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## Rockchip R-Box Platform User Manual

(技术研发部, TV 组)

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# 1 简介

本文档介绍了如何基于 Rockchip R-Box 平台配置，编译 android 和编译 Linux 内核，Linux 内核版本号为 3.0.8。

## 2 编译 android

在 android 的根目录下，需要以下几个步骤才能进行编译：

- 1) 初始化环境变量

```
source build/envsetup.sh
```

或者

```
. build/envsetup.sh
```

- 2) 选择编译目标

```
lunch rk30sdk-eng
```

或者

lunch 后选择列表上的对应 rk30sdk-eng 的数字

- 3) 编译代码

```
make -jn
```

注：开启的线程数（n）与编译用 PC 的 CPU 核心数和线程数相关

- 4) 生成固件

```
./mkimage.sh
```

注意：新进入此目录，或者退出此目录后，需要重新做初始化环境变量和选择编译目标，才能编译和生成固件。

详细的编译步骤，也参考：<http://source.android.com/source/building.html>

## 3 编译内核

### 3.1 配置编译工具

打开内核根目录下 Makefile，找到编译器配置路径，默认路径为：

```
ifneq ($(wildcard ../toolchain/arm-eabi-4.4.0),)
```

```
CROSS_COMPILE ?= ../toolchain/arm-eabi-4.4.0/bin/arm-eabi-
```

```
endif
```

请根据实际编译器路径修改上述路径。例如，实际的编译器路径位于 /home/demo/toolchain/arm-eabi-4.4.0，那么可以将上述路径修改为

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```
ifneq ($(wildcard /home/demo/toolchain/arm-eabi-4.4.0),)
CROSS_COMPILE ?= /home/demo/toolchain/arm-eabi-4.4.0/bin/arm-eabi-
endif
```

## 3.2 选择配置文件

R-Box 平台在内核中提供了以下参考配置，分别对应不同的参考电路。

配置文件	参考板
rk2908_itv_defconfig	RK2908 SDK Board
rk29_hotdog_defconfig	RK2908 Dongle, Use ANX7150
rk29_hotdog_D_defconfig	RK2908 Type D Dongle, Use ITE6610
rk30_hamburger_defconfig	RK3066 Box Board
rk30_pizza_defconfig	RK3066 SDK Box Board
rk30_hotdog_defconfig	RK3066 Dongle
rk30_hotdog_ti_defconfig	RK3066 Dongle, Use Ti TPS65910 PMU

### 3.2.1 选择配置

以 2908 开发板为例，要选择 rk2908\_itv\_defconfig 配置，请执行命令：

```
make rk2908_itv_defconfig
```

### 3.2.2 各配置主要功能

#### 3.2.2.1 rk30\_pizza\_defconfig

- RK3066
- 1G RAM, 456MHz
- Dual HDMI: SiI9024A and RK30
- TV Encoder: CH7026, support CVBS and YPbPr
- Codec: HDMI
- SPDIF
- PMU: WM8326
- IR Remoter
- Camera: Soc OV2659 and USB Camera
- WiFi&BT: RT903 (26M Crystal)

### 3.2.2.2 rk30\_hamburg\_defconfig

- RK3066
- 1G RAM, 456MHz
- HDMI: RK30
- TV Encoder: RK1000, support CVBS and YPbPr
- Codec: RK1000
- SPDIF
- PMU: WM8326
- IR Remoter
- USB Camera
- WiFi&BT: RT903 (26M Crystal)

### 3.2.2.3 rk30\_hotdog\_defconfig

- RK3066
- 1G RAM, 324MHz
- HDMI: RK30
- Codec: HDMI
- PMU: WM8326
- IR Remoter
- USB WiFi: RTL8188/8192

### 3.2.2.4 rk2908\_itv\_defconfig

- RK2908
- 1G RAM, 456MHz
- HDMI: IT6610
- TV Encoder: RK1000, support CVBS and YPbPr
- VGA: XN223
- Codec: RK1000
- IR Remoter
- USB Camera
- WiFi&BT: BCM4329

### 3.2.2.5 rk2908\_hotdog\_defconfig

- RK2908

- 1G RAM, 456MHz
- HDMI: ANX7150; Audio input interface is SPDIF
- SPDIF
- IR Remoter
- USB WiFi: RTL8188/8192

### 3.2.2.6 rk30\_hotdog\_ti\_defconfig

- RK3066
- 1G RAM, 324MHz
- HDMI: RK30
- Codec: HDMI
- PMU: Ti TPS65910
- IR Remoter
- USB WiFi: RTL8188/8192

### 3.2.2.7 rk29\_hotdog\_D\_defconfig

- RK2908
- 1G RAM, 456MHz
- HDMI: ITE6610; Audio input interface is SPDIF
- SPDIF
- IR Remoter
- USB WiFi: RTL8188/8192

## 3.3 编译内核

对于 RK2918 或者 rk3066 芯片，请执行命令：

```
make kernel.img
```

对于 RK2908 芯片，请执行命令：

```
make tvbox
```

如果需要多线程编译，请在上述命令后添加“-jn”，n 为开启的编译线程数。例如要 8 线程编译 RK2908 平台内核，可以执行命令：

```
make tvbox -j8
```

注意：开启的线程数与编译用 PC 的 CPU 核心数相关，可开启线程数  $n \leq 2 * \text{CPU 核心数}$ 。

## 4 详细配置

如果实际的电路与提供的参考电路不同，可以根据需要对内核进行配置。

### 4.1 显示输出

#### 4.1.1 Framebuffer

Android 的 Framebuffer 大小与内核的初始输出时序相关，BOX 内核提供三种选择：

Device Drivers --->

Graphics support --->

Display device support --->

LCD Panel Select (ITV framebuffer size and timing is 720P) --->

ITV framebuffer size and timing is 480P

ITV framebuffer size and timing is 720P

ITV framebuffer size and timing is 1080P

分别对应 720x480、1280x720、1920x1080。

#### 4.1.2 HDMI

##### 4.1.2.1 Kernel V3.0.8

###### 4.1.2.1.1 外部的 HDMI Transmitter

Device Drivers --->

Graphics support --->

Display device support --->

[\*] HDMI support(itv version) --->

HDMI/MHL Transmitter Select  --->

HDMI output mode select (depended on EDID) --->

HDMI HDCP Function Enable

[\*] Use irq mode to poll HDMI status

[\*] Enable debug log for HDMI

###### 4.1.2.1.2 主控集成的 HDMI Transmitter

RK3066 集成了 HDMI 输出，其配置选项不同于外部 HDMI Transmitter。

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```
Device Drivers --->
  Graphics support --->
    [*] RK30 HDMI support --->
      [ ] RK30 HDMI Debugging
      [ ] RK30 HDCP support
```

#### 4.1.2.2 Kernel V3.0.36

```
Device Drivers --->
  Graphics support --->
    [*] Rockchip HDMI support --->
```

```
--- Rockchip HDMI support
[*] RK30 HDMI support
   RK30 HDCP support
   [ ] Silicon Image HDMI transmitter siI9022A/9024A support (NEW)
   [ ] Rockchip GPIO CEC (NEW)
   [ ] Rockchip HDMI Debugging (NEW)
   [ ] Mute Codec when HDMI Activated (NEW)
```

#### 4.1.3 VGA

##### 4.1.3.1 Kernel V3.0.8

```
Device Drivers --->
  Graphics support --->
    Display device support --->
      [*] VGA support
```

##### 4.1.3.2 Kernel V3.0.36

暂时不支持。

#### 4.1.4 TV Encoder

##### 4.1.4.1 Kernel V3.0.8

```
Device Drivers --->
  Graphics support --->
    Display device support --->
      [*] TV Encoder support --->
```

- [ ] RK610(Jetta) TV Encoder support
- [ ] RK1000 TV Encoder support
- [\*] Support YPbPr Output
- [\*] Support CVBS Output
- [ ] CH7025/7026 TV Encoder Support

#### 4.1.4.2 Kernel V3.0.36

Device Drivers --->

Graphics support --->

[\*] Rockchip TV Encoder support --->

```

--- Rockchip TV Encoder support
[ ] RK610(Jetta) TV Encoder support (NEW)
[ ] RK1000 TV Encoder support (NEW)
[ ] CH7025/7026 TV Encoder Support (NEW)
    
```

#### 4.1.5 GPIO 和视频源

在 inlude/linux/display-sys.h 定义了显示接口的属性结构体

```

struct rkdisplay_platform_data {
    int property;           //display screen property: main display or aux display.
    int video_source;      //display screen video source
    int io_pwr_pin;        //power control gpio
    int io_reset_pin;      //reset control gpio
    int io_switch_pin;     //cvbs/ypbpr output switch gpio
};
    
```

可以在各自平台的 board 文件中配置各显示接口的属性。

RK29 平台 board 文件: arch/arm/mach-rk29/board-rk29-itv.c

RK30 平台 board 文件: arch/arm/mach-rk30/board-rk30-box.c

以 RK30 平台, HDMI Transmitter SiI9024 为例, 其属性结构体定义为:

```

static struct rkdisplay_platform_data hdmi_data = {
#ifdef CONFIG_HDMI_RK30
    .property          = DISPLAY_AUX,
#else
    .property          = DISPLAY_MAIN,
#endif
    .video_source      = DISPLAY_SOURCE_LCDC0,
    .io_pwr_pin        = INVALID_GPIO,
    .io_reset_pin     = RK30_PIN4_PD4,
};
    
```

};

若使能 RK30 内部 HDMI 时，显示属性为辅助显示（DISPLAY\_AUX），否则为主显示（DISPLAY\_MAIN）。其视频数据来源为 LCDC0（DISPLAY\_SOURCE\_LCDC0），无电源控制引脚，复位引脚为 GPIO4\_D4(RK30\_PIN4\_PD4)。

中断引脚定义为 GPIO4\_D3(RK30\_PIN4\_PD4)，定义如下：

```
#if defined (CONFIG_SII902X)
{
    .type          = "sii902x",
    .addr          = 0x72 >> 1,
    .flags         = 0,
    .irq           = RK30_PIN4_PD3,
    .platform_data = &hdmi_data,
},
#endif
```

#### 4.1.6 LED 状态灯

若要支持 LED 灯标示显示输出状态，需要两个步骤来配置：

- 内核选项打开显示 LED 支持

Device Drivers --->

Graphics support --->

Display device support --->

[\*] Enable Keyboard and Led control

- 在各自平台的 board 文件中配置 LED 灯控制 GPIO

RK29 平台 board 文件：arch/arm/mach-rk29/board-rk29-itv.c

RK30 平台 board 文件：arch/arm/mach-rk30/board-rk30-box.c

以 RK3066 SDK BOX Board 为例，LED 灯配置位于 board-rk30-box.c 的数组 static struct gpio\_led rk29\_leds[]，其内部 HDMI LED 灯配置为

```
#ifdef CONFIG_HDMI_RK30
{
    .name = "hdmi-soc",
    .gpio = RK30_PIN4_PD7,
    .active_low = 0,
    .retain_state_suspended = 0,
    .default_state = LEDS_GPIO_DEFSTATE_OFF,
},
#endif
```

LED 控制 GPIO 为 GPIO4\_D7(RK30\_PIN4\_PD7)，高电平点亮 LED(.active\_low = 0)，默认状态为灯灭 (.default\_state = LEDS\_GPIO\_DEFSTATE\_OFF)

## 4.2 音频

### 4.2.1 Codec

```

Device Drivers --->
  <*> Sound card support --->
    <*> Advanced Linux Sound Architecture --->
      <*> ALSA for SoC audio support --->
        <*> SoC Audio for the rockchip RK29/RK30 System-on-Chip
        [*] Soc RK29 I2S 8 Channel support(I2S0)
        [] Soc RK29 I2S 2 Channel support(I2S1)
        [] Soc RK29 I2S 2 Channel support(I2S2)
        Set audio DMA event mode (static mode) --->
        <> SoC I2S Audio support for rockchip - WM8900
        <> SoC I2S Audio support for rockchip - RT5631
        <*> SoC I2S Audio support for rockchip - RK1000
        <> SoC I2S Audio support for rockchip - HDMI
        <> SoC I2S Audio support for rockchip - RK610
        Set i2s type (Codec run in Slave) --->
  
```

备注： SoC I2S Audio support for rockchip – HDMI 是配合 HDMI 使用的虚拟 Codec，如果电路上不存在可操作的 I2C Codec，建议使用该项。

### 4.2.2 SPIDF

```

Device Drivers --->
  <*> Sound card support --->
    <*> Advanced Linux Sound Architecture --->
      <*> ALSA for SoC audio support --->
        [*] spdif support for rockchip rk29 or rk30
  
```

### 4.2.3 USB AUDIO

```

Device Drivers --->
  <*> Sound card support --->
    <*> Advanced Linux Sound Architecture --->
      [*] USB sound devices --->
        <*> USB Audio/MIDI driver
  
```

## 4.3 多功能设备

RK1000/RK610 是多功能设备，其内部集成了不同的功能，它们的驱动配置选项分配各自功能模块。

### 4.3.1 RK1000

RK1000 的配置有三部分：

- 控制：

Device Drivers --->

[\*] Multifunction device drivers --->

[\*] Support for RockChip Multimedia RK1000

- TV Encoder

Device Drivers --->

Graphics support --->

Display device support --->

[\*] TV Encoder support --->

[\*] RK1000 TV Encoder support

[\*] Support YPbPr Output

[\*] Support CVBS Output

- Codec

Device Drivers --->

<\*> Sound card support --->

<\*> Advanced Linux Sound Architecture --->

<\*> ALSA for SoC audio support --->

<\*> SoC I2S Audio support for rockchip - RK1000

### 4.3.2 RK610

RK610 配置包括四个部分：

- 控制

Device Drivers --->

[\*] Multifunction device drivers --->

[\*] Support for RockChip Multimedia RK610 (Jetta)

- HDMI

Device Drivers --->

Graphics support --->

Display device support --->

[\*] HDMI support(itv version) --->

HDMI/MHL Transmitter Select  
(Rockchip HDMI transimtter RK610(Jetta))--->

- TV Encoder
  - Device Drivers --->
    - Graphics support --->
      - Display device support --->
        - [\*] TV Encoder support --->
          - [\*] RK610 (Jetta) TV Encoder support
          - [\*] Support YPbPr Output
          - [\*] Support CVBS Output
- Codec
  - Device Drivers --->
    - <\*> Sound card support --->
      - <\*> Advanced Linux Sound Architecture --->
        - <\*> ALSA for SoC audio support --->
          - <\*> SoC I2S Audio support for rockchip – RK610

## 4.4 WiFi

- Device Drivers --->
  - [\*] Network device support --->
    - [\*] Wireless LAN --->
      - [\*] Wireless LAN (IEEE 802.11)
        - WiFi device driver support (Realtek 8192C USB WiFi) --->
          - [\*] Enable NL80211 support

目前支持的 WiFi 型号有:

- Broadcom BCM4329 WiFi/BT Combo SDIO
- Broadcom BCM4319 WiFi SDIO
- Marvell MV8686 SDIO
- Realtek 8192C USB WiFi
- Realtek rtl8188EU USB WiFi
- Atheros AR6003/AR6302 SDIO
- RK901/RK903/BCM4330

当选择 RK901/RK903/BCM4330 时，还有以下选项需要配置

- [\*] Enable NL80211 support
  - Select the wifi module (RK903) ---> (选择模组型号: RK901/RK903/BCM4330)
  - Select the wifi module crystal freq (26M) ---> (选择晶振频率: 26M/37.4M)

注意: USB wifi 不能与蓝牙共存，因此要使用 USB wifi，必须关闭如下蓝牙配置

```
Device Drivers --->
  Networking support --->
    [] RF switch subsystem support
```

## 4.5 USB

```
Device Drivers --->
  [*] USB support --->
    <*> Support for Host-side USB
    [*] USB announce new devices
    [*] USB device class-devices (DEPRECATED)
    <*> USB Mass Storage support
    <*> USB Serial Converter support --->
    <*> USB Gadget Support --->
    <> RockChip USB 1.1 host controller
    <*> Rockchip USB 2.0 host controller
    [*] ---usb2.0 host controller enable
    <*> RockChip USB 2.0 OTG controller
        USB2.0 OTG controller mode (BOTH HOST AND SLAVE) --->
        Controller default status (DEVICE) --->
```

## 4.6 红外遥控器

```
Device Drivers --->
  Input device support --->
    [*] rkxx remotectl --->
    <*> rkxx remotctrl
```

## 4.7 蓝牙

```
Networking support --->
  [*] bluetooth subsystem support --->
    [*] L2CAP protocol support
    [*] SCO links support
    <*> RFCOMM protocol support
    [*] RFCOMM TTY support
    <*> BNEP protocol support
    [*] HIDP protocol support
```

```

Bluetooth device drivers --->
  <*> HCI UART driver
  [*]   UART(H4) protocol support
  <*> HCI BCM4325 UART driver
        BD_ADDR read from (NAND ID block)
[*] RF switch subsystem support --->
  [*] Power off on suspend
  [*] Rockchips RFKILL driver
  
```

## 4.8 以太网

```

Device Drivers --->
  Networking support --->
    [*] Ethernet (10 or 100Mbit) --->
      <*> RK29 VMAC ethernet support
  
```

## 4.9 3G

### 1. USB 部分配置

```

Device Drivers --->
  USB support --->
    [ ] USB Modem(CDC ACM) support
    注：ACM 驱动存在问题，去除"USB Modem (CDC ACM) support"
    <*> USB Serial Converter support
    [*] USB Generic Serial Driver
    <*> USB driver for GSM and CDMA modems
  
```

### 2. PPP 协议配置

```

Device Drivers --->
  Networking support --->
    <*> PPP (Point-to-point protocol) support
    [*]   PPP multilink support (EXPERIMENTAL)
    [*]   PPP filtering
    [*]   PPP support for async serial ports
    [*]   PPP support for sync tty ports
    [*]   PPP Deflate compression
    [*]   PPP BSD-Compress compression
  
```

## 4.10 PPPoE

Device Drivers --->

Networking support --->

- <\*> PPP (Point-to-point protocol) support
  - [\*] PPP multilink support (EXPERIMENTAL)
  - [\*] PPP filtering
  - [\*] PPP support for async serial ports
  - [\*] PPP support for sync tty ports
  - [\*] PPP Deflate compression
  - [\*] PPP BSD-Compress compression
  - [\*] PPP over Ethernet (EXPERIMENTAL)

## 4.11 Camera

Device Drivers --->

<\*> Multimedia support --->

[\*] Video capture adapters --->

- <> ov7675 camera support for rockchip
- <> ov2655 camera support for rockchip
- <> ov2659 camera support for rockchip
- <> ov7690 camera support for rockchip
- <> ov9650 camera support for rockchip
- <> ov2640 camera support for rockchip
- <> ov3640 camera support for rockchip
- <> ov3660 camera support for rockchip
- <> ov5642 camera support for rockchip
- <> ov5640 camera support for rockchip
- [\*] V4L USB devices --->
  - <> USB Philips Cameras
  - <> USB ZR364XX Camera support
  - <> USB Syntek DC1125 Camera support
  - <> USB Sensoray 2255 video capture device

## 4.12 Special HID

Device Drivers --->

[\*] HID Devices --->

Special HID drivers --->

- <\*> Roccat Kova[+] mouse support
- <\*> Roccat Pyra mouse support
- <\*> Samsung InfraRed remote control or keyboards
- <\*> Sony PS3 controller

## 4.13 PMU 电源管理芯片

目前 sdk 支持两款 pmu 芯片，ti 的 tps29510 和 wm 的 wm8326.

### 4.13.1 ti tps29510

Device Drivers --->

[\*] Multifunction device drivers --->

```
[*] TPS65910 Power Management chip
[ ] TPS65912 Power Management chip with I2C
[ ] Texas Instruments TWL4030/TWL5030/TWL6030/TPS659x0 Support
[ ] Support TI Codec Aic3262
[ ] Support STMicroelectronics STMPE
[ ] Support Toshiba TC35892 and variants
[ ] Support Toshiba T7L66XB
[ ] Support Toshiba TC6387XB
[ ] Support Toshiba TC6393XB
[ ] Dialog Semiconductor DA9030/DA9034 PMIC Support
[ ] Analog Devices ADP5520/01 MFD PMIC Core Support
[ ] Maxim Semiconductor MAX8925 PMIC Support
[ ] Maxim Semiconductor MAX8997/8966 PMIC Support
[ ] Maxim Semiconductor MAX8998/National LP3974 PMIC Support
< > Support Wolfson Microelectronics WM8400
```

Device Drivers --->

[\*] Voltage and Current Regulator Support ---> (共两处地方)

```
< > Maxim MAX8952 Power Management IC
<*> TI TPS65910/TPS65911 Power Regulators
<*> Wolfson Microelectronics WM831x PMIC regulators
< > National Semiconductors LP3971 PMIC regulator driver
< > National Semiconductors LP3972 PMIC regulator driver
< > TI TPS65023 Power regulators
< > TI TPS6507X Power regulators
< > rk2818 Charger IC
< > rk2818 pmic lp8725
< > Active Semi ACT8891 PMIC regulators
< > rk2918 pwm voltage regulator
<*> rk30 pwm voltage regulator for discrete dc/dc or ldo
< > Intersil ISL6271A Power regulator
< > Analog Devices AD5398/AD5821 regulators
```

注意：使用 pwm 调整电压的需要打开宏 rk30 pwm voltage regulator for discrete dcde or ldo

Device Drivers --->

[\*] Real Time Clock --->

```
<*> Wolfson Microelectronics WM831x RTC
*** on-CPU RTC drivers ***
<*> tps65910 rtc for rk
```

### 4.13.2 wm8326

Device Drivers --->

[\*] Multifunction device drivers ---

```
--- Multifunction device drivers
[ ] Support Marvell 88PM8606/88PM8607
< > Support for silicon Motion SM501
[ ] Support for Compaq ASIC3
[ ] HTC EGPIIO support
< > HTC PASIC3 LED/DSLWM chip support
[ ] HTC I2C PLD chip support
< > TPS61050/61052 Boost Converters
< > TPS6501x Power Management chips
< > TPS6507x Power Management / Touch Screen chips
[ ] TPS6586x Power Management chips
[ ] TPS65910 Power Management chip
[ ] TPS65912 Power Management chip with I2C
[ ] Texas Instruments TWL4030/TWL5030/TWL6030/TPS659x0 Support
[ ] Support TI Codec Aic3262
[ ] Support STMicroelectronics STMPE
[ ] Support Toshiba TC35892 and variants
[ ] Support Toshiba T7L66XB
[ ] Support Toshiba TC6387XB
[ ] Support Toshiba TC6393XB
[ ] Dialog Semiconductor DA9030/DA9034 PMIC Support
[ ] Analog Devices ADP5520/01 MFD PMIC Core Support
[ ] Maxim Semiconductor MAX8925 PMIC Support
[ ] Maxim Semiconductor MAX8997/8966 PMIC Support
[ ] Maxim Semiconductor MAX8998/National LP3974 PMIC Support
< > Support Wolfson Microelectronics WM8400
[*] Support Wolfson Microelectronics WM831x/2x PMICs with I2C
[ ] Support Wolfson Microelectronics WM8350 with I2C
[ ] Support Wolfson Microelectronics WM8994
```

Device Drivers --->

[\*] Voltage and Current Regulator Support --->

```
--- voltage and Current Regulator Support
[ ] Regulator debug support
[ ] Provide a dummy regulator if regulator lookups fail
< > Fixed voltage regulator support
< > Virtual regulator consumer support
< > Userspace regulator consumer support
< > TI bq24022 Dual Input 1-Cell Li-Ion Charger IC
< > Maxim 1586/1587 voltage regulator
< > Maxim 8649 voltage regulator
< > Maxim 8660/8661 voltage regulator
< > Maxim MAX8952 Power Management IC
< * > Wolfson Microelectronics WM831x PMIC regulators
< > National Semiconductors LP3971 PMIC regulator driver
< > National Semiconductors LP3972 PMIC regulator driver
```

Device Drivers --->

[\*] Real Time Clock --->

```
< > ST M48T86/Dallas DS12887
< > ST M48T35
< > ST M48T59/M48T08/M48T02
< > Oki MSM6242
< > TI BQ4802
< > Ricoh RP5C01
< > EM Microelectronic v3020
< * > Wolfson Microelectronics WM831x RTC
*** on-CPU RTC drivers ***
```

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