Introduction

This release note describes the contents of the RZ/V2MA DRP-AI Support Package and how to construct its operating environments.
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1. Release Items

The release items in the RZ/V2MA DRP-AI Support Package are as follows.

- **Name and Version**
  RZ/V2MA DRP-AI Support Package Version.7.30

- **Target Board**
  RZ/V2MA Evaluation Board Kit

  **Note:** For the settings of RZ/V2MA Evaluation Board Kit, please refer to the RZ/V2MA Linux Package Start-Up Guide (R01US0578).

- **Features**
  1. **RZ/V2MA DRP-AI Driver**
     This is a Linux Package Recipe to use DRP-AI on RZ/V2MA.
  2. **RZ/V2L, RZ/V2M, RZ/V2MA AI Implementation Guide**
     This is a guide on how to implement the AI model in RZ/V2L, RZ/V2M and RZ/V2MA.
  3. **RZ/V2MA AI Evaluation Software**
     This is a software to evaluate AI models on RZ/V2MA without coding.
  4. **RZ/V2MA DRP-AI Sample Application**
     This is a set of sample applications for DRP-AI on RZ/V2MA.
  5. **RZ/V2L, RZ/V2M, RZ/V2MA DRP-AI Accuracy Report**
     This is a report of evaluating the accuracy of AI models on DRP-AI.
  6. **RZ/V2L, RZ/V2M, RZ/V2MA DRP-AI Performance Report**
     This is a report of evaluating the performance of AI models on DRP-AI.

  **Note:** From v7.30 this package must be built together with RZ/V2MA Video codec package.
  Please refer to 3.Build for the details.
### File Contents

Table 1-1 shows the list of contents in this package.

<table>
<thead>
<tr>
<th>Contents</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>r11an0592ej0730-rzv2ma-drpai-sp.pdf</td>
<td>This document.</td>
</tr>
<tr>
<td>rzv2ma_drpai-driver</td>
<td>RZ/V2MA DRP-AI Driver.</td>
</tr>
<tr>
<td>meta-rz-features.tar.gz</td>
<td>Recipe to deploy DRP-AI Driver.</td>
</tr>
<tr>
<td>rzv_ai-evaluation-software</td>
<td>AI Evaluation Software.</td>
</tr>
<tr>
<td>rzv2ma_ai-evaluation-software_ver7.30.tar.gz</td>
<td>Software environment</td>
</tr>
<tr>
<td>rzv2ma_drpai-sample-application</td>
<td>DRP-AI Sample Application.</td>
</tr>
<tr>
<td>r11an0593ej0730-rzv2ma-drpai-application-note.pdf</td>
<td>Document (English).</td>
</tr>
<tr>
<td>rzv2ma_drpai-sample-application_ver7.30.tar.gz</td>
<td>Sample code.</td>
</tr>
<tr>
<td>rzv_ai-implementation-guide</td>
<td>AI Implementation Guide.</td>
</tr>
<tr>
<td>r11an0616ej0730-rzv-ai-imp-getstarted.pdf</td>
<td>Document (English).</td>
</tr>
<tr>
<td>rzv_ai-implementation-guide_ver7.30.tar.gz</td>
<td>Sample code.</td>
</tr>
<tr>
<td>pytorch_resnet</td>
<td>Sample of PyTorch ResNet.</td>
</tr>
<tr>
<td>r11an0617ej0730-rzv-ai-imp-resnet.pdf</td>
<td>Document (English).</td>
</tr>
<tr>
<td>pytorch_resnet_ver7.30.tar.gz</td>
<td>Sample code.</td>
</tr>
<tr>
<td>pytorch_mobilenet</td>
<td>Sample of PyTorch MobileNet.</td>
</tr>
<tr>
<td>pytorch_mobilenet_ver7.30.tar.gz</td>
<td>Sample code.</td>
</tr>
<tr>
<td>pytorch_deeplabv3</td>
<td>Sample of PyTorch DeepLabV3.</td>
</tr>
<tr>
<td>pytorch_deeplabv3_ver7.30.tar.gz</td>
<td>Sample code.</td>
</tr>
<tr>
<td>darknet_yolo</td>
<td>Sample of Darknet YOLOv3/v2, Tiny YOLOv3/v2.</td>
</tr>
<tr>
<td>darknet_yolo_ver7.30.tar.gz</td>
<td>Sample code.</td>
</tr>
<tr>
<td>mmmpose_hrnet</td>
<td>Sample of MMPose HRNet.</td>
</tr>
<tr>
<td>mmmpose_hrnet_ver7.30.tar.gz</td>
<td>Sample code.</td>
</tr>
<tr>
<td>appendix</td>
<td>AI Implementation Guide appendix.</td>
</tr>
<tr>
<td>rzv_drpai-report</td>
<td>RZ/V2MA DRP-AI Reports.</td>
</tr>
<tr>
<td>r11an0628ej0730-rzv-drpai-accuracy-report.pdf</td>
<td>DRP-AI Accuracy Report (English).</td>
</tr>
</tbody>
</table>
• Related Packages
  1. RZ/V2MA Linux Package Version 1.1.0 or later
  2. RZ/V2MA Video Codec Package Version 0.9.6 or later
  3. DRP-AI Translator v1.81 or later

• Related Documents
  1. RZ/V2MA Linux Package Release Note (R01AN6514)
  2. RZ/V2MA Linux Package Start-Up Guide (R01US0578)
  3. RZ/V2MA Video Codec Integration Guide (R01US0600)
  4. DRP-AI Translator User's Manual (R20UT5010)
2. Operating Environment

This package uses five different environments.

Note: For the environment of AI Evaluation Software, please refer to the RZ/V2L, RZ/V2M, RZ/V2MA AI Evaluation Software Guide.

2.1 Translate Environment

This is the environment for translating AI model on Linux PC (Ubuntu 20.04).

Please refer to RZ/V2L, RZ/V2M, RZ/V2MA AI Implementation Guide for details of this environment.

2.2 Build Environment

This is the environment for building Linux Package of RZ/V2MA on Linux PC (Ubuntu 20.04 LTS).

Please refer to RZ/V2MA Linux Package Start-Up Guide (R01US0578) and 3 Build for the details of this environment.

2.3 Boot Environment

This is the environment for booting the Linux OS on RZ/V2MA.

There are two booting methods, Network and SD card.

1. Network Booting environment
   
   Please refer to 4. Network Booting for the details of this environment.

2. SD Card Booting environment
   
   Please refer to 5. SD Card Booting for the details of this environment.

2.4 Compile Environment

This is the environment for cross-compiling the Linux application on Linux PC (Ubuntu 20.04 LTS) using RZ/V2MA Linux Standard Development Kit (SDK).

Please refer to 6. SDK for the details of this environment.

2.5 Execution Environment

This is the environment for executing the Linux application on RZ/V2MA.

Please refer to RZ/V2MA DRP-AI Sample Application Note for the details of this environment.
3. Build
This chapter will explain the procedure to deploy DRP-AI Driver to RZ/V2MA Linux Package.

Before reading this chapter, please allocate RZ/V2MA Linux Package and prepare the configuration files (bblayers.conf and local.conf) as explained in the RZ/V2MA Linux Package Start-Up Guide (R01US0578).

Note: If you use DRP-AI Support Package, you need to apply RZ/V2MA Video Codec Package, those two packages must be installed in the following order.

   Step 1. Follow the RZ/V2MA Video Codec Integration Guide (R01US0600) to apply the RZ/V2MA Video Codec Package to the Build Environment.

   Step 2. Follow the Chapter 3.2 of this document to apply the DRP-AI Support Package to the Build Environment.

3.1 Preparation
3.1.1 Operating Environment
Please refer to the RZ/V2MA Linux Package Start-Up Guide (R01US0578) for the operating environment.

3.1.2 Recipe Configuration
This chapter uses meta-rz-features.tar.gz, which content is shown below.

```plaintext
  ➪ meta-rz-features
  ➪ recipes-drpai
      ➪ recipes-app
          ➪ ai-eva-sw
              ➪ ai-eva-sw_*.bb
          ➪ ai-eva-sw
              ➪ rzv_ai_eva_sw
              ➪ ...
      ➪ recipes-core
          ➪ images
              ➪ core-image-bsp.bbappend
              ➪ core-image-minimal.bbappend
      ➪ recipes-drpai
          ➪ drpai
              ➪ drpai_*.bb
              ➪ files
      ➪ recipes-kernel
          ➪ linux
              ➪ linux-renesas_*.bbappend
              ➪ kernel-module-udmabuf
              ➪ linux-renesas
```

Figure 3-1 Directory Structure of Recipe
3.2 Build Instructions

3.2.1 Install Software Package
Please install the following package for environment setup on Ubuntu PC. These are common necessary software package for this chapter.

```bash
$ sudo apt-get update
$ sudo apt-get install gawk wget git-core diffstat unzip texinfo \
gcc-multilib build-essential chrpath socat cpio python3 python3-pip \
python3-pexpect xz-utils debianutils iputils-ping python3-git \
python3-jinja2 libegl1-mesa libstdc++-dev pylint3 xterm \
python3-subunit mesa-common-dev
```

3.2.2 Add the Environmental Variable
As in the RZ/V2MA Linux Package Start-Up Guide (R01US0578), set the working directory as the environmental variable.

```bash
$ export WORK=/home/user/user_work
```

Note: Specify the working directory in red above according to your machine. Example above uses “user/user_work”.

3.2.3 Unzip the DRP-AI Support Package Recipe
Place the rzv2ma_drpai-driver directory to the working directory and run the following command.

```bash
$ cd $WORK
$ tar -zxvf ./rzv2ma_drpai-driver/meta-rz-features.tar.gz
```

After executed the command, recipes-drpai directory will be shown in meta-rz-features directory.
3.2.4 Set the Build Environment Variable
Run the following command to set the environment variable for the build.

Note: The environmental variable will be reset if the terminal is closed. Please run the command for each time you open the terminal.

```
$ cd $WORK
$ source poky/oe-init-build-env
$ cp ../meta-renesas/docs/template/conf/rzv2ma/*.conf ./conf/
```

3.2.5 Build
Run the bitbake command to build the Linux Package.

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

After the Build, following files will be generated under $WORK/build/tmp/deploy/images/rzv2ma.

<table>
<thead>
<tr>
<th>Filename</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>image-rzv2ma.bin</td>
<td>Linux Kernel Image</td>
</tr>
<tr>
<td>r9a09g055ma3gbg-evaluation-board.dtb</td>
<td>Linux Device Tree File</td>
</tr>
<tr>
<td>core-image-bsp-rzv2ma.tar.bz2</td>
<td>A set of root filesystem</td>
</tr>
</tbody>
</table>
4. Network Booting

This chapter will explain the procedure for the Network Booting.

Network Booting is a booting method that mounts the server on Ubuntu PC to access the files which are extracted to memory on the RZ/V2MA Evaluation Board Kit.

4.1 Hardware Configuration

Figure 4-1 shows the hardware configuration for the Network Booting.

![Diagram of Network Booting hardware configuration](image)

Figure 4-1 Hardware Configuration
4.2 Preparation

4.2.1 Equipment

Necessary equipment for Network Booting is as follows.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RZ/V2MA Evaluation Board Kit</td>
<td>Evaluation board kit for RZ/V2MA. For board setup and other information, see RZ/V2MA Linux Package Start-Up Guide (R01US0578).</td>
</tr>
<tr>
<td>Linux PC</td>
<td>Used as build/debug environment for RZ/V2MA Linux software. 100GB of free space on HDD is necessary.</td>
</tr>
<tr>
<td>- OS</td>
<td>Ubuntu 20.04 LTS. Use a 64bit OS.</td>
</tr>
<tr>
<td>- TFTP server</td>
<td>Used for downloading the Linux kernel to board.</td>
</tr>
<tr>
<td>- NFS server</td>
<td>Used for mounting rootfs via NFS.</td>
</tr>
<tr>
<td>Serial to Micro USB Cable</td>
<td>Used for serial communication between PC and board.</td>
</tr>
<tr>
<td>Ethernet cable</td>
<td>Used for ethernet communication between Linux PC and board.</td>
</tr>
<tr>
<td>USB camera</td>
<td>(Optional) Used for image capture. Operation Environment: Logicool C930e Web Cam</td>
</tr>
<tr>
<td>- Type-C to USB-A Adaptor</td>
<td>(Optional) Necessary since USB port on board is Type-C. Operation Environment: SANWA AD-USB28CAF</td>
</tr>
</tbody>
</table>
4.2.2 Files for Booting
Table 4-2 shows the necessary files for booting and their mounted server.

<table>
<thead>
<tr>
<th>Filename</th>
<th>Description</th>
<th>Mounted Server</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image-rzv2ma.bin</td>
<td>Linux Kernel Image (The boot program)</td>
<td>TFTP server on Ubuntu PC</td>
</tr>
<tr>
<td>r9a09g055ma3gbg-evaluation-board.dtb</td>
<td>Linux Device Tree File (The configuration file for booting)</td>
<td>TFTP server on Ubuntu PC</td>
</tr>
<tr>
<td>core-image-bsp-rzv2ma.tar.bz2</td>
<td>A set of root filesystem</td>
<td>NFS server on Ubuntu PC</td>
</tr>
</tbody>
</table>

Note: All files listed above are created in 3 Build.

Necessary files listed above will be mounted to RZ/V2MA Evaluation Board Kit as described below.

4.2.3 Software Package
Please install the following packages and packages used in the 3.2.1 Install Software Package.

These are common necessary software package for this chapter.

```bash
$ sudo apt-get install tftp tftpd-hpa nfs-common nfs-kernel-server cu
```
4.3 Setup

4.3.1 Build TFTP Server

This section will explain how to build TFTP server which will mount the boot program.

Please complete the instruction in 4.2.3. Software Package before reading this section.

This section uses following packages.

- tftp
- tftpd-hpa

1. Create a directory for TFTP server.

   ```
   $ sudo mkdir /tftpboot
   
   Note:       Directory name will be used at booting step. Please use the above directory name.
   ```

2. Setup the TFTP server configuration file.

   Edit `/etc/default/tftpd-hpa` file and change “TFTP_DIRECTORY” as the following configuration.

   ```
   # /etc/default/tftpd-hpa
   TFTP_USERNAME="tftp"
   TFTP_DIRECTORY="/tftpboot"
   TFTP_ADDRESS=":69"
   TFTP_OPTIONS="--secure"
   ```


   ```
   $ sudo systemctl enable tftpd-hpa
   $ sudo systemctl restart tftpd-hpa
   ```

4. Confirm the TFTP server is successfully started.

   Execute the following commands.

   ```
   $ sudo chmod 777 /tftpboot
   $ sudo echo "Hello" > /tftpboot/hello.txt
   $ sudo tftp localhost
   > get hello.txt
   ```

   If the command returns without any errors, the TFTP server is built successfully.

   Note: If above command did not show the expected result, please restart the Ubuntu PC, and try it again.
4.3.2 Setup the Files for TFTP Server
Extract following two files on the TFTP server.
- Image-rzv2ma.bin
- r9a09g055ma3gbg-evaluation-board.dtb

Please execute the following command on Ubuntu PC, which the TFTP server is already started.
Note: <PATH_to_FILE> is a path to the above files.

```bash
$ sudo cp <PATH_to_FILE>/Image-rzv2ma.bin /tftpboot
$ sudo cp <PATH_to_FILE>/r9a09g055ma3gbg-evaluation-board.dtb /tftpboot
```

4.3.3 Build NFS Server
This section will explain how to build the NFS server that will mount the root filesystem.
Please complete the instruction in 4.2.3. Software Package before reading this section.
This section uses following packages.
- nfs-common
- nfs-kernel-server

1. Create a directory for NFS server.

```bash
$ sudo mkdir /nfs/rzv2m -p
```
Note: Directory name will be used at booting step. Please use the above directory name.

2. Start the NFS server.

```bash
$ sudo /etc/init.d/nfs-kernel-server start
```

3. Modify the NFS server configuration.
   Add the following line at the end of `/etc/exports` file.

```bash
/nfs/rzv2m *(rw,no_subtree_check,sync,no_root_squash)
```

4. Refresh the NFS server.

```bash
$ sudo exportfs -a
```

5. Confirm that the NFS server is successfully started.
   Execute the following command. If the same result is shown, the NFS server is successfully started.

```bash
$ showmount -e localhost
Export list for localhost:
/nfs/rzv2m *
```

Note: If above command did not show the expected result, please restart the Ubuntu PC, and try it again.
4.3.4 Setup the Files for NFS Server

Extract the following file on the NFS server.
- core-image-bsp-rzv2ma.tar.bz2

Please execute the following command on Ubuntu PC, which the NFS server is already started.
Note: `<PATH_to_FILE>` is a path to the above files

```
$ sudo tar xfj <PATH_to_FILE>/core-image-bsp-rzv2ma.tar.bz2 -C /nfs/rzv2m
```

4.3.5 Setup the Static IP Address

In order to have ethernet communication between Ubuntu PC and RZ/V2MA Evaluation Board Kit, the IP address of Ubuntu PC must be static.

1. Disable the default network setting. The yaml filename may be different depending on the environment.

   ```
   $ sudo mv /etc/netplan/01-network-manager-all.yaml \
   /etc/netplan/01-network-manager-all.yaml.disabled
   ```

2. Create `/etc/netplan/99-netcfg.yaml` and add the following line.

   ```yaml
   network:
     version: 2
     ethernets:
       enp0s3:
         addresses: [192.168.1.10/24]
         gateway4: 192.168.1.1
         nameservers:
           addresses: [192.168.1.1]
           search: []
           optional: true
   ```

   Note1: The name "enp0s3" may be different depending on the environment.

   Note2: Since IP address stated here will be used when booting, please use the above address.

3. Restart the network.

   ```
   $ sudo netplan apply
   ```
4.3.6 Setup the Serial Communication
Please execute the instructions explained in this section on Ubuntu PC.

Network booting assumes the serial communication will be done between Ubuntu PC and RZ/V2MA Evaluation Board Kit.
Please complete the instruction in 4.2.3. Software Package before reading this section.
This section uses following packages.
   - cu

1. Connect Ubuntu PC and RZ/V2MA Evaluation Board Kit with the Serial to Micro USB Cable.

2. On Ubuntu PC, retrieve the name of serial port by executing the following command.

   ![Command Output]

3. Change the permission of serial port.

   $ sudo chmod 666 /dev/ttyUSB0

4. Execute the following command to start the serial communication.

   $ cu -s 115200 -l /dev/ttyUSB0 --parity none --nostop

<table>
<thead>
<tr>
<th>Configuration Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud rate</td>
<td>115200</td>
</tr>
<tr>
<td>Data bit</td>
<td>8bit</td>
</tr>
<tr>
<td>Parity</td>
<td>none</td>
</tr>
<tr>
<td>Stop bit</td>
<td>1bit</td>
</tr>
</tbody>
</table>

5. Open another console on the Ubuntu PC and change "crtscts" option.

   $ stty -F /dev/ttyUSB0 -crtscts

6. To end the communication, enter "..".
4.4 Boot

This chapter will explain how to boot from the network.

Board information such as switch configuration will not be explained.

Please write the loader files to eMMC.

For more details about switch configuration and how to write the loader files, please refer to RZ/V2MA Linux Package Start-Up Guide (R01US0578).

1. Setup the hardware according to 4.1 Hardware Configuration.

2. Start the server on the Ubuntu PC.

   Normally, the server starts automatically when PC is booted up.

3. Carry out the serial communication according to 4.3.6 Setup the Serial Communication.

4. Turn on the RZ/V2MA Evaluation Board Kit and change the U-boot environment variable.

   Note: Only when switching the booting method from SD Card Booting

   (1) After turned on the RZ/V2MA Evaluation Board Kit, keep pressing the ENTER key.

   (2) The U-boot console will be activated.

   ```
   => env default -a
   => setenv ipaddr 192.168.1.11
   => setenv serverip 192.168.1.10
   => setenv bootcmd run bootnfs
   => saveenv
   => boot
   ```

   (3) Enter the following commands.

   Details of above setting are as follow.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ipaddr</td>
<td>IP address of RZ/V2MA Evaluation Board Kit</td>
</tr>
<tr>
<td>serverip</td>
<td>IP address of Ubuntu PC (IP address defined in 4.3.5 Setup the Static IP Address)</td>
</tr>
<tr>
<td>bootcmd</td>
<td>boot command</td>
</tr>
</tbody>
</table>

5. After the boot-up, login screen will be shown on serial communication console.

   Login information is as follows.

   user: "root"
   password: none
5. **SD Card Booting**

This chapter will explain about the SD Card Booting.

SD Card Booting is a booting method that mount the microSD card to access the files which are extracted to memory on the RZ/V2MA Evaluation Board Kit.

5.1 **Hardware Configuration**

Figure 5-1 shows the hardware configuration for SD Card Booting.

![Figure 5-1 Hardware Configuration](image-url)
5.2 Preparation

5.2.1 Equipment

Necessary equipment for SD Card Booting is as follows.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RZ/V2MA Evaluation Board Kit</strong></td>
<td>Evaluation board kit for RZ/V2MA. For board setup and other information, see RZ/V2MA Linux Package Start-Up Guide (R01US0578).</td>
</tr>
<tr>
<td><strong>Linux PC</strong></td>
<td>Used for creating microSD card. 100GB of free space on HDD is necessary.</td>
</tr>
<tr>
<td><strong>OS</strong></td>
<td>Ubuntu 20.04 LTS. Use a 64bit OS.</td>
</tr>
<tr>
<td><strong>SD card reader</strong></td>
<td>Used for creating microSD card.</td>
</tr>
<tr>
<td><strong>Windows PC</strong></td>
<td>Used for Serial communication display.</td>
</tr>
<tr>
<td><strong>OS</strong></td>
<td>Windows 10</td>
</tr>
<tr>
<td><strong>Terminal software</strong></td>
<td>Used for controlling serial console of the target board. Operation Environment: Tera Term</td>
</tr>
<tr>
<td><strong>Serial port driver</strong></td>
<td>Virtual COM Port driver which enables to communicate Windows PC and the target board via USB which is virtually used as serial port.</td>
</tr>
<tr>
<td><strong>Serial to Micro USB Cable</strong></td>
<td>Used for serial communication between PC and board.</td>
</tr>
<tr>
<td><strong>Ethernet cable</strong></td>
<td>Used for ethernet communication between Linux PC and board.</td>
</tr>
<tr>
<td><strong>microSD card</strong></td>
<td>Used for SD Card Booting. Operation Environment: Transcend USH-I microSD 300S 16GB</td>
</tr>
<tr>
<td><strong>USB camera</strong></td>
<td>(Optional) Used for image capture. Operation Environment: Logicool C930e Web Cam</td>
</tr>
<tr>
<td><strong>Type-C to USB-A Adaptor</strong></td>
<td>(Optional) Necessary since USB port on board is Type-C. Operation Environment: SANWA AD-USB28CAF</td>
</tr>
</tbody>
</table>

5.2.2 Files for Booting

Table 5-2 shows the necessary files for SD Card Booting and their mounted partition on microSD card.

<table>
<thead>
<tr>
<th>Filename</th>
<th>Description</th>
<th>Mounted Server</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image-rzv2ma.bin</td>
<td>Linux Kernel Image (The boot program)</td>
<td>Partition 1</td>
</tr>
<tr>
<td>r9a09g055ma3gbg-evaluation-board.dbt</td>
<td>Linux Device Tree File (The configuration file for booting)</td>
<td>Partition 1</td>
</tr>
<tr>
<td>core-image-bsp-rzv2ma.tar.bz2</td>
<td>A set of root filesystem</td>
<td>Partition 2</td>
</tr>
</tbody>
</table>

Note: All files listed above are created in 3 Build.

5.2.3 Software Package

Please install the packages used in the 3.2.1 Install Software Package before executing this chapter.
5.3 Setup

5.3.1 Setup the SD Card
Please execute the instructions explained in this section on Ubuntu PC.

1. Format the microSD card as shown in the following table according to the RZ/V2MA Linux Package Start-Up Guide (R01US0578).

<table>
<thead>
<tr>
<th>Partition No.</th>
<th>Size</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>128MB or more</td>
<td>fat32</td>
</tr>
<tr>
<td>2</td>
<td>The rest</td>
<td>ext4</td>
</tr>
</tbody>
</table>

Table 5-3 Format of MicroSD Card

2. Setup the partition 1
   Confirm the microSD card is inserted to Ubuntu PC and execute the following command.
   Notes: 
   
   $ sudo mkdir -p /mnt/sd
   $ sudo mount /dev/sdb1 /mnt/sd
   $ sudo cp <PATH_to_FILE>/Image-rzv2ma.bin /mnt/sd
   $ sudo cp <PATH_to_FILE>/r9a09g055ma3ggbg-evaluation-board.dtb /mnt/sd
   $ sync
   $ sudo umount /mnt/sd

3. Setup the partition 2
   Confirm the microSD card is inserted to Ubuntu PC and execute the following command.
   Notes: 
   
   $ sudo mount /dev/sdb2 /mnt/sd
   $ sudo tar xjf <PATH_to_FILE>/core-image-bsp-rzv2ma.tar.bz2 -C /mnt/sd
   $ sync
   $ sudo umount /mnt/sd

4. Eject the microSD card from Ubuntu PC.

5.3.2 Install the Serial Port Driver
In order to carry out the serial communication between Windows PC and RZ/V2MA Evaluation Board Kit, following serial port driver must be installed.

https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers

Download the "CP210x Windows Drivers" and extract it.
Execute the x64 exe file extracted to install the serial port driver.
5.4 Boot
This section will explain how to boot-up from the microSD card.

Board information such as switch configuration will not be explained.
Please write the loader files to eMMC.
For more details about switch configuration and how to write the loader files, please refer to the RZ/V2MA Linux Package Start-Up Guide (R01US0578).

1. Setup the hardware according to 5.1 Hardware Configuration.

2. Carry out the serial communication.
   For Ubuntu PC, refer to the 4.3.6 Setup the Serial Communication.
   For Windows PC, use the terminal emulator software.

   Configuration for serial communication is as follows.
<table>
<thead>
<tr>
<th>Configuration items</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud rate</td>
<td>115200</td>
</tr>
<tr>
<td>Data bit</td>
<td>8bit</td>
</tr>
<tr>
<td>Parity</td>
<td>none</td>
</tr>
<tr>
<td>Stop bit</td>
<td>1bit</td>
</tr>
</tbody>
</table>

3. Turn on the RZ/V2MA Evaluation Board Kit and change the U-boot environment variable.
   Note: Only when switching the booting method from Network Booting.
   (1) After turned on the RZ/V2MA Evaluation Board Kit, keep pressing the ENTER key.
   (2) The U-boot console will be activated.
   (3) Enter the following commands.

   => env default -a
   => setenv bootcmd run bootsd
   => saveenv
   => boot

   Details of above setting are as follow.
   bootcmd: boot command

4. After the boot-up, login screen will be shown on serial communication console.
   Login information is as follows.
   user: “root”
   password: none
6. SDK
This chapter will explain how to construct the Compile Environment, SDK, which is necessary to compile a RZ/V2MA Linux application.

The compiling procedures are explained in the RZ/V2MA DRP-AI Sample Application Note.
This chapter assumes that procedures explained in the 3 Build are already executed and Build Environment is already prepared.

6.1 About the SDK
SDK (Software Development Kit) is a development environment that will allow users to cross-compile the C/C++ source code for RZ/V2MA Linux (ARM64).

6.2 Build SDK
In the working directory, which is set in 3.2.2 Add the Environmental Variable, run the following command.

```
$ cd $WORK
$ source poky/oe-init-build-env
$ bitbake core-image-bsp -c populate_sdk
```

After the Build, following files will be generated under $WORK/build/tmp/deploy/sdk.

<table>
<thead>
<tr>
<th>Filename</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>poky-glibc-x86_64-core-image-bsp-aarch64-rzv2ma-toolchain-3.1.14.sh</td>
<td>SDK Installer Shell Script</td>
</tr>
</tbody>
</table>
6.3 Install SDK
This section uses the file generated in 6.2 Build SDK.

1. On Ubuntu PC, run the following command.

   `cd $WORK/build/tmp/deploy/sdk/
   sudo sh poky-glibc-x86_64-core-image-bsp-aarch64-rzv2ma-toolchain-3.1.14.sh`

   In the Installer, specify the SDK installation directory and enter “Y”.

   Example below installs the SDK to default directory, “/opt/poky/3.1.14”.

   ```
   Poky (Yocto Project Reference Distro) SDK installer version 3.1.14
   =================================================================================
   Enter target directory for SDK (default: /opt/poky/3.1.14):
   You are about to install the SDK to “/opt/poky/3.1.14”. Proceed[Y/n]? Y
   Extracting SDK............................................................done
   Setting it up...done
   Setup /etc/ld.so.conf for the SDK with multilib environment
   Each time you wish to use the SDK in a new shell session, you need to source
   the environment setup script e.g.
   . /opt/poky/3.1.14/environment-setup-aarch64-poky-linux
   . /opt/poky/3.1.14/environment-setup-armv7vet2hf-neon-vfpv4-pokymllib32-
     linux-gnueabi
   ```

2. Confirm that following directories and files are generated under the specified directory.

   Note: “/opt/poky/3.1.14” will be replaced with your SDK installed path.

   ```
   ├── opt
   │   └── poky
   │       └── 3.1.14
   │           └── sysroots
   │               └── environment-setup-aarch64-poky-linux
   │               └── environment-setup-armv7vet2hf-neon-vfpv4-pokymllib32-linux-
   │                              gnueabi
   │               └── site-config-aarch64-poky-linux
   │               └── site-config-armv7vet2hf-neon-vfpv4-pokymllib32-linux-gnueabi
   │               └── version-aarch64-poky-linux
   │               └── version-armv7vet2hf-neon-vfpv4-pokymllib32-linux-gnueabi
   ```

   **Figure 6-1 Directory Structure of SDK**

   The file “environment-setup-aarch64-poky-linux” will be used to change the environment variable to compile the RZ/V2MA Linux application.

   To compile the RZ/V2MA Linux application, please refer to the RZ/V2MA DRP-AI Sample Application Note.
## Version History

<table>
<thead>
<tr>
<th>Ver.</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.30</td>
<td>31 Jan. 2023</td>
<td>Supported the RZ/V2MA Linux Package update to v1.1.0.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supported the RZ/V2MA Video Codec Package update to v0.9.6.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Updated the DRP-AI Translator to v1.81.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supported the DRP-AI Driver update to v2.00.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>From v7.30, must be build together with RZ/V2MA Video Codec Package.</td>
</tr>
</tbody>
</table>
General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)
   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on
   The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state
   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins
   Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals
   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin
   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between \( V_{IL} \) (Max.) and \( V_{IH} \) (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between \( V_{IL} \) (Max.) and \( V_{IH} \) (Min.).

7. Prohibition of access to reserved addresses
   Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products
   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.
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