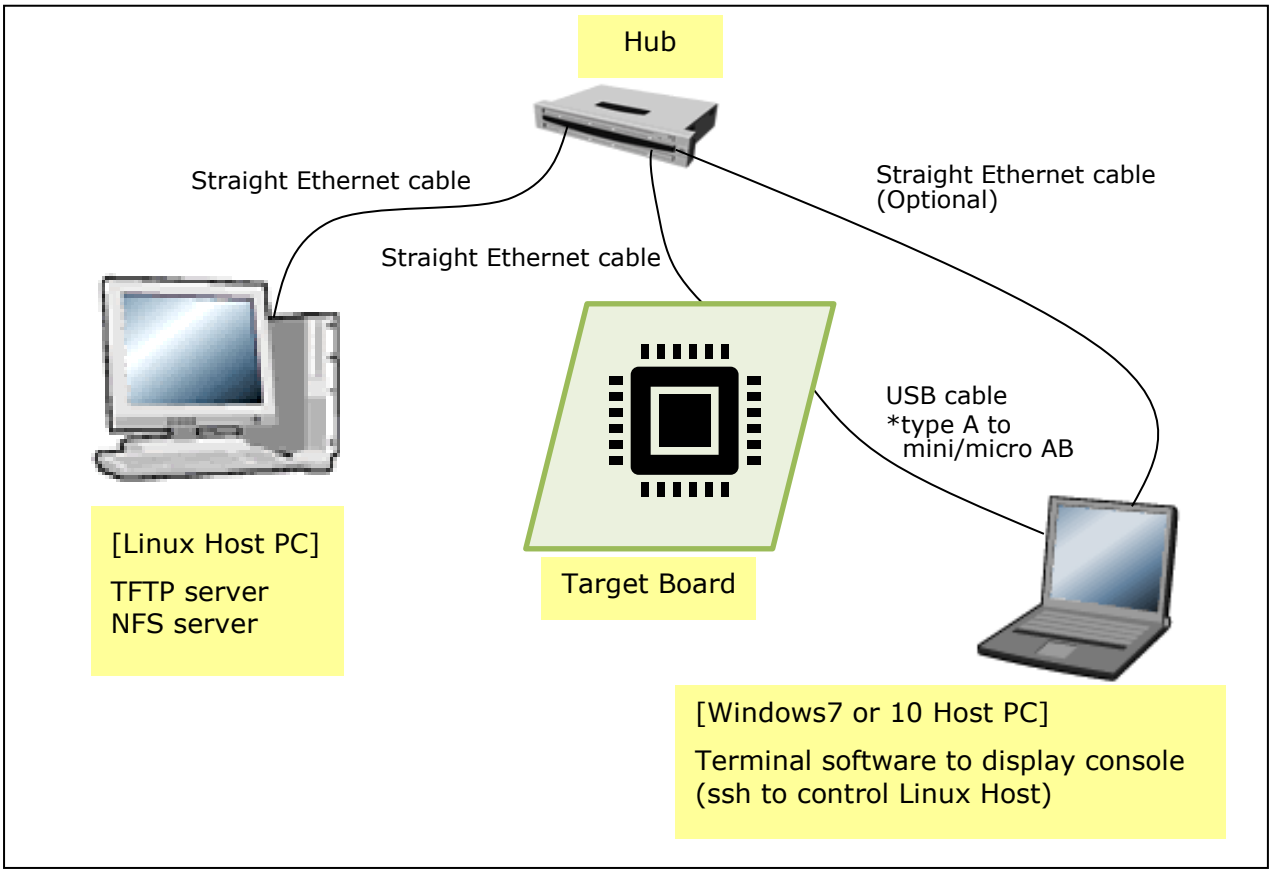

Figure 1. Recommended Environment

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 7 or 10 are 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_v101.tar.gz
```

Please replace "*type*" by "*pro*" or "*eva*". Copy the compressed Yocto recipe package files (rzg2_bsp_*pro*_v101.tar.gz for product version, rzg2_bsp_*eva*_v101.tar.gz for evaluation version) into the current directory prior to this step.

Note) 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 < directory/0001-BSP-1.0.1-add-support-HDMI.patch
```

Please replace "*directory*" to the path to the directory which stores the patch file.

(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

EK874 RZ/G2E board: ek874

(6) Decompress OSS files to "build" directory

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

Copy the compressed Yocto recipe package files (oss_pkg.7z.001 - oss_pkg.7z.013) into the "build" directory prior to this step. All OSS packages will be decompressed at the step marked "*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 setting BB_NO_NETWORK = "0" in next step and connecting Linux Host to the internet when running bitbake command.

(7) Download Linux kernel source code

```
$ cd $WORK/build
$ bitbake linux-renesas -c fetch
```

Once this step is finished, the Linux Host PC can be disconnected from the network. 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) 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.

Steps (9) - (11) are required to be run in case HTML5 GUI framework (Gecko) is selected. Please do not run these steps in case Qt GUI framework is selected.

(9) Download recipe files

```
$ cd $WORK
$ git clone -b firefox-60esr https://github.com/webdino/meta-browser.git
$ git clone https://github.com/webdino/meta-rust.git
$ cd meta-rust
$ git checkout -b tmp 4110f1d92af4dbcb73ed5ad6f18b25bd097451ae
```

Connect the Linux Host PC to the network to download the required files to build Gecko.

(10) Modify recipe files

Enable the meta-browser and the meta-rust by adding the line in the ${WORK}/build/conf/bblayers.conf as below:

```
BBLAYERS += " ${TOPDIR}/../meta-browser "
BBLAYERS += " ${TOPDIR}/../meta-rust "
```

Enable the browser application by adding the line in the ${WORK}/build/conf/local.conf as below:

```
HOSTTOOLS += "autoconf2.13 llvm-config-3.9"
IMAGE_INSTALL_append = " firefox "
IMAGE_INSTALL_append = " ttf-sazanami-gothic ttf-sazanami-mincho "

PACKAGECONFIG_append_pn-firefox = " egl "
PACKAGECONFIG_append_pn-firefox = " openmax "
PACKAGECONFIG_append_pn-firefox = " webgl "
PACKAGECONFIG_append_pn-firefox = " canvas-gpu "
PACKAGECONFIG_append_pn-firefox = " stylo "

IMAGE_INSTALL_append = " pulseaudio-server "
```

Note) If additional functions (egl, openmax, webgl, canvas-gpu) are not required, these lines are not required to be added.

Enable the browser application by changing the line in the ${WORK}/build/conf/local.conf as below:

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

```
BB_NO_NETWORK = "0"
```

To available “openssl_debian”.

```
BBMASK .= "|openssl_debian"
```

(11) Start the build

```
$ cd $WORK/build
$ bitbake core-image-weston
```

Note) In case building Gecko, always “core-image-weston” is used as an image name.
In this release, please connect the Linux Host PC to the network to build Gecko.

All necessary files listed in **Table 4** will be generated by 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/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) or (11).

Please note that typical HiHope RZ/G2M users who use the combination of main and sub boards need to use "Image-r8a774a1-hihope-rzg2m-**ex**.dtb" as a device tree file.
For the booting method and the required settings, please refer to the "RZ/G2 Reference Boards Linux Start-up Guide".

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.

Note) Commands to build SDK have been slightly changed from VLP64 1.0.0.

4. Components

Compared to the VLP for 32bit kernel, VLP64 uses different version of Linux kernel and compiler, but many commonly used components are the same versions. VLP64 v1.0.0 and v1.0.1 are based on same version of Linux kernel and the other components. Please also refer to the “Component list” for details.

Table 5. Versions of commonly used components

Components	VLP for 32bit kernel 2.1.1	VLP for 64bit kernel 1.0.1
Linux kernel	4.4.166-cip29	4.19.13-cip1
GCC	7.2.1 (Linaro GCC 7.2-2017.11)	7.3.1 (Linaro GCC 7.3-2018.05)
glibc	2.19 (CIP)	2.19 (CIP)
binutils	2.25 (CIP)	2.25 (CIP)
busybox	1.22.0 (CIP)	1.22.0 (CIP)
openssl	1.0.1t (CIP)	1.0.1t (CIP)
gstreamer1.0	1.12.2	1.12.2
wayland	1.13.0	1.13.0
weston	2.0.0	2.0.0
python2	2.7.13	2.7.13
python3	3.5.3	3.5.3
Qt (LGPL version)	5.6.3	5.6.3
Gecko	60	60

Note) CIP version of components is going to be maintained by CIP project for over ten years.

5. Restrictions

5.1 All MPUs

(1) Qt

Playing HD and higher resolution video is not smooth, has flicker phenomenon.

(2) VIN/CSI2

VIN/CSI2 is not supported in this release.

(3) Video playback

Videos using below formats cannot run in this release.

- H.265, 80×80 resolution

(4) Others

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

- MSIOF
- Bluetooth
- IPMMU

5.2 RZ/G2M

(1) Gecko

Gecko is not available in this release.

(2) USB

USB3.0 storage failed to run on USB2.0 OTG port.

(3) Qt

Qt failed to play 4K video on 4K screen.

(4) I2C

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

(5) MSIOF

Slave mode is not supported in this release.

(6) Wifi

Wifi is not supported in this release.

(7) ECC

ECC is not supported in this release.

5.3 RZ/G2E

(1) Gecko

Gecko cannot build offline. Please connect the Linux Host PC to the network when you build.

(2) Weston

Weston infrequently fails to start when using HDMI display, and need to restart by this command.

```
# systemctl restart weston
```

(3) ECC

64bit data/8bit ECC setting is not supported in this release.

6. Note

(1) GStreamer

OSS module “gstreamer1.0-plugins-good”, “gstreamer1.0-plugins-bad” and “gstreamer1.0-omx” cannot build offline using the default settings of them. If you want to build whole BSP without connecting network, please follow the steps below.

1. Prepare build environment according to the section 3 (1) to (7)

2. Unpack the module

```
$ cd $WORK/build
$ bitbake -c unpack gstreamer1.0-plugins-good
$ bitbake -c unpack gstreamer1.0-plugins-bad
$ bitbake -c unpack gstreamer1.0-omx
```

3. Move to the directory which contains the file to be modified

```
$ cd tmp/work/aarch64-poky-linux/gstreamer1.0-plugins-good/1.12.2-r0/git
```

4. Modify the address for acquiring a submodule

```
$ vi .gitmodules
```

Before:

```
[submodule "common"]
        path = common
        url = https://anongit.freedesktop.org/git/gstreamer/common.git
```

After:

```
[submodule "common"]
        path = common
        url = file:///home/user/user_work/build/oss_packages/git.anongit.freedeskto
p.org.git.gstreamer/common/
```

Note) Please set your working directory using absolute path.
All necessary files are included in the OSS package file of VLP.

5. Apply the change

```
$ git submodule init
$ git submodule update
```

6. Move to another directory which contains the file to be modified

```
$ cd $WORK/build/tmp/work/aarch64-poky-linux/gstreamer1.0-omx/1.12.2-r0/git
```

7. Modify the address and apply the change as same as step 4 and 5.

8. Build BSP according to the section 3 (8)

(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 un-comment (deleting "#") the line below in the `local.conf`.

```
#MACHINE_FEATURES_append = " ecc"
```

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 inserting SD card. Please plugged in a card before turning on the power.

(6) Ether

Linking up 1Gbps mode fails between early revision EK874 boards and some devices. In that case, please apply below changes to the Linux kernel to restrict ethernet speed to max 100Mbps.

```
diff --git a/drivers/net/ethernet/renesas/ravb_main.c b/drivers/net/ethernet/renesas
/ravb_main.c
index d6f7539..bee095e 100644
--- a/drivers/net/ethernet/renesas/ravb_main.c
+++ b/drivers/net/ethernet/renesas/ravb_main.c
@@ -1026,6 +1026,11 @@ static const struct soc_device_attribute r8a7795es10[] = {
     { /* sentinel */ }
 };

+static const struct soc_device_attribute ravb_quirks_match[] = {
+    { .soc_id = "r8a774c0", .revision = "ES1.*" },
+    { /* sentinel */ }
+};
+
 /* PHY init function */
 static int ravb_phy_init(struct net_device *ndev)
 {
```

```
@@ -1064,7 +1069,8 @@ static int ravb_phy_init(struct net_device *ndev)
     /* This driver only support 10/100Mbit speeds on R-Car H3 ES1.0
      * at this time.
      */
-    if (soc_device_match(r8a7795es10)) {
+    if (soc_device_match(r8a7795es10) ||
+        soc_device_match(ravb_quirks_match)) {
         err = phy_set_max_speed(phydev, SPEED_100);
         if (err) {
             netdev_err(ndev, "failed to limit PHY to 100Mbit/s\n");
@@ -1956,6 +1962,9 @@ static void ravb_set_delay_mode(struct net_device *ndev)
     struct ravb_private *priv = netdev_priv(ndev);
     int set = 0;

+    if (soc_device_match(ravb_quirks_match))
+        return;
+
     if (priv->phy_interface == PHY_INTERFACE_MODE_RGMII_ID ||
         priv->phy_interface == PHY_INTERFACE_MODE_RGMII_RXID)
         set |= APSR_DM_RDM;
```

Website and Support

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

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