RZ/G Verified Linux Package
Version 3.0.6
Release Note

R01US0553EJ0112
Rev. 1.12
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Introduction

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

Please also refer to the following documents that describe the instruction to build VLP/G and boot the evaluation boards.

- r01us0645ej0102-rz-g(Linux Start-up Guide RZG3S).pdf
- r01us0555ej0103-rz-g(Linux Start-up Guide RZG2H,M,N,E).pdf
- r01us0616ej0102-rz-g(Linux Start-up Guide RZG2L,LC,UL).pdf
- r01us0618ej0103-rz-g(Linux Start-up Guide RZG1H,M,N,E,C).pdf

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1. Release Items

- **Name and version**
  RZ/G Verified Linux Package
  Version 3.0.6 (hereinafter referred to as "VLP/G v3.0.6")

- **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 v3.0.6 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 v3.0.6 which are listed in Table 1 from the site below.

  RZ/G Verified Linux Package [5.10-CIP]:
  https://www.renesas.com/us/en/products/microcontrollers-microprocessors/rz-mpus/rzg-linux-platform/rzg-marketplace/verified-linux-package/rzg-verified-linux-package

- **Target board**

RZ/G3S reference board

RZ/G3S Evaluation board Kit (P/N: RTK9845S33S01000BE) (smarc-rzg3s)
- RZ/G3S SMARC Module Board (P/N: RTK9845S33C01000BE)
- RZ SMARC Series Carrier Board (P/N: RTKSMCBB2B01000BE)

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):
- RZ/G2L SMARC Module Board v2.1
- RZ SMARC Series Carrier Board v4.0

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

RZ/G2UL Evaluation Board Kit (*4):
- RZ/G2UL SMARC Module Board v1.0
- RZ SMARC Series Carrier Board v4.0

iWave RZ/G1H-PF Qseven Development Platform R2.1, R4.0
iWave RZ/G1M-PF Qseven Development Platform R2.0, R5.0
iWave RZ/G1N-PF Qseven Development Platform R3.4
iWave RZ/G1E-PF SODIMM Development Platform R3.1, R4.0

(*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.

(*4) "RZ/G2UL Evaluation board Kit" includes the RZ/G2UL SMARC Module Board and the RZ SMARC Series Carrier Board.

- **Build Environment**

  Linux Host PC

  OS: Ubuntu 20.0.4 LTS (64 bit OS must be used.)

  20.04 inside a docker container also OK.

  200GB free space on HDD or SSD is necessary. (*)

  (*) The necessary free space

  Note) Please note that the build of VLP is failed when Ubuntu 22.04 is used.

- **Verified functions**

  Linux VLP
  - Linux Kernel
  - Linux Drivers
  - Graphics Libraries
  - Codec Libraries

  GUI Framework
  - Qt (LGPL version)

- **File contents**

  VLP/G is delivered by the files listed in the Table 1.

Table 1. RZ/G Verified Linux Package

Basic files of VLP/G v3.0.6

File	Description
RTK0EF0045Z0021AZJ-v3.0.6.zip (*1)	Verified Linux Package. This file includes the **Yocto recipe packages** and the necessary documents.
rzg_vlp_v3.0.6.tar.gz	**Yocto recipe packages**
r01us0553ej0112-rz-g(Release Note).pdf	This document
r01us0645ej0102-rz-g3s(Linux Start-up Guide RZG3S).pdf	Documents describing building instruction, booting method and the required settings of bootloader for **RZ/G3S**.
r01us0555ej0103-rz-g(Linux Start-up 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**.
r01us0616ej0102-rz-g(Linux Start-up Guide RZG2L,LC,UL).pdf	Documents describing booting method and the required settings of bootloader for **RZ/G2L, RZ/G2LC, and RZ/G2UL**.
r01us0648ej0103-rz-g(Linux Start-up Guide RZG1H,M,N,E).pdf	Documents describing booting method and the required settings of bootloader for **RZ/G1H, RZ/G1M, RZ/G1N, and RZ/G1/E**.
oss_pkg_rzg_v3.0.6.7z (*1)	Open source software packages See the Note below before you download.

(*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) The open source software (OSS) packages contain all the relevant source code files. These are the same versions of OSS that was used when VLP/G was verified. Downloading a using this large OSS package file

(oss_pkg_rzg_xxx.7z) is not mandatory if your build PC is connected to the Internet and can directly download the individual source code packages listed in the Yocto recipes. However, if your build PC is not connected to the Internet, this OSS package file contains all the source packages required by the Yocto build.

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 the documents of “Linux_StartUp_Guide”.

Optional packages (*1)

	File (“XX” is replaced by “EN” or “JP”.)	**Description**
RZ MPU Graphics Library	RTK0EF0045Z13001ZJ-v1.2.2_XX.zip (Evaluation version) RTK0EF0045Z14001ZJ-v1.2.2_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-v1.2.1_XX.zip (Evaluation version) RTK0EF0045Z16001ZJ-v1.2.1_rzg_XX.zip (Unrestricted version)	RZ MPU Video Codec Library for **RZ/G2L**.
Multimedia Packages for RZ/G2	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.
Multimedia Packages for RZ/G1	- (Preparing for release.)	Multimedia Packages for **RZ/G1H,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 check the optional packages in the renesas web below.

RZ/G Verified Linux Package [5.10-CIP]:
https://www.renesas.com/us/en/products/microcontrollers-microprocessors/rz-mpus/rzg-linux-platform/rzg-marketplace/verified-linux-package/rzg-verified-linux-package

Additional packages

File	**Description**
RTK0EF0045Z9006AZJ-v3.0.6.zip	BSP Manual Set for RZ/G2L, RZ/G2LC, RZ/G2UL, RZ/G3S, RZ/Five, and RZ/V2L.
RTK0EF0045Z9002AZJ-v3.0.1.zip	BSP Manual Set for RZ/G2H, RZ/G2M, RZ/G2N, and RZ/G2E.
RTK0EF0045Z9000AZJ-v3.0.0.zip	BSP Manual Set for RZ/G1H, RZ/G1M, RZ/G1N, and RZ/G1E.

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".

Download Site:

RZ/G Verified Linux Package [5.10-CIP]:

https://www.renesas.com/us/en/products/microcontrollers-microprocessors/rz-mpus/rzg-linux-platform/rzg-marketplace/verified-linux-package/rzg-verified-linux-package

2. Components

The components which are commonly used in this release are listed in the Table 2. Please also refer to the manifest file for details. The manifest file is created to following path after building the images:

```
$WORK/build/tmp/deploy/images/<board>/core-image-<image-name>-<board>.manifest
```

Note: <board> is refer to Linux Start-up Guide of each device.
<image-name> is minimal, bsp, Weston or qt.

Please refer build instructions in Linux Start-up Guide of each device.

Table 2. Versions of commonly used components

Components	VLP/G v3.0.5-update3 For RZ/G Series	VLP/G v3.0.6 For RZ/G Series
Linux kernel	5.10.184-cip36	5.10.201-cip41
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	1.30.1	1.30.1
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	3.8.18
qt (LGPL version)*1	5.6.3	5.6.3
docker	19.03.8-ce	19.03.8-ce

*1) New versions such as Qt6.2.4 are also known to work. Please contact The Qt Company for instructions and support.

3. Changes

The following table lists the changes from the previous version.

Table 3. Changes

Changes of VLP/Gv3.0.6

Features	Description
Package	Newly support RZ/G3S.
Yocto	3.1.31 (dunfell)
Linux Kernel	Update the kernel version to v5.10.201-cip41.
RZ MPU Graphics Library (RZ/G2L, LC)	Some bug fixes are included.
RZ MPU Graphics Video Codec Library (RZ/G2L)	Some bug fixes are included.

4. 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.

Wifi/Bluetooth function on the iWave RZ/G1E rev4.0 board has not been supported.

(4) RZ/G3S

SPDIF driver and PDM driver are not implemented.

Ethernet driver and SSI driver don't work properly after resuming (Ethernet PHY is up but cannot ping. SSI cannot play audio).

(5) Docker

When building the VLP following the guidelines outlined in "Linux_Start-up_Guide", Docker can be enabled as an option. While the build process proceeds correctly, issues arise when executing Docker commands. The subsequent commands and log serve as an example.

```
root@smarc-rzg2l:~# docker pull hello-world
root@smarc-rzg2l:~# docker run hello-world
docker: Cannot connect to the Docker daemon at unix:///var/run/docker.sock. Is the d
ocker daemon running?.
```

After encountering the above error, restart the Docker service. This should enable successful execution of the Docker command.

```
root@smarc-rzg2l:~# systemctl restart docker
root@smarc-rzg2l:~# docker pull hello-world
root@smarc-rzg2l:~# docker run hello-world
Hello from Docker!
```

Renesas is investigating the root cause.

5. Note

5.1 Notes

None.

5.2 Memory Map

5.2.1 RZ/G3S

Note)

Kernel uses 4KB page size (VA_BITS=48) and 4 levels of translation tables.

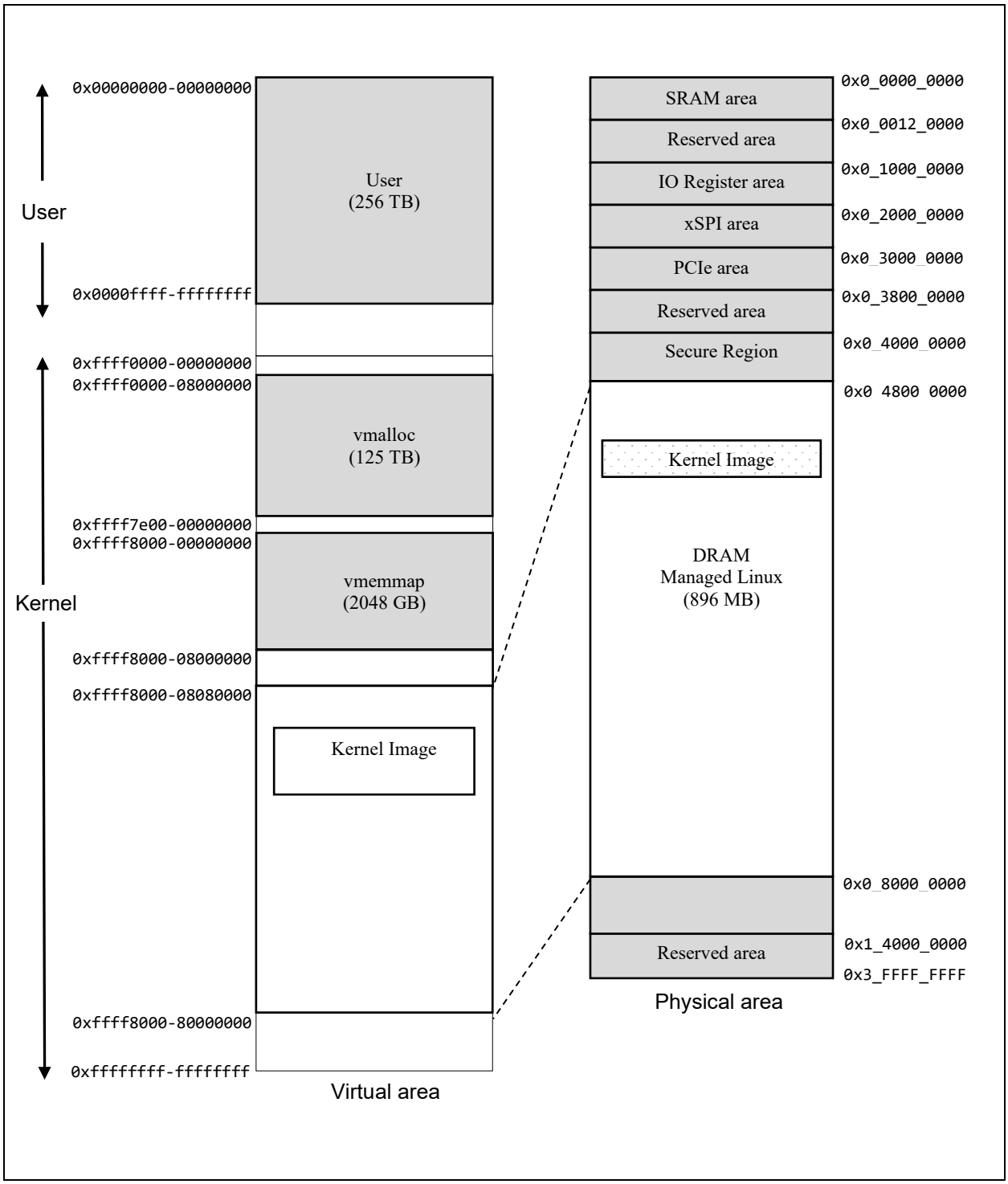

Figure 1. Memory map of kernel (RZ/G3S SMARC Evaluation Kit)

5.2.2 RZ/G2[H/M/N/E]

Following from Figure 2 to Figure 10 show memory map of RZ/G2[H/M/N/E] in this Linux BSP package.

Note)

- The volume of SDRAM is total:
  - 2GB (RZ/G2E System Evaluation Board EK874)
  - 4GB (RZ/G2M System Evaluation Board HiHope-RZG2M)
  - 4GB (RZ/G2N System Evaluation Board HiHope-RZG2N)
  - 4GB (RZ/G2H System Evaluation Board HiHope-RZG2H).
- 2GB from 0x00_4000_0000 to 0x00_BFFF_FFFF is a shadow area from 0x04_0000_0000 to 0x04_7FFF_FFFF.
- The following regions are used as a secure region. It doesn't allow U-Boot and kernel to access those regions.
  - 63MB from 0x00_43F0_0000 to 0x00_47DF_FFFF in SDRAM
  - 16KB from 0x00_E630_0000 to 0x00_E630_3FFF in System RAM
- **In case the configuration of BSP + 3D Graphics + Multimedia package, it doesn't allow to store any data in "CMA for Lossy comp" (default: 0x00_5400_0000 - 0x00_56FF_FFFF) region which is for media playback before kernel boots up. Any data stored in this region are read through the decompression module in AXI-Bus, so a normal data (not a decoded frame) will be corrupted.**

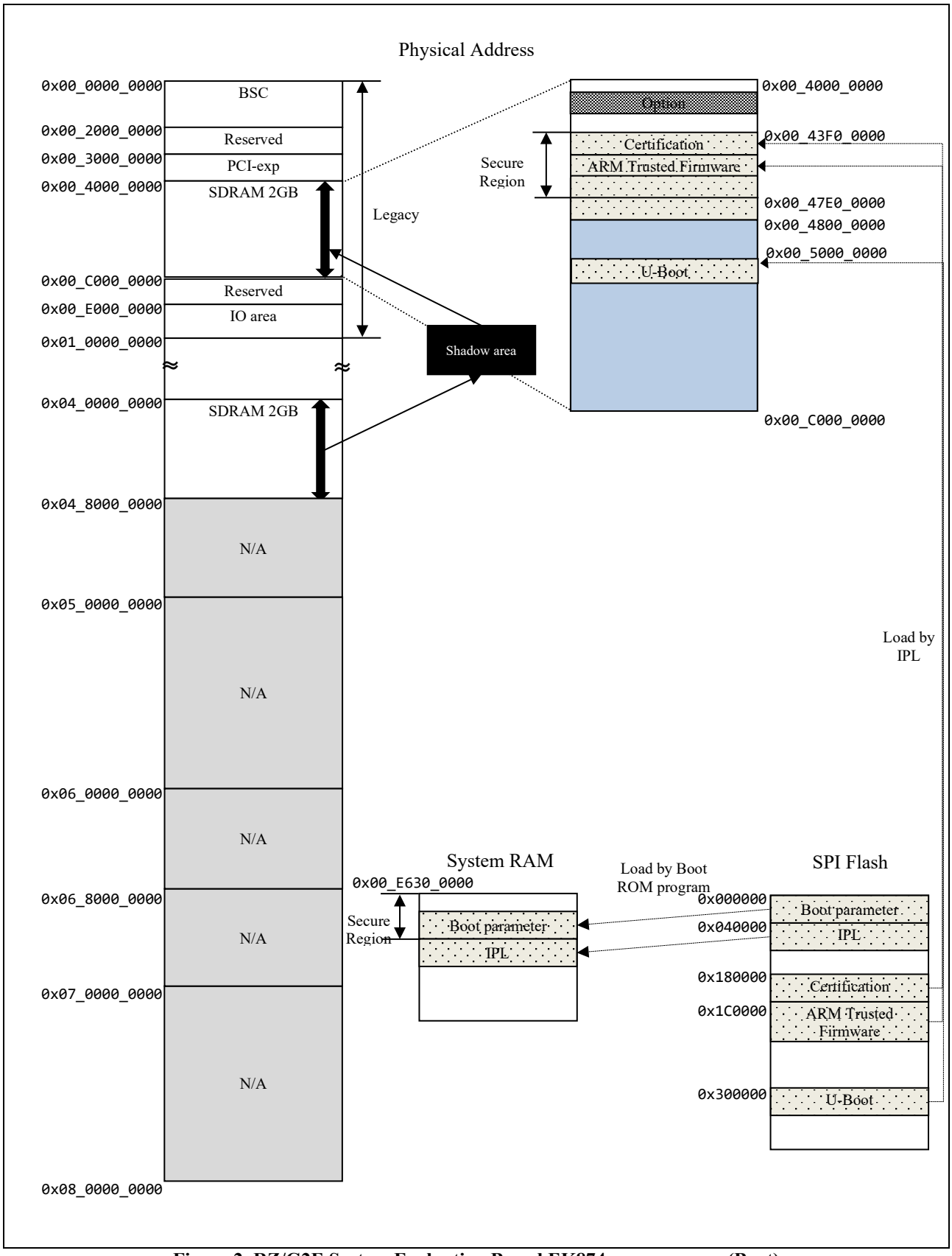

Figure 2. RZ/G2E System Evaluation Board EK874 memory map (Boot)

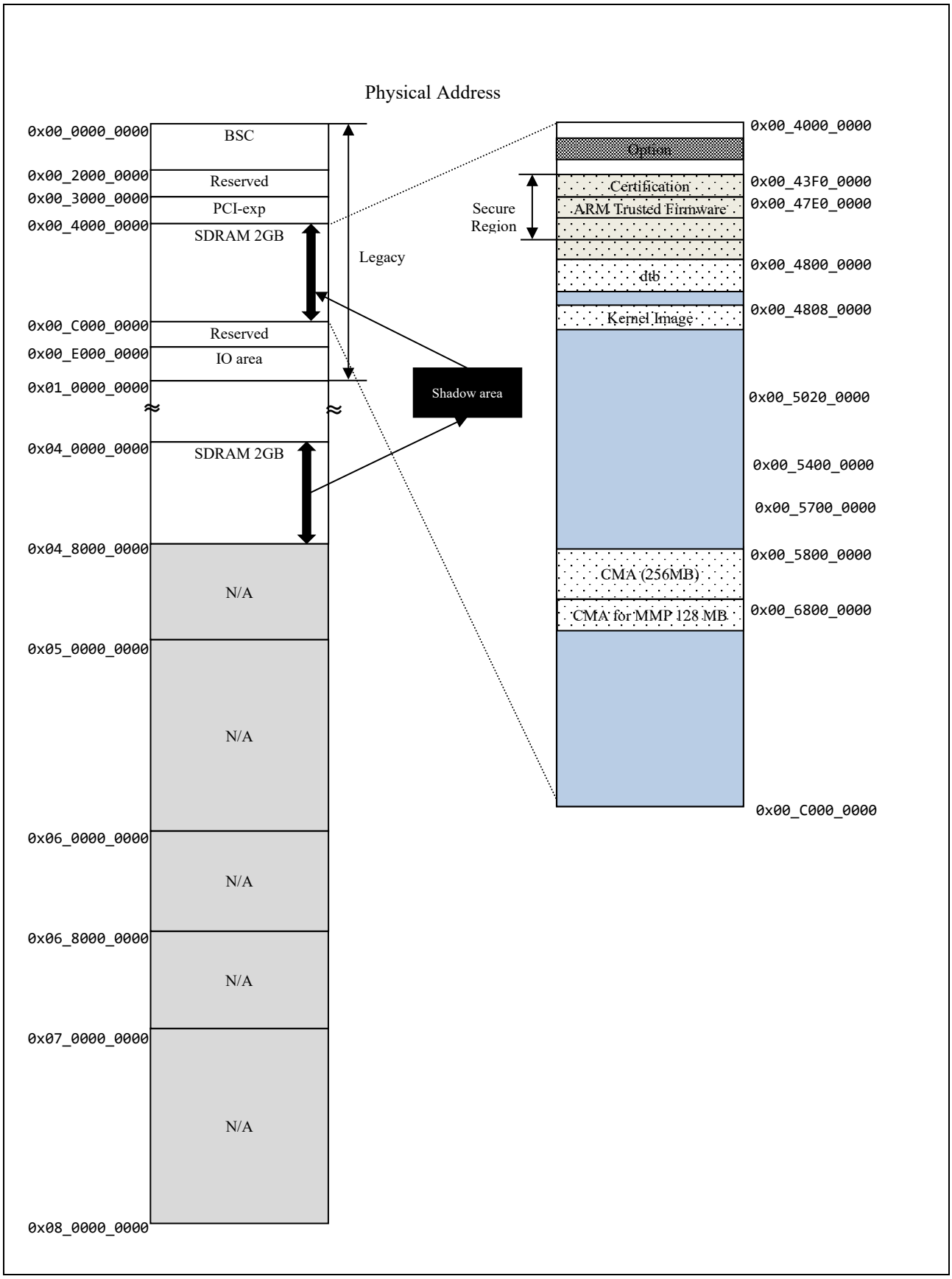

Figure 3. RZ/G2E System Evaluation Board EK874 memory map (Linux)

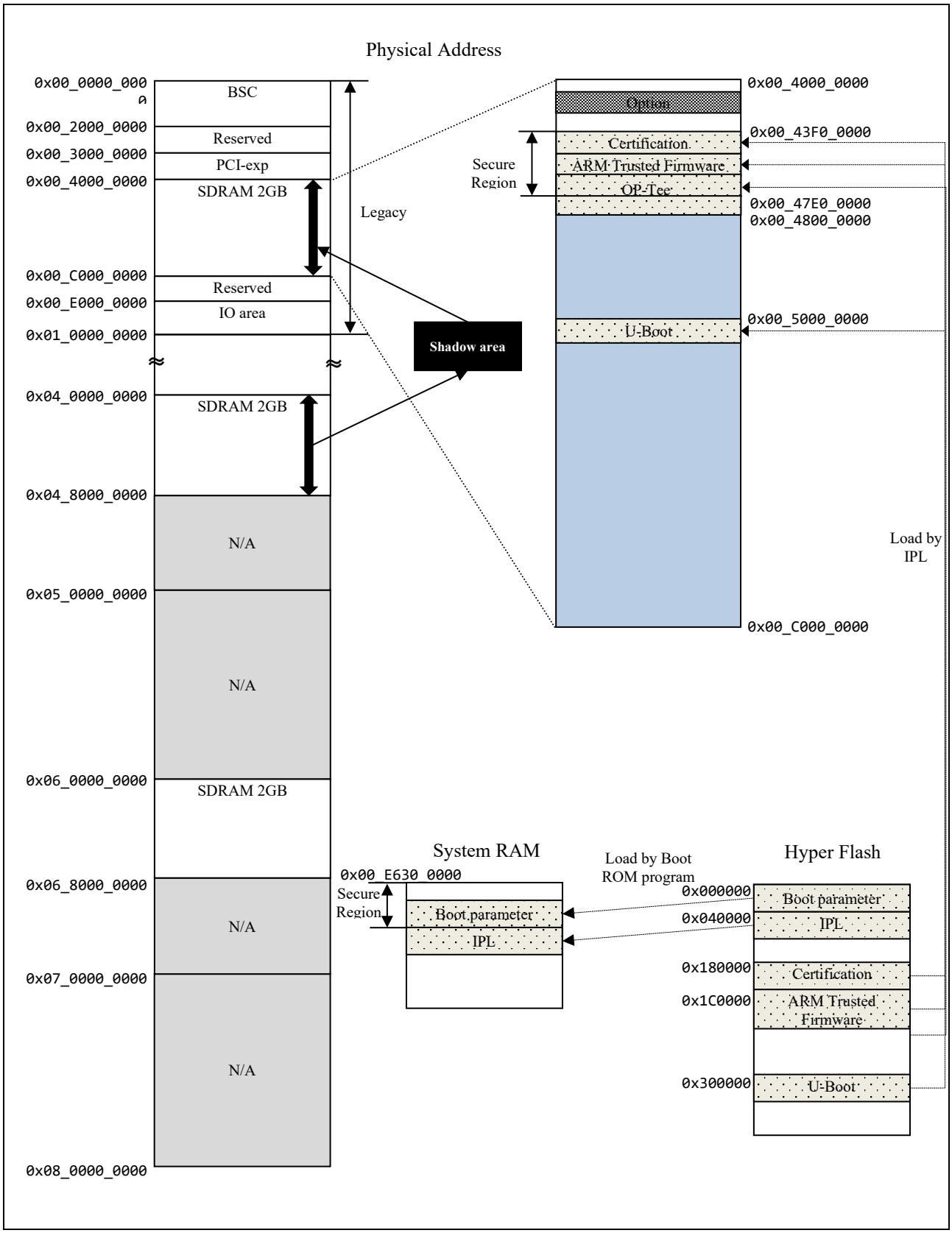

Figure 4. RZ/G2M System Evaluation Board (HIHOPE-RZG2M) memory map (Boot)

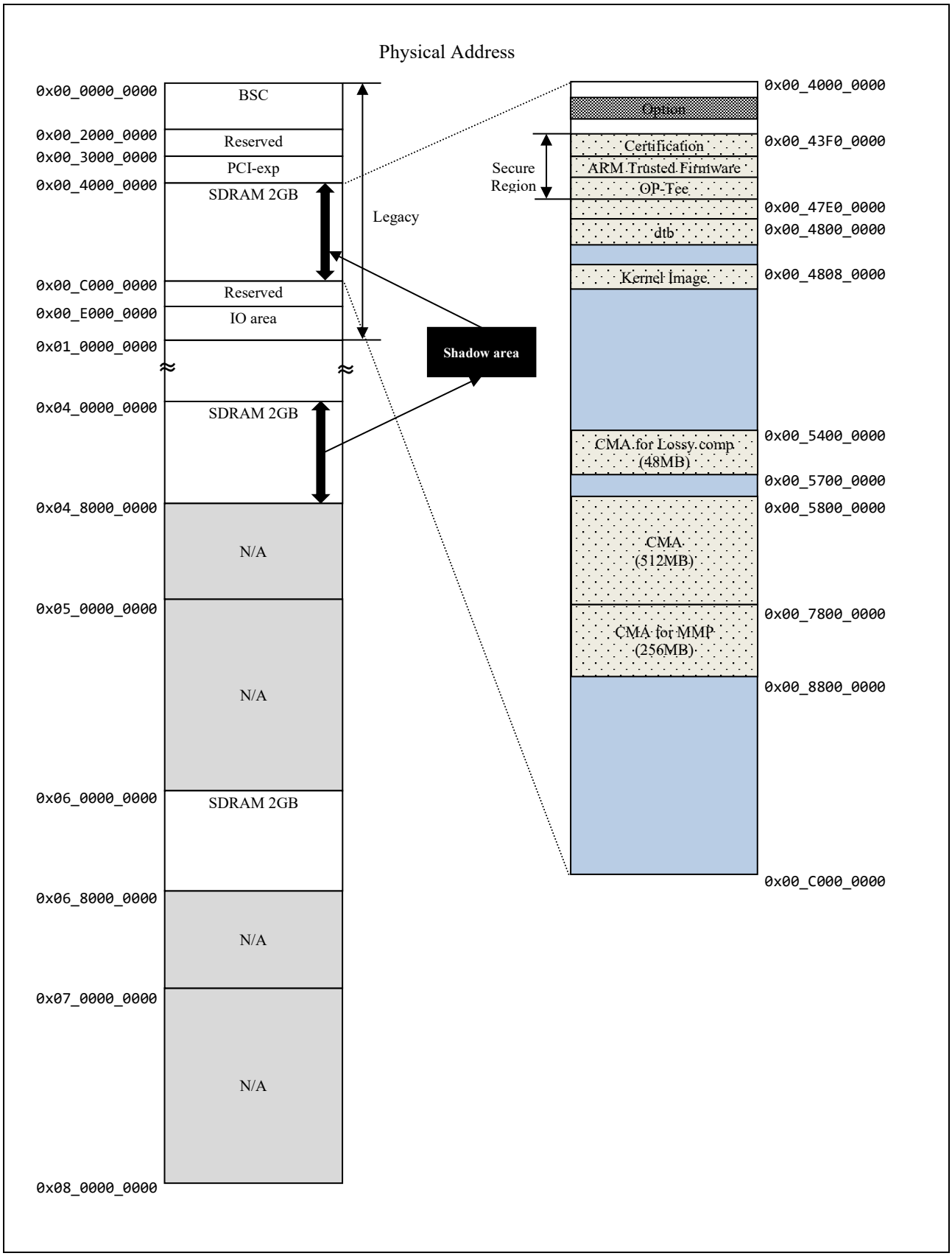

Figure 5. RZ/G2M System Evaluation Board (HiHope-RZG2M) memory map (Linux)

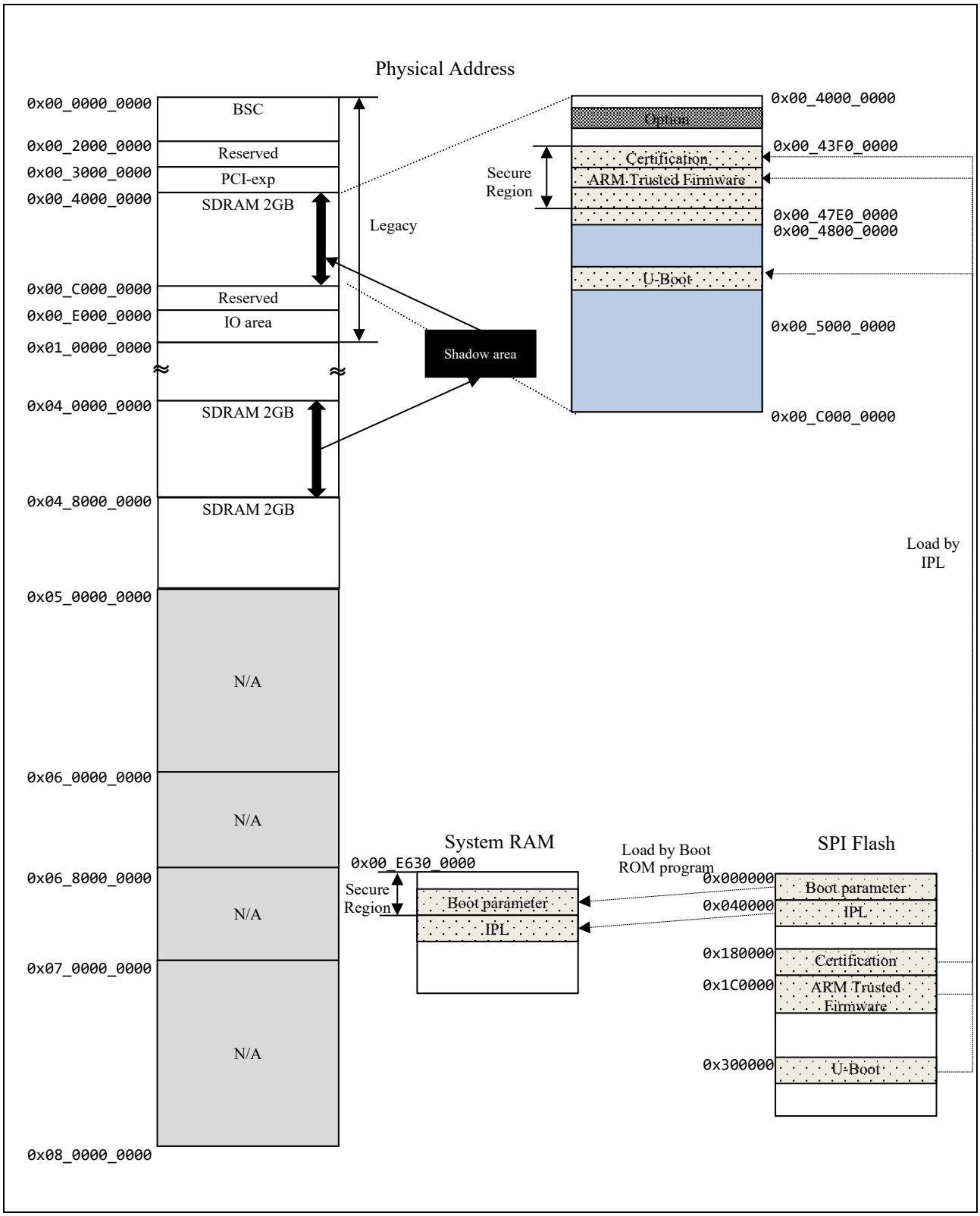

Figure 6. RZ/G2N System Evaluation Board (HiHope-RZG2N) memory map (Boot)

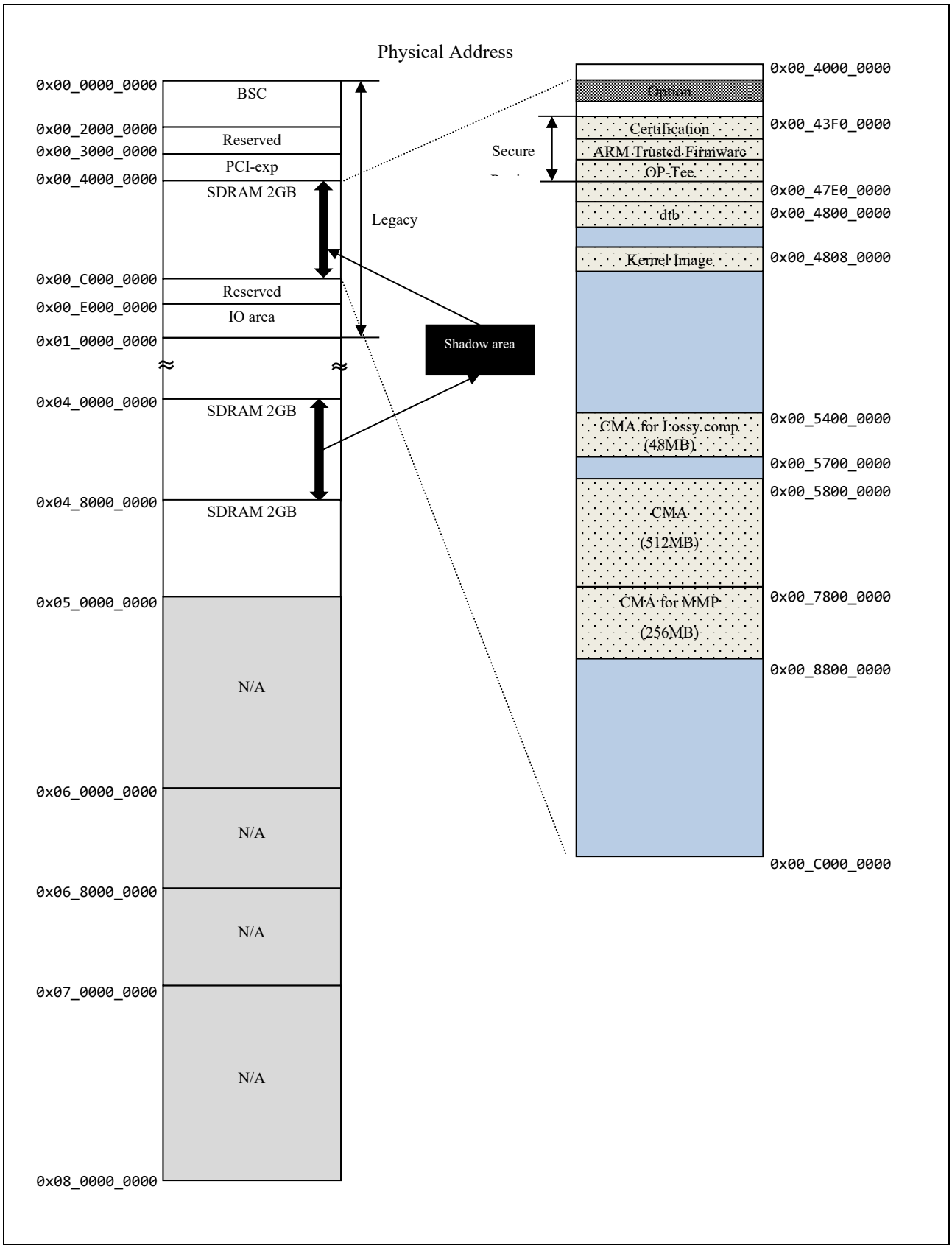

Figure 7. RZ/G2N System Evaluation Board (HiHope-RZG2N) memory map (Linux)

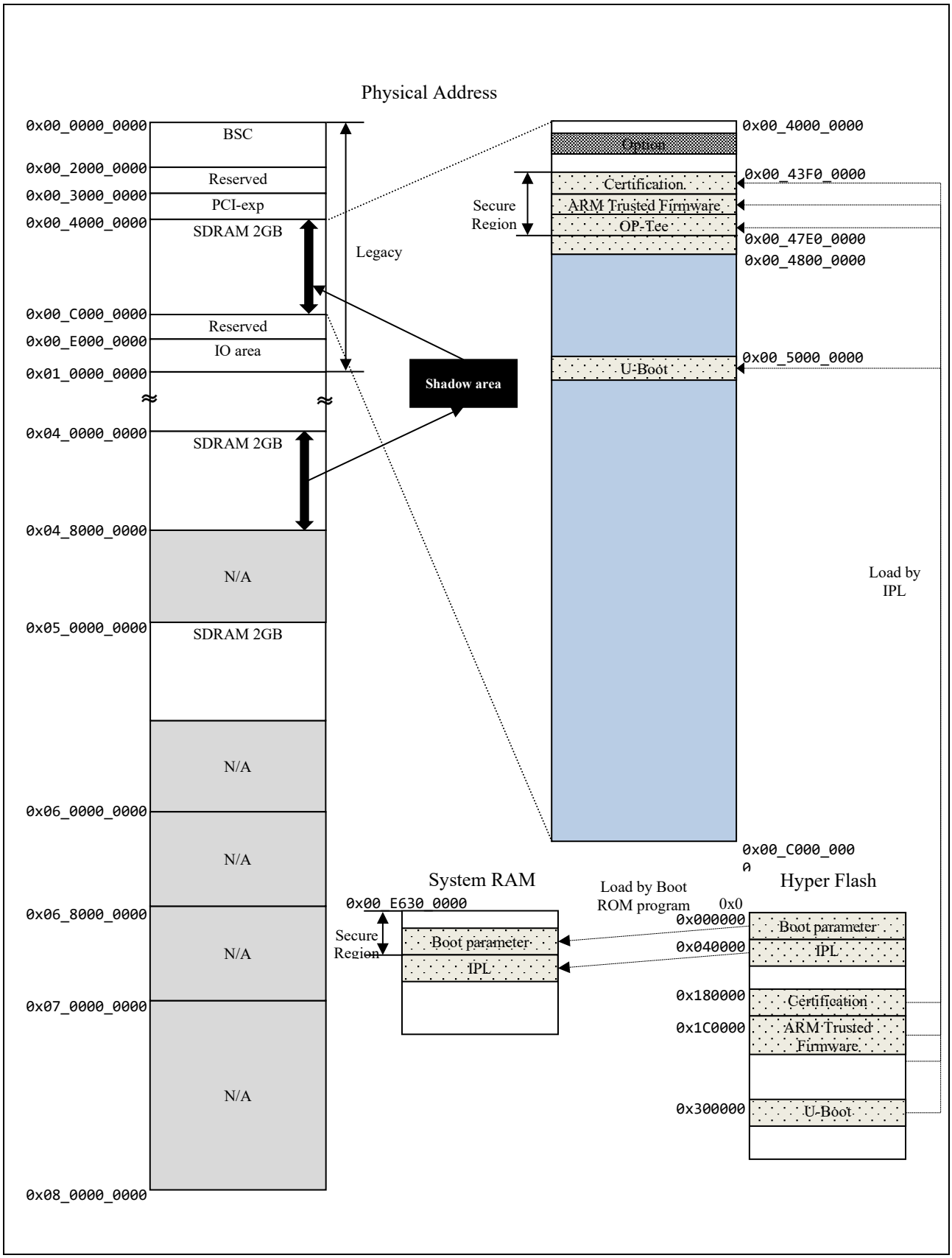

Figure 8. RZ/G2H System Evaluation Board (HIHOPE-RZG2H) memory map (Boot)

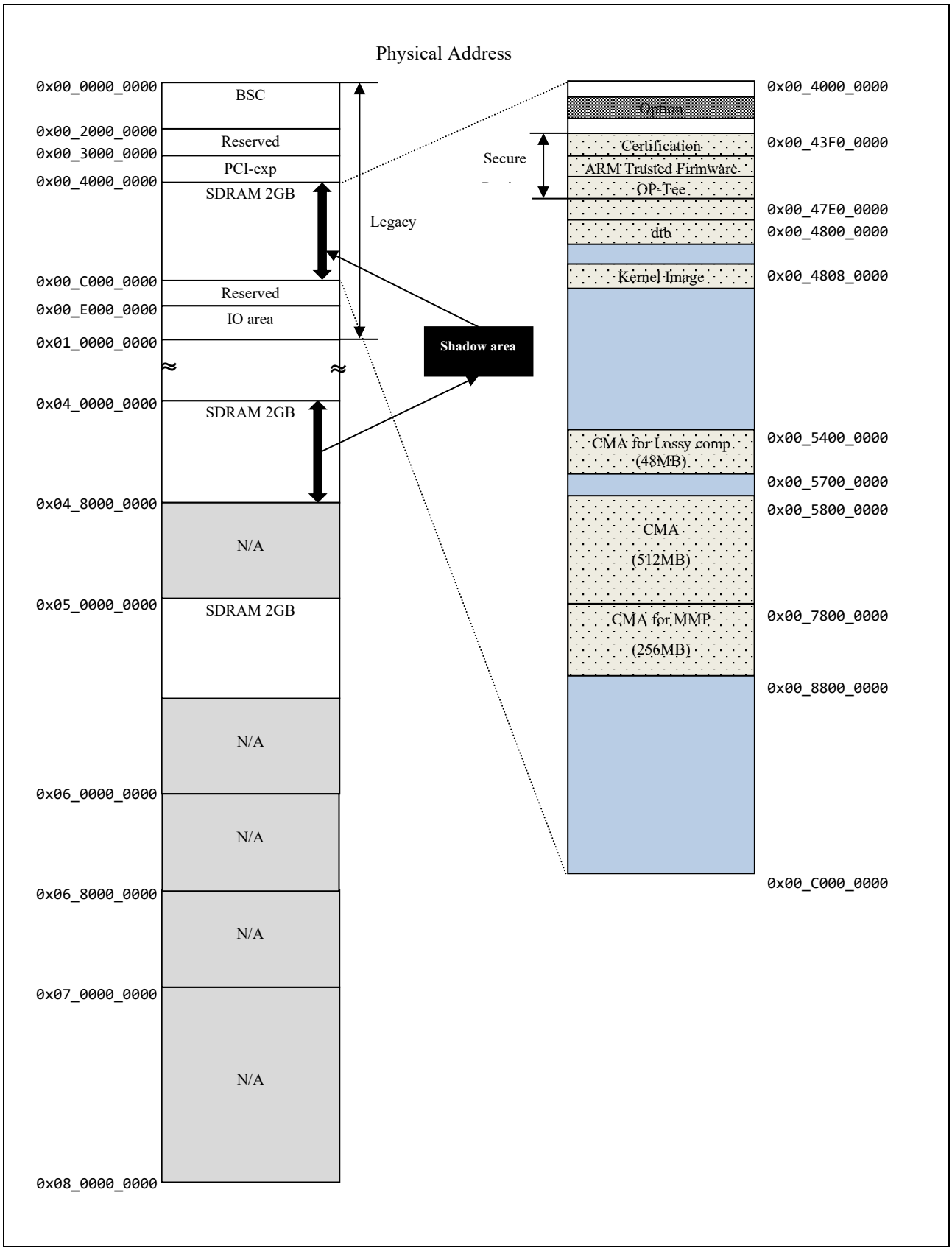

Figure 9. RZ/G2H System Evaluation Board (HiHope-RZG2H) memory map (Linux)

Note)
- Kernel region is assigned by Kernel device tree arch/arm64/boot/dts/renesas/xxx.dts and totally mapped to 1920MB (RZ/G2E System Evaluation Board EK874), 3968MB (RZ/G2M System Evaluation Board HiHope-RZG2M), 3968MB (RZ/G2N System Evaluation Board HiHope-RZG2N), 3968MB (RZ/G2H System Evaluation Board HiHope-RZG2H)

Kernel region consists of 1 part: (RZ/G2E System Evaluation Board EK874)

- 1920MB from 0x00_4800_0000 to 0x00_BFFF_FFFF

Kernel region consists of 2 part: (RZ/G2M System Evaluation Board HiHope-RZG2M)

- 1920MB from 0x00_4800_0000 to 0x00_BFFF_FFFF
- 2GB from 0x06_0000_0000 to 0x06_7FFF_FFFF

Kernel region consists of 2 part: (RZ/G2N System Evaluation Board HiHope-RZG2N)

- 1920MB from 0x00_4800_0000 to 0x00_BFFF_FFFF
- 2GB from 0x04_8000_0000 to 0x04_EFFF_FFFF

Kernel region consists of 2 part: (RZ/G2H System Evaluation Board HiHope-RZG2H)

- 1920MB from 0x00_4800_0000 to 0x00_BFFF_FFFF
- 2GB from 0x05_0000_0000 to 0x05_7FFF_FFFF

There are three types of CMA regions.

They are defined in device tree (arch/arm64/boot/dts/renesas/xxxx.dts).

- Default CMA region: It is for kernel, general drivers and multimedia package.

```
linux,cma {
    compatible = "shared-dma-pool";
    reusable;
    reg = <0x00000000 0xXXXXXXXX 0x0 0xYYYYYYYY>;
    linux,cma-default;
};

0xXXXXXXXX is start address of CMA region.
0xYYYYYYYY is size of CMA region.
```

Note)

- 128 MB in this CMA (RZ/G2M (v1.3, v3.0) |G2N|G2H 512MB, RZ/G2E 256MB) is reserved for kernel and general drivers, and the remaining RZ/G2M (v1.3, v3.0) |G2N|G2H 384 MB, RZ/G2E 128MB is reserved for multimedia package.
- The CMA region can be adjusted by changing the start address and the size.
- Should take care of the lack of memory allocated by kernel and general drivers when reducing the region size.

- CMA region for MMP: It is for multimedia package (specific H/Ws).

```
mmp_reserved: linux,multimedia {
   compatible = "shared-dma-pool";
   reusable;
   reg = <0x00000000 0xXXXXXXXX 0x0 0xYYYYYYYY>;
};

0xXXXXXXXX is start address of CMA region.
0xYYYYYYYY is size of CMA region.
```

Note)

- Refer to User's manual of Memory Manager in order to change CMA region for MMP.

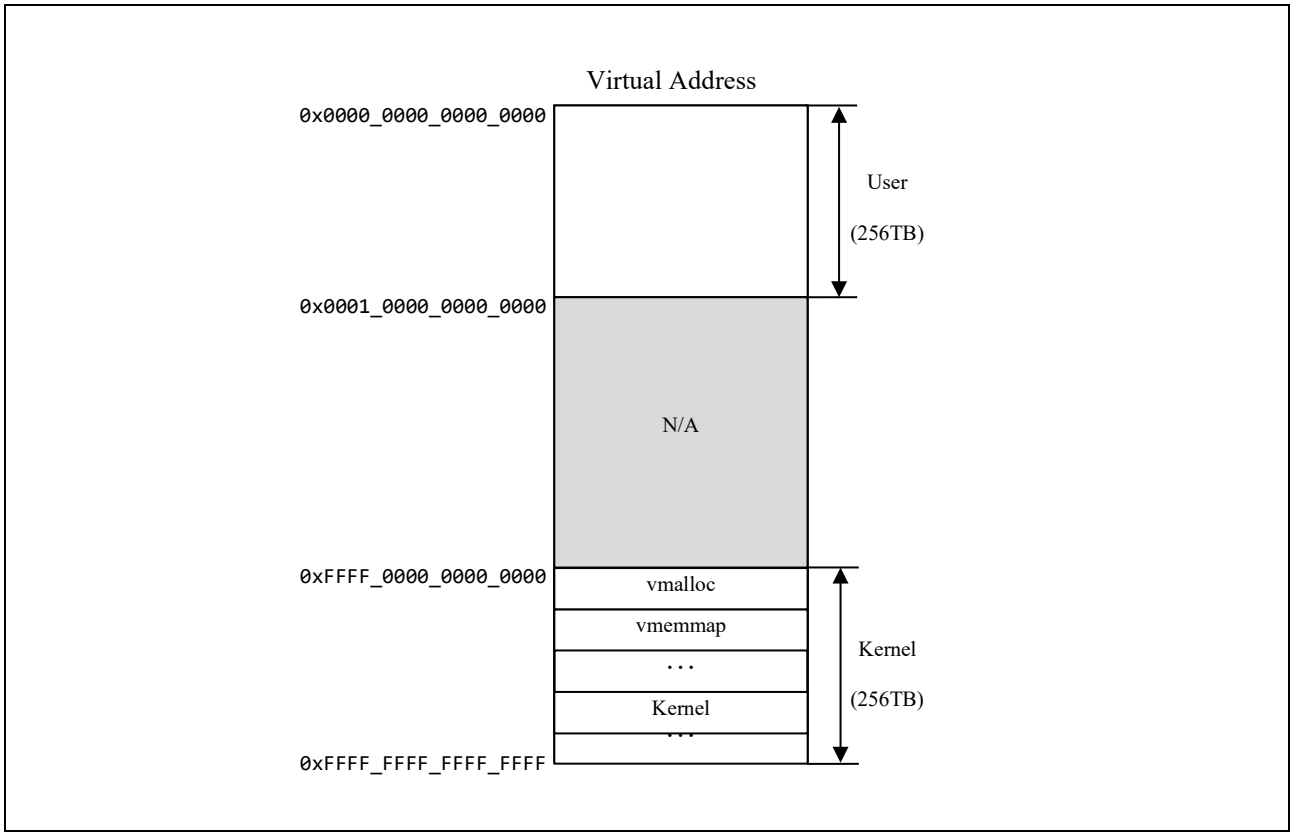

Figure 10. RZ/G2[H/M/N/E] memory map (Virtual)

Note)

- Kernel uses 4KB page size (VA_BITS=48) and 4 levels of translation tables. Both regions of User and Kernel are 256TB. Refer to Documentation/arm64/memory.txt.

- Detail information about kernel memory map in virtual address space, refer to User's manual of Kernel.

5.2.3 RZ/G2L Series

Following from Figure 11 to Figure 13 show memory map of RZ/G2L Series in this Linux BSP package.

Note)

- The volume of SDRAM is total:
  - 2GB (RZ/G2L Evaluation Board Kit PMIC version)
  - 1GB (RZ/G2LC and RZ/G2UL Evaluation Board Kit).
- The following region is used as a secure region. It doesn't allow U-Boot and kernel to access those regions.
  - 128MB from 0x00_4000_0000 to 0x00_47FF_FFFF in SDRAM

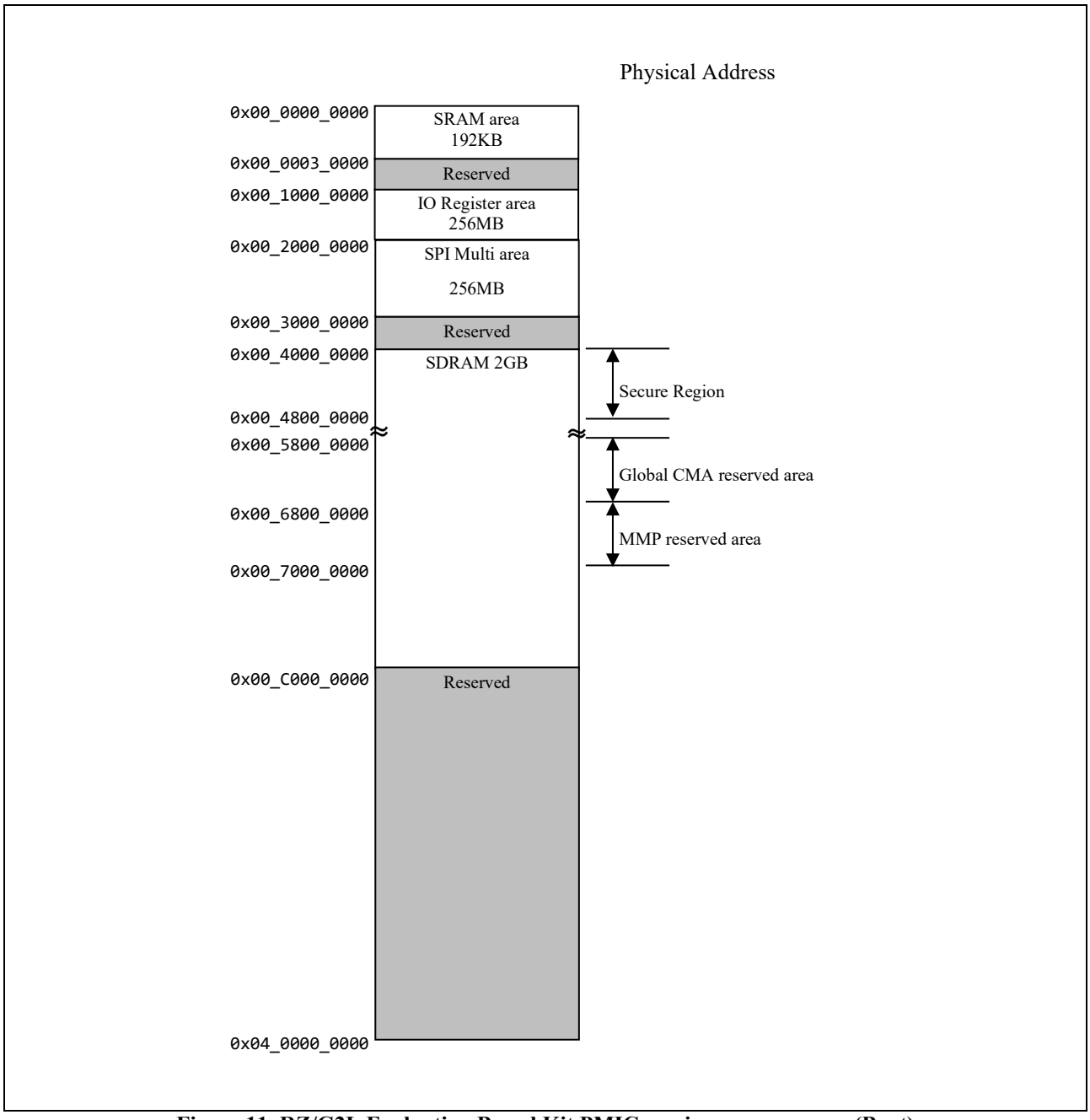

Figure 11. RZ/G2L Evaluation Board Kit PMIC version memory map (Boot)

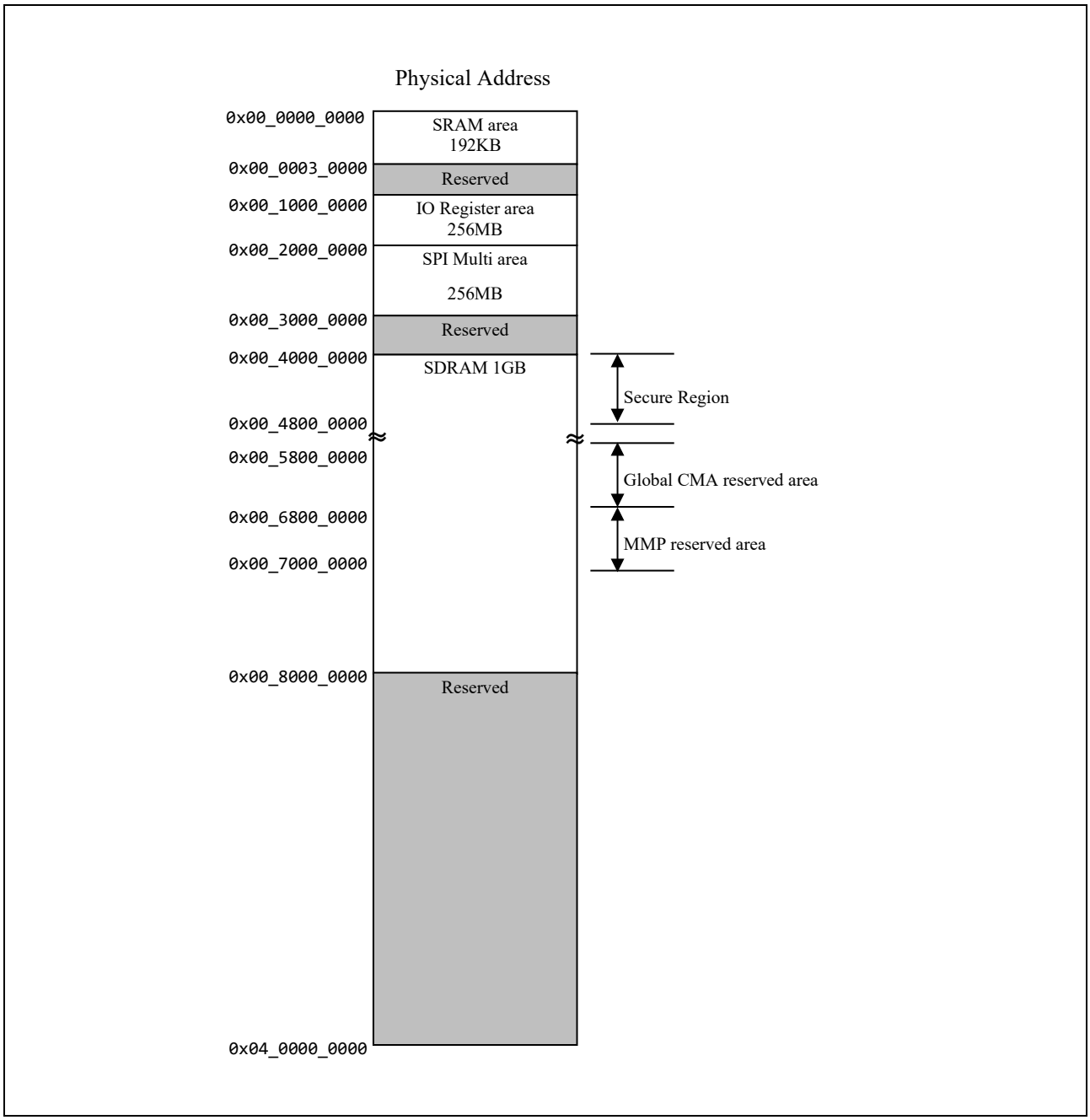

Figure 12. RZ/G2LC Evaluation Board Kit version memory map (Boot)

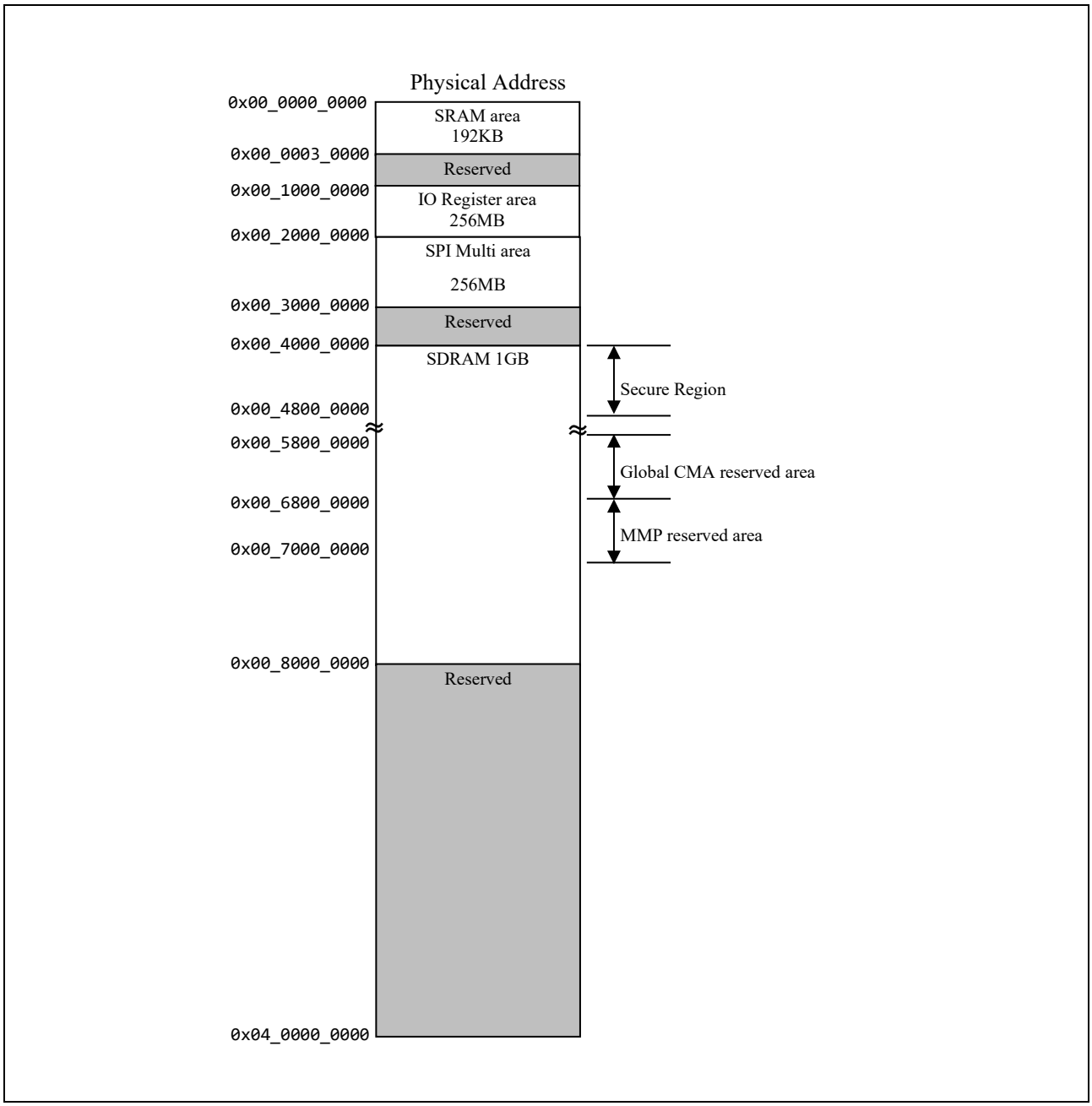

Figure 13. RZ/G2UL Evaluation Board Kit version memory map (Boot)

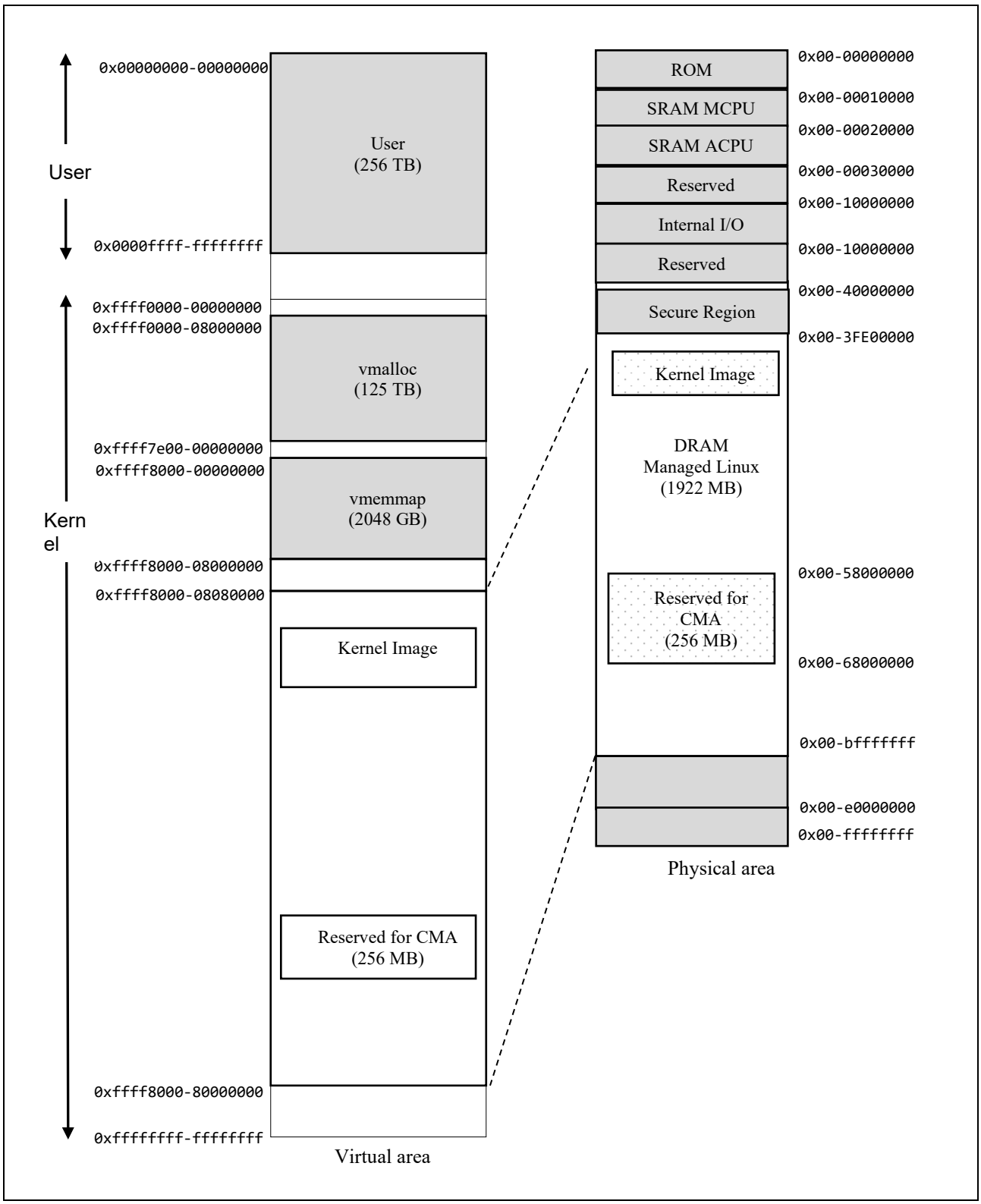

Figure 14. Memory map of kernel (RZ/G2L Evaluation Board Kit)

5.2.4 RZ/G1[H,M,N,E]

Following Figure 15, Figure 16, Figure 17, Figure 18 shows memory map of this RZ/G1H, RZ/G1M, RZ/G1N, RZ/G1E Linux BSP package.

A saving area of the environment variable of U-Boot is address 0xc0000 of SPI Flash. If you would like to return default value, please use "env default -a" command, after that save by the saveenv command.

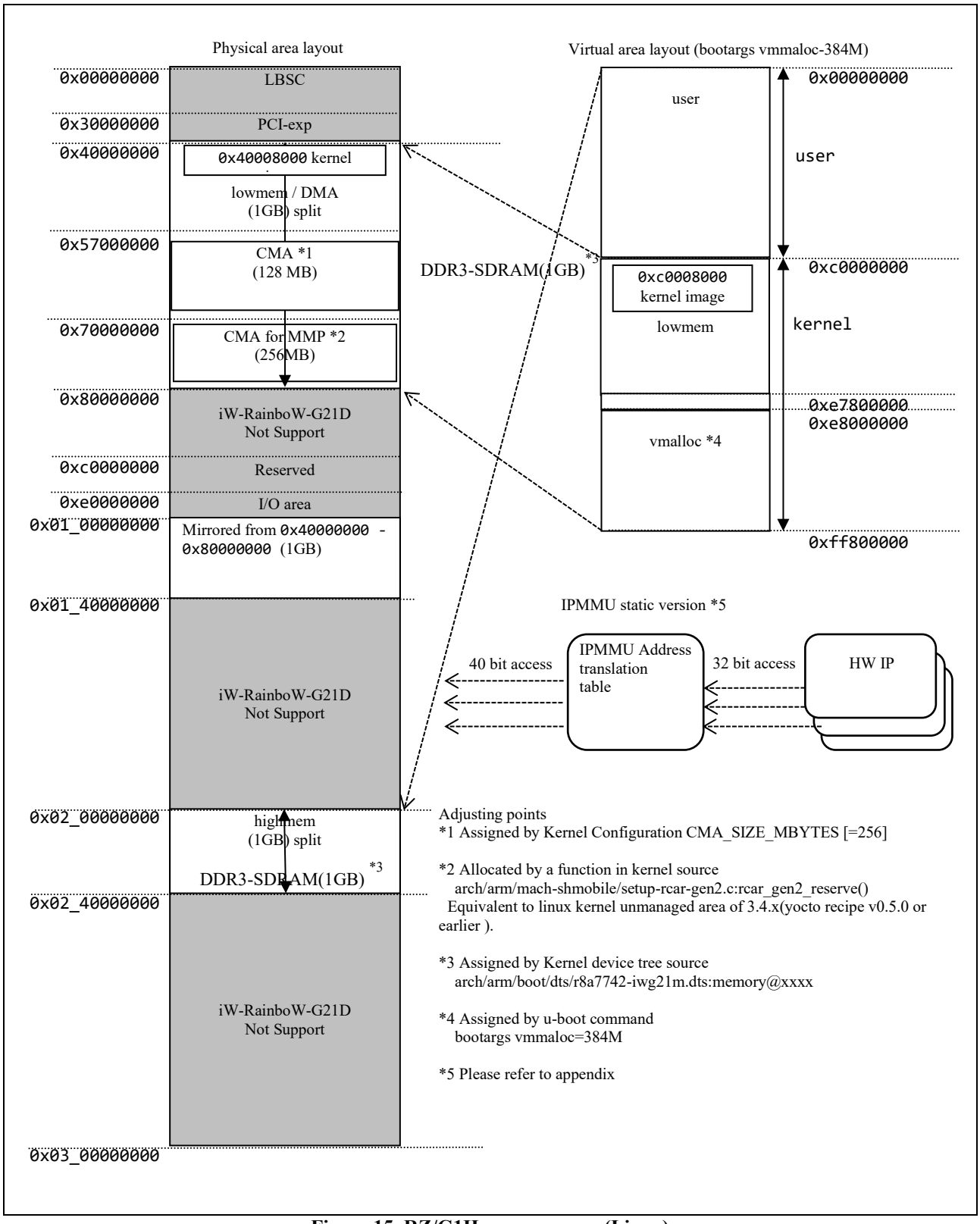

Figure 15. RZ/G1H memory map (Linux)

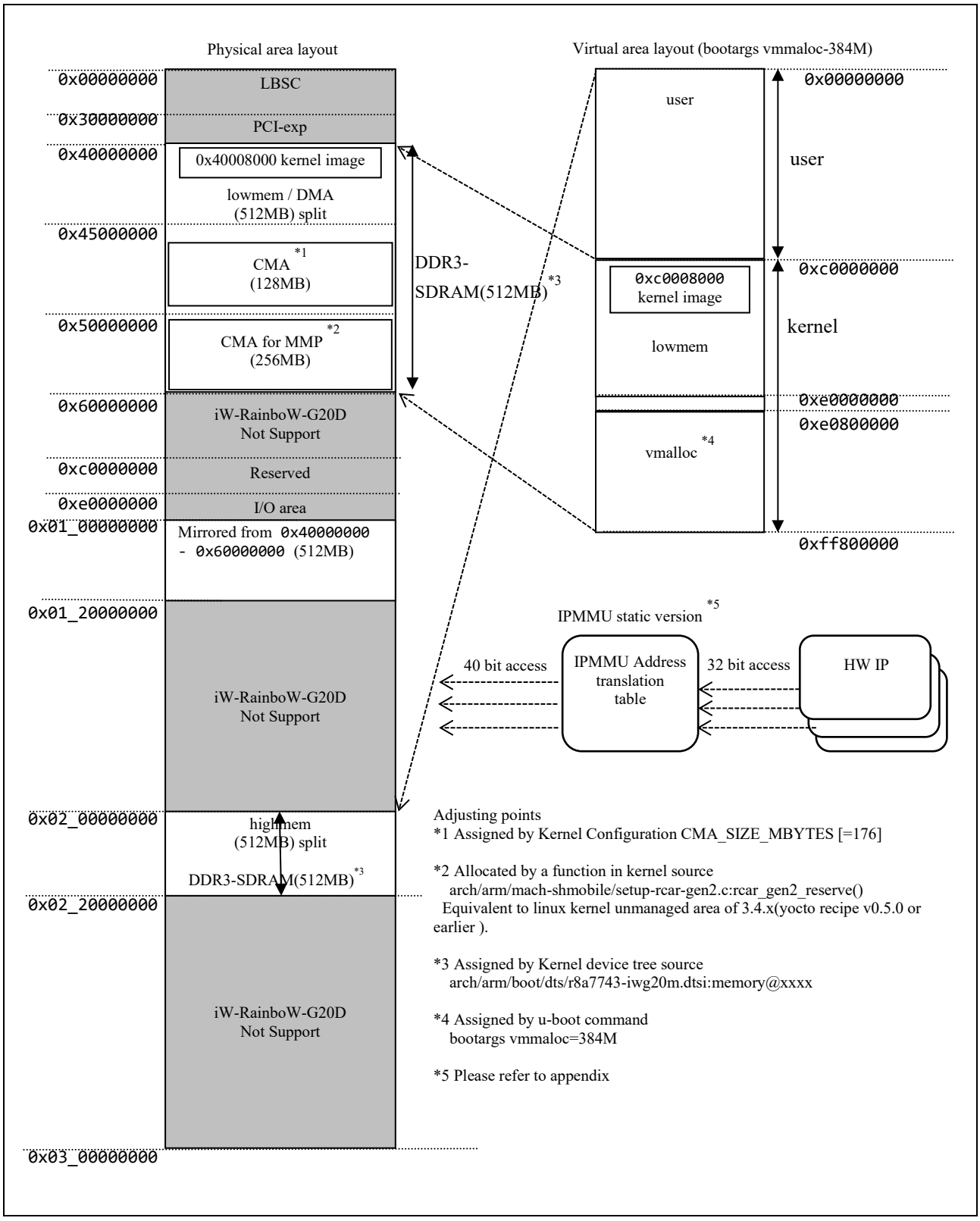

Figure 16. RZ/G1M memory map (Linux)

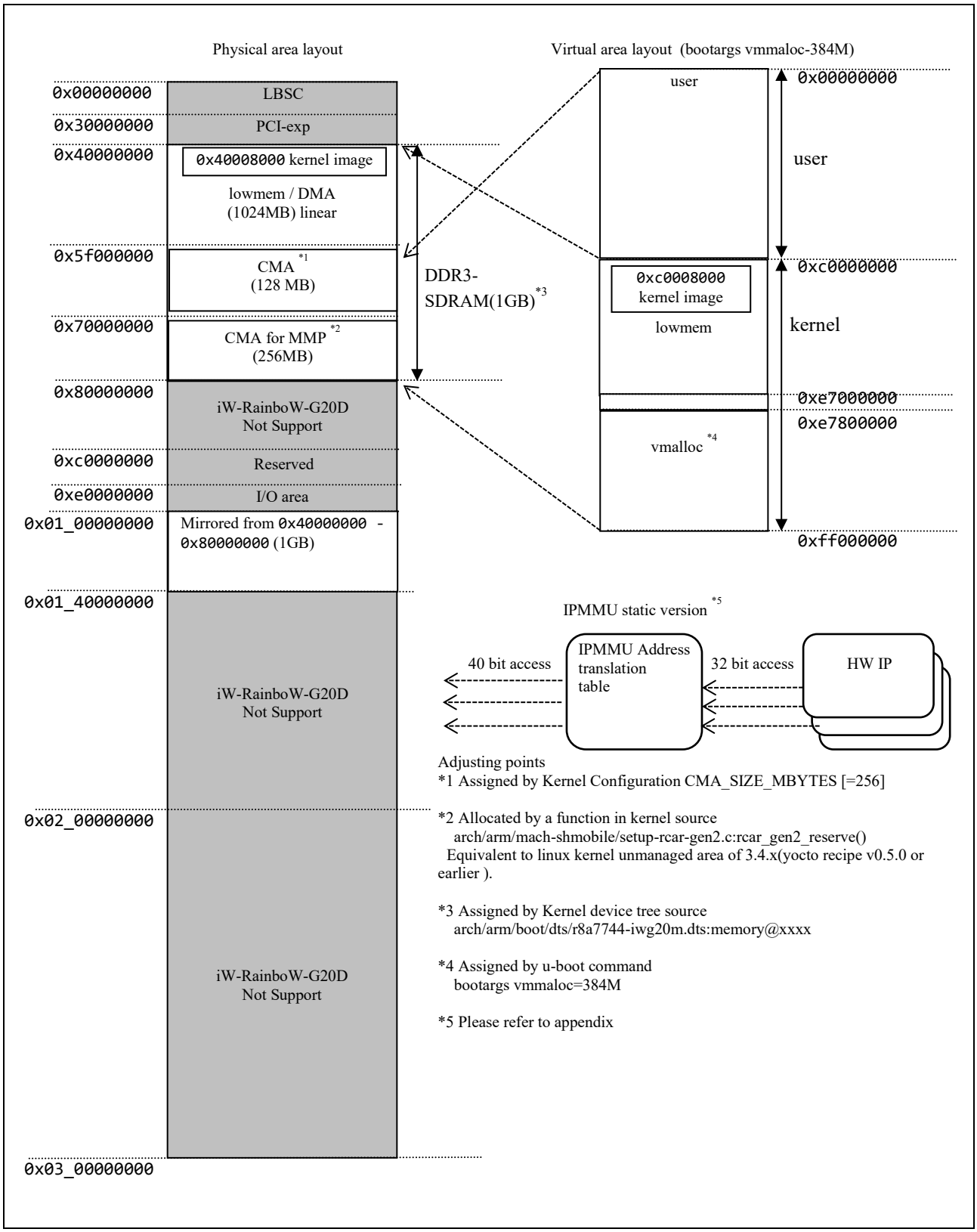

Figure 17. RZ/G1N memory map (Linux)

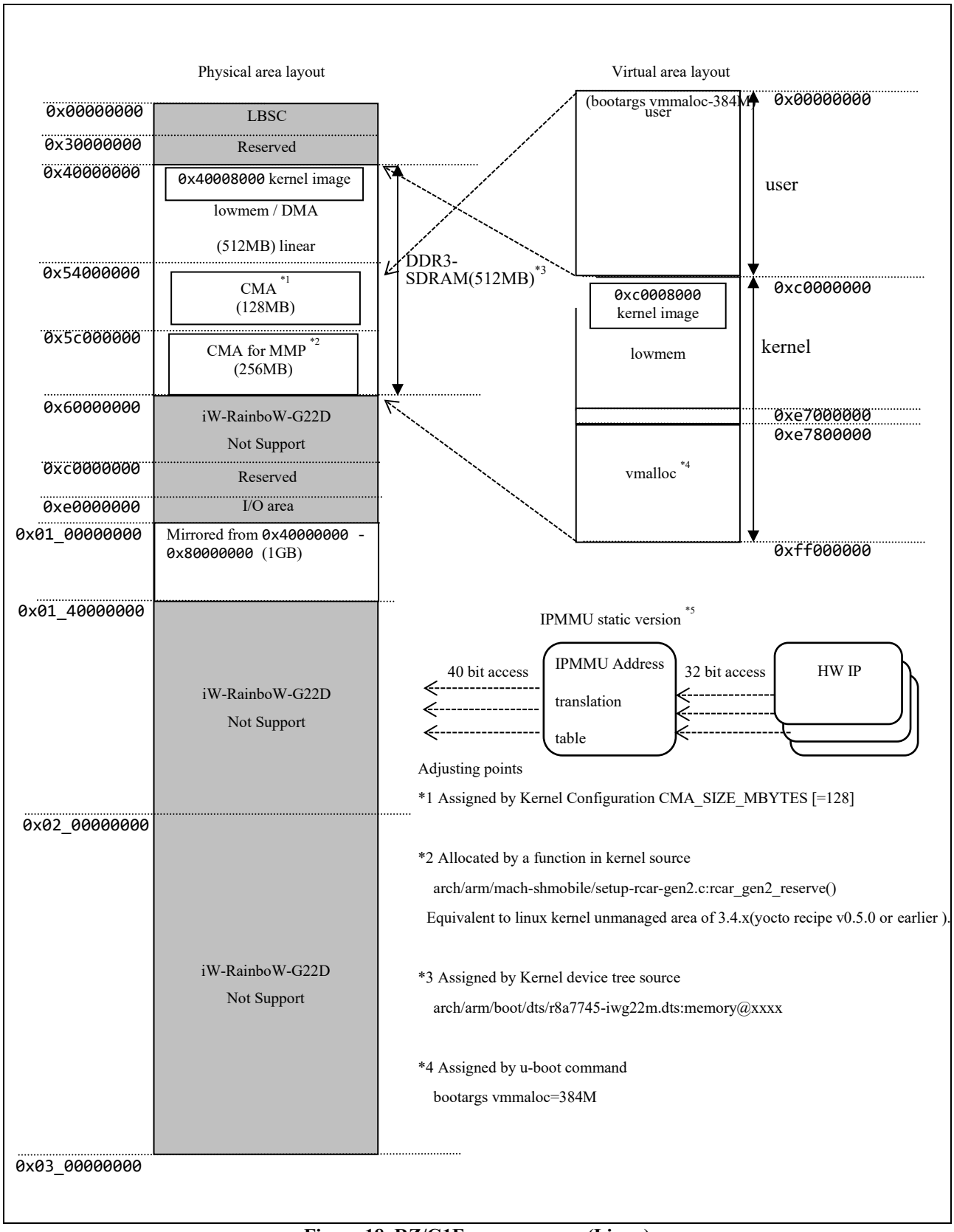

Figure 18. RZ/G1E memory map (Linux)

6. Revision History

		Description	
Rev.	**Date**	**Page**	**Summary**
1.01	Jul. 13, 2022	-	First edition for VLP/G v3.0.0-update1.
1.02	Jun. 24, 2022	11	Add the “Target devices” column to the Table 4.
		23	Fix the patch file name and the commands.
1.03	Jul. 8, 2022	5	Update the Graphics and Video codec libraries for RZ/G2L and RZ/G2L.
		15	Add the additional information to the table 7.
1.04	Aug. 9, 2022	-	Change some introduction about VLP/G v3.0.0-update1 to VLP/G v3.0.0-update 2.
		4	Update the Release Note and Component List. Add the additional information to OSS files.
		5	Update Optional packages.
		23	Add the update points of VLP/G v3.0.0-update2.
1.05	Sep. 30, 2022	-	First edition for VLP/G v3.0.1.
1.06	Mar. 30, 2023	-	First edition for VLP/G v3.0.3.
1.07	Apr. 21, 2023	4, 8	Update the Multimedia Package revision for RZ/G2H, RZ/G2M, RZ/G2N and RZ/G2E.
1.08	Oct. 31, 2023	-	First edition for VLP/G v3.0.5.
		-	Added support RZ/G1H, RZ/G1M, RZ/G1N, and RZ/G1E.
1.09	Nov. 15, 2023	-	Add the patch file of update1.
1.10	Nov. 30, 2023	3	Change “Linux_StartUp_Guide_RZG1H,M,N,E” revision.
1.11	Jan. 22, 2024	-	Add the patch file of update3.
1.12	Apr. 24, 2024		First edition for VLP/G v3.0.6.
			Added support RZ/G3S.
		8	Workaround when executing Docker command.
		10-31	Add section 5.2 Memory maps.

Website and Support

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