

# Rockchip RK3326 Linux SDK Quick Start

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## Preface

### Overview

The document presents Rockchip RK3326 Linux SDK release notes, aiming to help engineers get started with RK3326 Linux SDK development and debugging faster.

### Intended Audience

This document (this guide) is mainly intended for:

Technical support engineers

Software development engineers

### Chipset and System Support

Chipset	Buildroot
RK3326/RK3326-S	Y

### Revision History

Date	Version	Author	Revision History
2022-06-16	V1.0.0	WJL	Initial version.
2022-06-20	V1.8.0	WJL	Update version to V1.8.0
2022-09-20	V1.8.1	LinJianHua	Support Linux5.10 SDK
2022-11-20	V1.8.2	Caesar Wang	Update Linux Upgrade Instruction

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# 1. Set up an Development Environment

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It is recommended to use Ubuntu 20.04 for compilation. Other Linux versions may need to adjust the software package accordingly. In addition to the system requirements, there are other hardware and software requirements. Hardware requirements: 64-bit system, hard disk space should be greater than 40G. If you do multiple builds, you will need more hard drive space

Software requirements: Ubuntu 20.04 system:

Please install software packages with below commands to setup SDK compiling environment:

```
sudo apt-get install git ssh make gcc libssl-dev liblz4-tool expect \
g++ patchelf chrpath gawk texinfo chrpath diffstat binfmt-support \
qemu-user-static live-build bison flex fakeroot cmake gcc-multilib \
g++-multilib unzip device-tree-compiler ncurses-dev libgucharmap-2-90-dev \
bzip2 expat gpgv2 cpp-aarch64-linux-gnu g++-aarch64-linux-gnu
```

It is recommended to use Ubuntu 20.04 system or higher version for development. If you encounter an error during compilation, you can check the error message and install the corresponding software packages accordingly.

## 2. Software Development Guide

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### 2.1 Development Guide

Aiming to help engineers get started with SDK development and debugging faster, We have released “Rockchip\_Developer\_Guide\_Linux\_Software\_CN.pdf” with the SDK, please refer to the documents under the project's docs/ directory.

### 2.2 Software Update History

Software release version upgrade can be checked through project xml file by the following command:

```
# Linux4.4 SDK
.repo/manifests$ realpath rk3326_linux_release.xml
# e.g.:printf version v1.8.0, update time on 20220620
<SDK>/.repo/manifests/rk3326_linux_release_v1.8.0_20220620.xml

# Linux4.19 SDK
.repo/manifests$ realpath rk3326_linux4.19_release.xml
# e.g.:printf version v1.2.0, update time on 20220620
<SDK>/.repo/manifests/rk3326_linux4.19_release_v1.2.0_20220620.xml

# Linux5.10 SDK
.repo/manifests$ realpath rk3326_linux5.10_release.xml
```

```
# e.g.:printf version v1.0.0, update time on 20220920
<SDK>/repo/manifests/rk3326_linux5.10_release_v1.0.0_20220920.xml
```

Software release version updated information can be checked through the project text file by the following command:

```
# Linux4.4 SDK
.repo/manifests$ cat RK3326_Linux_SDK_Release_Note.md

# Linux4.19 SDK
.repo/manifests$ cat RK3326_Linux4.19_SDK_Release_Note.md

# Linux5.10 SDK
.repo/manifests$ cat RK3326_Linux5.10_SDK_Note.md
```

Or refer to the project directory:

```
# Linux4.4 SDK
<SDK>/docs/RK3326/RK3326_Linux_SDK_Release_Note.md

# Linux4.19 SDK
<SDK>/docs/RK3326/RK3326_Linux4.19_SDK_Release_Note.md

# Linux5.10 SDK
<SDK>/docs/RK3326/RK3326_Linux5.10_SDK_Note.md
```

## 3. Hardware Development Guide

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Please refer to user guides in the project directory for hardware development:

RK3326 hardware design guide:

```
<SDK>/docs/RK3326/Hardware/Rockchip_RK3326_Hardware_Design_Guide_V1.2_EN.pdf
```

RK3326 EVB hardware development guide:

```
<SDK>/docs/RK3326/Hardware/Rockchip_RK3326_User_Manual_EVB_V1.1_EN.pdf
```

## 4. SDK Building Introduction

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### 4.1 SDK Project Directory Introduction

There are buildroot, debian, recovery, app, kernel, u-boot, device, docs, external and other directories in the project directory. Each directory or its sub-directories will correspond to a git project, and the commit should be done in the respective directory.

- app: store application APPs with Demo.

- buildroot: root file system based on Buildroot (2018.02-rc3).
- device/rockchip: store board-level configuration for each chip and some scripts and prepared files for building and packaging firmware.
- docs: stores development guides, platform support lists, tool usage, Linux development guides, and so on.
- IMAGE: stores building time, XML, patch and firmware directory for each building.
- external: stores some third-party libraries, including audio, video, network, recovery and so on.
- kernel: stores kernel4.4 development code.
- prebuilts: stores cross-building toolchain.
- rkbin: stores Rockchip Binary and tools.
- rockdev: stores building output firmware.
- tools: stores some commonly used tools under Linux and Windows system.
- u-boot: store U-Boot code developed based on v2017.09 version.

## 4.2 SDK Board Level Configuration

Enter the project `<SDK>/device/rockchip/RK3326` directory:

Board level configuration	Note
BoardConfig-rk3326-evb-lp3-v10.mk BoardConfig-rk3326-evb-lp3-v10-32bit.mk	Suitable for RK3326 EVB V10 development board with LPDDR3
BoardConfig-rk3326-evb-lp3-v12.mk BoardConfig-rk3326-evb-lp3-v12-32bit.mk	Suitable for RK3326 EVB V12 development board with LPDDR3
BoardConfig-rk3326-robot64.mk BoardConfig-rk3326-robot64_no_gpu.mk	Suitable for RK3326 Robot development board with tiny system
BoardConfig.mk	Default

The first way:

Add board configuration file behind `./build.sh` , for example:

Select the board configuration of **RK3326 EVB V10 development board with LPDDR3**:

```
./build.sh device/rockchip/rk3326/BoardConfig-rk3326-evb-lp3-v10.mk
or
./build.sh device/rockchip/rk3326/BoardConfig-rk3326-evb-lp3-v10-32bit.mk
```

Select the board configuration of **RK3326 EVB V12 development board with LPDDR3**:

```
./build.sh device/rockchip/rk3326/BoardConfig-rk3326-evb-lp3-v12.mk
or
./build.sh device/rockchip/rk3326/BoardConfig-rk3326-evb-lp3-v12-32bit.mk
```

Select the board configuration of the **RK3326 Robot development board with tiny system**:

```
./build.sh device/rockchip/rk3326/BoardConfig-rk3326-robot64.mk
or
./build.sh device/rockchip/rk3326/BoardConfig-rk3326-robot64_no_gpu.mk
```

The second way:

```
rk3326$ ./build.sh lunch
processing option: lunch

You're building on Linux
Lunch menu...pick a combo:

0. default BoardConfig.mk
1. BoardConfig-rk3326-evb-lp3-v10-32bit.mk
2. BoardConfig-rk3326-evb-lp3-v10.mk
3. BoardConfig-rk3326-evb-lp3-v12-32bit.mk
4. BoardConfig-rk3326-evb-lp3-v12.mk
5. BoardConfig-rk3326-robot64.mk
6. BoardConfig-rk3326-robot64_no_gpu.mk
7. BoardConfig.mk
Which would you like? [0]:
...
```

## 4.3 Compilation Commands

Execute the command in the root directory: `./build.sh -h|help`

```
rk3326$ ./build.sh -h
Usage: build.sh [OPTIONS]
Available options:
BoardConfig*.mk  -switch to specified board config
lunch            -list current SDK boards and switch to specified board config
wifibt          -build wifibt
uboot           -build uboot
uefi            -build uefi
spl             -build spl
loader          -build loader
kernel          -build kernel
modules         -build kernel modules
toolchain       -build toolchain
rootfs          -build default rootfs, currently build buildroot as default
buildroot       -build buildroot rootfs
ramboot         -build ramboot image
multi-npu_boot  -build boot image for multi-npu board
yocto           -build yocto rootfs
debian          -build debian rootfs
pcba            -build pcba
recovery        -build recovery
all             -build uboot, kernel, rootfs, recovery image
cleanall        -clean uboot, kernel, rootfs, recovery
firmware        -pack all the image we need to boot up system
updateimg       -pack update image
otapackage      -pack ab update otapackage image (update_ota.img)
sdpackage       -pack update sdcard package image (update_sdcard.img)
```

```

save                -save images, patches, commands used to debug
allsave             -build all & firmware & updateimg & save
check               -check the environment of building
info                -see the current board building information
app/<pkg>            -build packages in the dir of app/*
external/<pkg>       -build packages in the dir of external/*

createkeys          -create secureboot root keys
security_rootfs     -build rootfs and some relevant images with security paramter
(just for dm-v)
security_boot       -build boot with security paramter
security_uboot      -build uboot with security paramter
security_recovery   -build recovery with security paramter
security_check      -check security paramter if it's good

Default option is 'allsave'.

```

View detailed build commands for some modules, for example: `./build.sh -h kernel`

```

rk3326$ ./build.sh -h kernel
###Current SDK Default [ kernel ] Build Command###
cd kernel
make ARCH=arm64 px30_linux_defconfig rk3326_linux.config
make ARCH=arm64 rk3326-evb-lp3-v10-linux.img -j12

```

## 4.4 Automatic Build

Enter root directory of project directory and execute the following commands to automatically complete all build:

```

./build.sh all # Only build module code(u-Boot, kernel, Rootfs, Recovery)
               # Need to execute ./mkfirmware.sh again for firmware package

./build.sh     # Base on ./build.sh all
               # 1. Add firmware package ./mkfirmware.sh
               # 2. update.img package
               # 3. Copy the firmware in the rockdev directory to the
IMAGE/***_RELEASE_TEST/IMAGES directory
               # 4. Save the patches of each module to the
IMAGE/***_RELEASE_TEST/PATCHES directory
               # Note: ./build.sh and ./build.sh allsave command are the same

```

## 4.5 Build and package each module

### 4.5.1 U-boot Build

```

### U-Boot build command
./build.sh uboot

### To view the detailed U-Boot build command
./build.sh -h uboot

```



## 4.5.2 Kernel Build

```
### Kernel build command
./build.sh kernel

### To view the detailed Kernel build command
./build.sh -h kernel
```

## 4.5.3 Recovery Build

```
### Recovery build command
./build.sh recovery

### To view the detailed Recovery build command
./build.sh -h recovery
```

Note: Recovery is a unnecessary function, some board configuration will not be set

## 4.5.4 Buildroot Build

Enter project root directory and run the following commands to automatically complete compiling and packaging of Rootfs.

```
./build.sh rootfs
```

After build, rootfs.ext4 is generated in Buildroot directory “output/rockchip\_chipset/images”.

## 4.5.5 Cross-compilation

If you need to compile individual modules or third-party applications, you need to configure the cross-compilation environment. For example, RK3326, whose cross-compilation tool is located in the `buildroot/output/rockchip_rk3326_64/host/usr` directory, needs to set the `bin/` directory of the tool and the `aarch64-buildroot-linux-gnu/bin/` directory as environment variables, and execute the script of automatically configuring environment variables in the top-level directory:

```
source envsetup.sh
```

Enter the command to view:

```
cd buildroot/output/rockchip_rk3326_64/host/usr/bin
./aarch64-linux-gcc --version
```

Then the following logs are printed:

```
aarch64-linux-gcc.br_real (Buildroot 2018.02-rc3-XXXXXX) 10.3.0
# XXXXXX is the latest commit ID of Buildroot
```

#### 4.5.5.1 Build Modules in Buildroot

For example, for the busybox module, commonly used build commands are as follows:

- Build busybox

```
SDK$make busybox
```

- Rebuild busybox

```
SDK$make busybox-rebuild
```

- delete busybox

```
SDK$make busybox-dirclean  
or  
SDK$rm -rf buildroot/output/rockchip_rk3326_64/build/busybox-1.34.1
```

#### 4.5.6 Firmware Package

After compiling various parts of Kernel/U-Boot/Recovery/Rootfs above, enter root directory of project directory and run the following command to automatically complete all firmware packaged into rockdev directory:

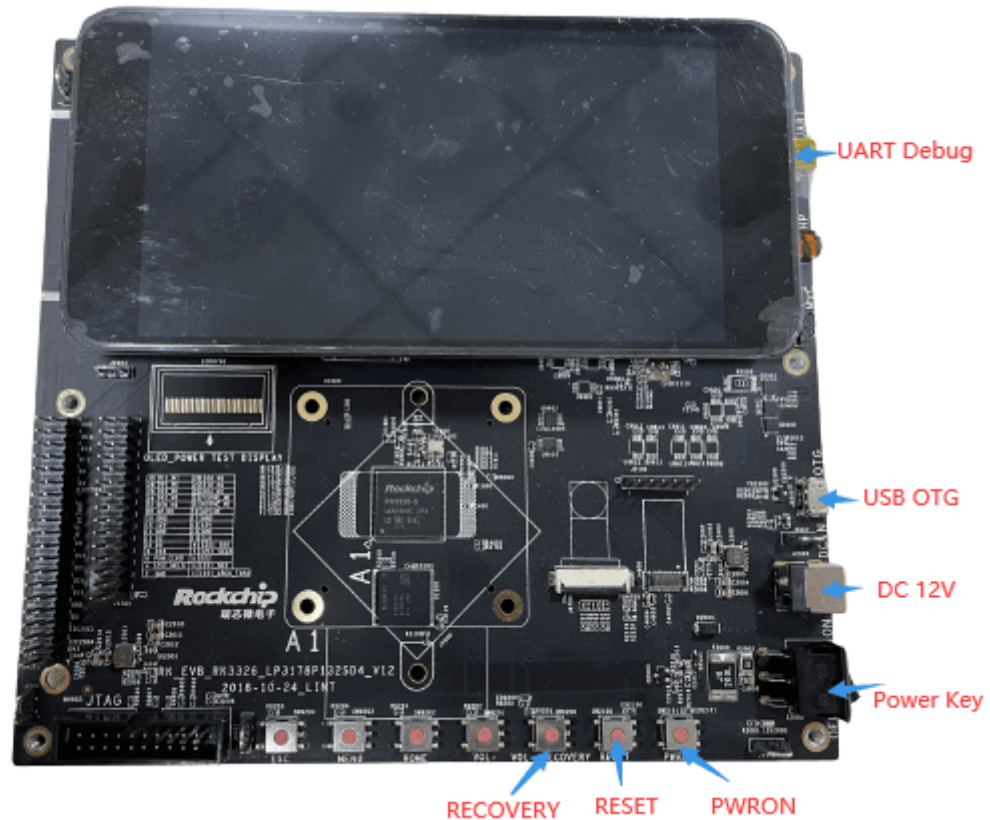
Firmware generation:

```
./mkfirmware.sh
```

## 5. Upgrade Introduction

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Interfaces layout of RK3326 EVB board are showed as follows:

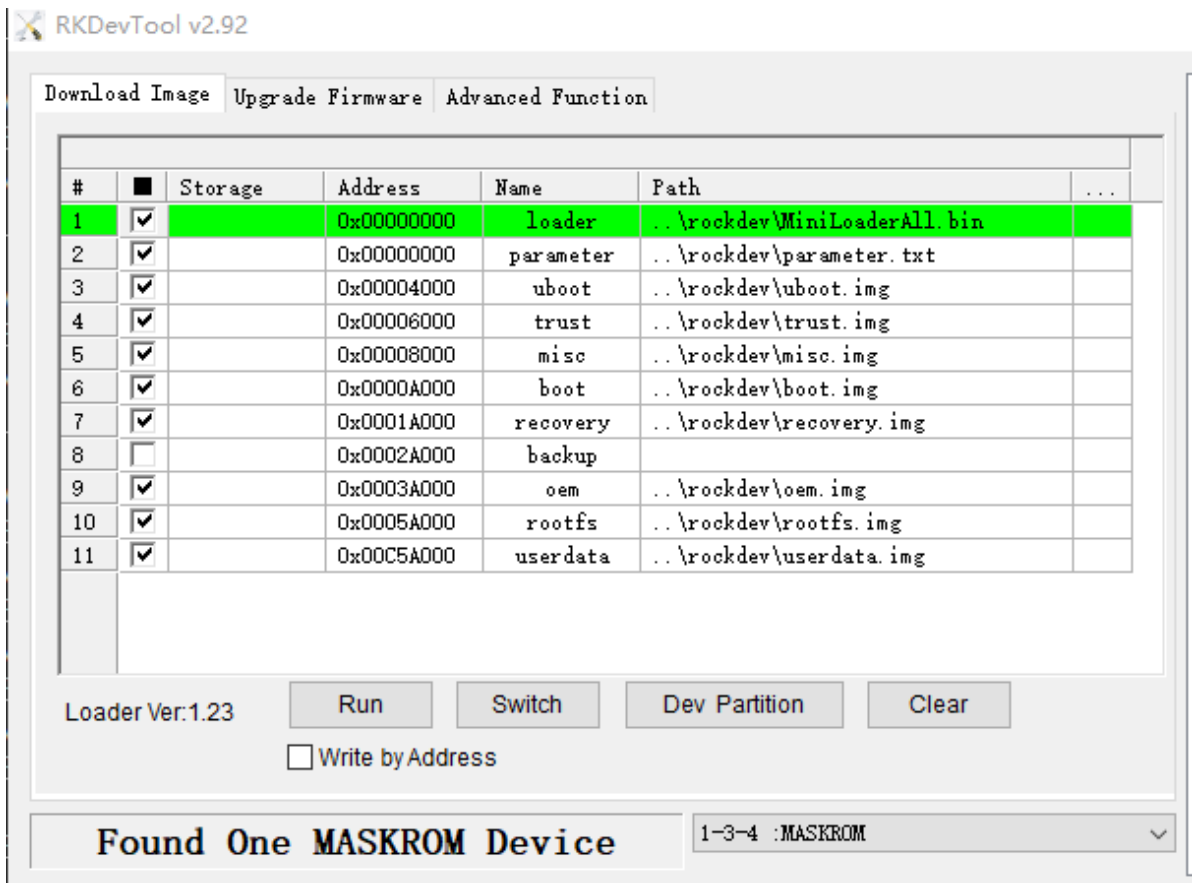


## 5.1 Windows Upgrade Introduction

SDK provides windows upgrade tool (this tool should be V2.92 or later version) which is located in project root directory:

```
tools/  
└─ windows/RKDevTool
```

As shown below, after compiling the corresponding firmware, device should enter MASKROM or BootROM mode for update. After connecting USB cable, long press the button “MASKROM” and press reset button “RST” at the same time and then release, device will enter MASKROM Mode. Then you should load the paths of the corresponding images and click “Run” to start upgrade. You can also press the “recovery” button and press reset button “RST” then release to enter loader mode to upgrade. Partition offset and flashing files of MASKROM Mode are shown as follows (Note: Window PC needs to run the tool as an administrator):



Note: Before upgrade, please install the latest USB driver, which is in the below directory:

<SDK>/tools/windows/DriverAssitant\_v5.11.zip

## 5.2 Linux Upgrade Instruction

The Linux upgrade tool (Linux\_Upgrade\_Tool should be v2.1 or later versions) is located in “tools/linux” directory. Please make sure your board is connected to MASKROM/loader rockusb, if the compiled firmware is in rockdev directory, upgrade commands are as below:

```
sudo ./upgrade_tool ul rockdev/MiniLoaderAll.bin -noreset
sudo ./upgrade_tool di -p rockdev/parameter.txt
sudo ./upgrade_tool di -u rockdev/uboot.img
sudo ./upgrade_tool di -misc rockdev/misc.img
sudo ./upgrade_tool di -b rockdev/boot.img
sudo ./upgrade_tool di -recovery rockdev/recovery.img
sudo ./upgrade_tool di -oem rockdev/oem.img
sudo ./upgrade_tool di -rootfs rockdev/rootfs.img
sudo ./upgrade_tool di -userdata rockdev/userdata.img
sudo ./upgrade_tool rd
```

Or upgrade the whole update.img in the firmware

```
sudo ./upgrade_tool uf rockdev/update.img
```

Or in root directory, run the following command on the machine to upgrade in MASKROM state:

```
./rkflash.sh
```

## 5.3 System Partition Introduction

Default partition introduction (below is RK3326 EVB reference partition):

Number	Start (sector)	End (sector)	Size	Name
1	16384	24575	4096K	uboot
2	24576	32767	4096K	trust
3	32768	40959	4096K	misc
4	40960	106495	32M	boot
5	106496	303104	32M	recovery
6	172032	237567	32M	bakcup
7	237568	368639	64M	oem
8	368640	12951551	6144M	rootfs
9	12951552	30535646	8585M	userdata

- uboot partition: for uboot.img built from uboot.
- misc partition: for misc.img built from recovery.
- boot partition: for boot.img built from kernel.
- recovery partition: for recovery.img built from recovery.
- backup partition: reserved, temporarily useless. Will be used for backup of recovery as in Android in future.
- oem partition: used by manufactor to store their APP or data, mounted in /oem directory
- rootfs partition: store rootfs.img built from buildroot
- userdata partition: store files temporarily generated by APP or for users, mounted in /userdata directory

## 6. RK3326 SDK Firmware

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- Baidu Cloud Disk

[Buildroot](#)

- Microsoft OneDriver

[Buildroot](#)