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Rockchip_3G_DONGLE_配置说明

Rockchip_3G_DONGLE_Configuration_Introduction

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V1.2	赵子初 Zhao Zichu	2020-02-21	增加 Android10.0 的支持 Add Android10.0 support	

目 录 Contents

1 目的 Purpose

明确 android 平台上 3g dongle 支持原理和注意事项。

To introduce 3g dongle support principle and notices based on Android platform.

1.1 Kernel 注意事项 Kernel notices

如果插入 3G dongle 无法被系统识别，需要添加 3G dongle 的 pid 和 vid 支持。

If the 3G dongle inserted cannot not be recognized by the system, need to add the support of pid and vid for 3G dongle.

以华为 MU509 为例：

Take Huawei MU509 as example:

```
diff --git a/drivers/usb/serial/option.c b/drivers/usb/serial/option.c
index 2317e59..74be8d1 100755
--- a/drivers/usb/serial/option.c
+++ b/drivers/usb/serial/option.c
@@ -80,6 +80,7 @@ static void option_instat_callback(struct urb *urb);
 #define OPTION_PRODUCT_GTM380_MODEM            0x7201

 #define HUAWEI_VENDOR_ID                       0x12D1
+#define HUAWEI_PRODUCT_MU509                    0x1001
 #define HUAWEI_PRODUCT_E173                    0x140C
 #define HUAWEI_PRODUCT_E140C                    0x140C
 #define HUAWEI_PRODUCT_K4505                   0x1464
@@ -597,6 +598,7 @@ static const struct usb_device_id option_ids[] = {
        { USB_DEVICE(QUANTA_VENDOR_ID, QUANTA_PRODUCT_GLX) },
        { USB_DEVICE(QUANTA_VENDOR_ID, QUANTA_PRODUCT_GKE) },
        { USB_DEVICE(QUANTA_VENDOR_ID, QUANTA_PRODUCT_GLE) },
+       { USB_DEVICE(HUAWEI_VENDOR_ID, HUAWEI_PRODUCT_MU509) },
        { USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, HUAWEI_PRODUCT_E140C, 0xff, 0xff, 0xff) },
        //{ USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, HUAWEI_PRODUCT_E173, 0xff, 0xff, 0xff),
        //      .driver_info = (kernel_ulong_t) &net_intf1_blacklist },
```

1.2 Android 注意事项 Android notices

SDK 通常默认 dongle 功能是关闭的，需要 dongle 功能的项目可以在 BoradConfig.mk 中将 BOARD_HAVE_DONGEL 设置为 true 启用 dongle 功能。

Generally, the dongle function in SDK is disabled by default. For the project requiring dongle function, set BOARD_HAVE_DONGEL as true in BoradConfig.mk can enable dongle function.

```
#enable 3g dongle
BOARD_HAVE_DONGLE ?= false
```

1.2.1 Android7.1 注意事项 Android7.1 notices

Android7.1 只需要打开 BOARD_HAVE_DONGEL，没有其他配置。

Android7.1 only requires to enable BOARD_HAVE_DONGEL, without any other configuration.

1.2.2 Android8.0 注意事项 Android8.0 notices

需要在 device/rockchip/common/manifest.xml 加入以下修改：

Need to add the following modification in device/rockchip/common/manifest.xml:

```
<hal format="hidl">
    <name>android.hardware.radio</name>
    <transport>hwbinder</transport>
    <version>1.0</version>
    <interface>
        <name>IRadio</name>
        <instance>slot1</instance>
    </interface>
    <interface>
        <name>ISap</name>
        <instance>slot1</instance>
    </interface>
</hal>
<hal format="hidl">
    <name>android.hardware.radio.deprecated</name>
    <transport>hwbinder</transport>
    <version>1.0</version>
    <interface>
        <name>IOemHook</name>
        <instance>slot1</instance>
    </interface>
</hal>
```

1.2.3 Android9.0 注意事项 Android9.0 notices

1. 要关闭 sepolicy，device/rockchip/common/BoardConfig.mk 中将 PRODUCT_SEPOLICY_SPLIT 设置为 false

   Need to close sepolicy. Set PRODUCT_SEPOLICY_SPLIT as false in device/rockchip/common/BoardConfig.mk.

2. 在对应的 manifest 中加入以下修改，如果不知道使用的是哪一个 manifest，可以在工程目录 lunch 后使用以下命令查看，以 RK3399 为例：

   Add the following modification in the corresponding manifest. If not sure which manifest is used, you can use the following command to check after lunch the project directory. Take RK3399 as example:

   get_build_var DEVICE_MANIFEST_FILE，执行后得到以下结果：

Get the result as below after execution:

device/rockchip/rk3399/manifest.xml

```
    <hal format="hidl">
        <name>android.hardware.radio</name>
        <transport>hwbinder</transport>
        <version>1.2</version>
        <interface>
            <name>IRadio</name>
            <instance>slot1</instance>
        </interface>
    </hal>
    <hal format="hidl">
        <name>android.hardware.radio.deprecated</name>
        <transport>hwbinder</transport>
        <version>1.0</version>
        <interface>
            <name>IOemHook</name>
            <instance>slot1</instance>
        </interface>
</hal>
```

3. device.mk 文件加入以下修改：

Add the following modification in device.mk file:

```
device/rockchip/rk3399$ git diff
diff --git a/device.mk b/device.mk
index daeaac5..8ed5ebc 100755
--- a/device.mk
+++ b/device.mk
@@ -101,6 +101,8 @@ PRODUCT_PROPERTY_OVERRIDES += \
        ro.ril.ecclist=112,911 \
        ro.opengles.version=196610 \
        wifi.interface=wlan0 \
+       vendor.rild.libpath=/vendor/lib64/libril-rk29-dataonly.so \
+       vendor.rild.libargs=-d /dev/ttyACM0 \
        rild.libpath=/vendor/lib64/libril-rk29-dataonly.so \
        rild.libargs=-d /dev/ttyACM0 \
        persist.tegra.nvmmlite = 1 \
```

1.2.4 Android10.0 注意事项 Android10.0 notices

1. 在对应的 manifest 中加入以下修改，如果不知道使用的是哪一个 manifest，可以在工程目录 lunch 后使用以下命令查看，以 RK3399 为例：

   Add the following modification in the corresponding manifest. If not sure which manifest is used, you can use the following command to check after lunch the project directory. Take RK3399 as example:

   get_build_var DEVICE_MANIFEST_FILE，执行后得到以下结果：
   Get the result as below after execution:
   device/rockchip/rk3399/manifest.xml

```
    <hal format="hidl">
        <name>android.hardware.radio</name>
        <transport>hwbinder</transport>
        <fqname>@1.1::ISap/slot1</fqname>
        <fqname>@1.1::IRadio/slot1</fqname>
    </hal>
    <hal format="hidl">
        <name>android.hardware.radio.deprecated</name>
        <transport>hwbinder</transport>
        <version>1.0</version>
        <interface>
            <name>IOemHook</name>
            <instance>slot1</instance>
        </interface>
</hal>
```

2. device.mk 文件加入以下修改：

   Add the following modification in device.mk file:

```
device/rockchip/rk3399$ git diff
diff --git a/device.mk b/device.mk
index daeaac5..8ed5ebc 100755
--- a/device.mk
+++ b/device.mk
@@ -101,6 +101,8 @@ PRODUCT_PROPERTY_OVERRIDES += \
        ro.ril.ecclist=112,911 \
        ro.opengles.version=196610 \
        wifi.interface=wlan0 \
+       vendor.rild.libpath=/vendor/lib64/libril-rk29-dataonly.so \
+       vendor.rild.libargs=-d /dev/ttyACM0 \
```

```
rild.libpath=/vendor/lib64/libril-rk29-dataonly.so \
rild.libargs=-d /dev/ttyACM0 \
persist.tegra.nvmmlite = 1 \
```

2 Dongle 上网原理说明 Dongle networking principle

插入 dongle 后，通过 usb modem switch 通过 PID/VID 完成从 CDROM 到 MODEM 的切换，切换完成后，usb 加载相应的驱动。加载完驱动后，系统中会出现 ttyACM*或 ttyUSB*的串口。之后通过此串口发送 AT Command 完成拨号上网。

After the dongle is connected, it will switch from CDROM to MODEM through usb modem switch by PID/VID, and usb will load the corresponding driver after the switch is completed. After loading the driver, ttyACM* or ttyUSB* serial port will appear in the system. Then send AT Command through the serial port can implement dial-up networking.

2.1 Dongle 模式切换 Dongle mode switch

市面上的大部分 dongle 默认模式是存储模式，需要切换到 modem 模式才能用于上网。这里我们用到一个开源的工具（usb_modeswitch）来对 dongle 模式进行切换。

The default mode of most dongle in the market is memory mode, which should be switched to modem mode for networking. Here we use an open-sourced tool (usb_modeswitch) to switch the dongle mode.

涉及代码：

Relative code:

system/vold

external/usb_modeswitch

vold 负责监视系统是否有 3G dongle 设备出现，并调用 usb_modeswitch 进行 USB 模式切换。

Vold is responsible for monitoring whether there is 3G dongle existing, and invoking usb_modeswitch to switch USB mode.

注意：Android9.0 之后 vold 监听部分的代码移到 external/usb_modeswitch/usb_dongle 中，代码逻辑不变。

Note: after Android9.0 the monitoring part code of vold is transferred to external/usb_modeswitch/usb_dongle, but the code logic is unchanged.

代码如下：

The code is as below:

```
int G3Dev::handleUsbEvent(NetlinkEvent *evt) {
 const char *devtype = evt->findParam("DEVTYPE");
    if( devtype!=NULL &&strcmp(devtype, "usb_device") )
        return 0;
        pid_t status ;

        NetlinkEvent::Action action = evt->getAction();
        if( action == NetlinkEvent::Action::kAdd)
        {
        const char *product = evt->findParam("PRODUCT");
        if(product!=NULL && product[0] != 0 && devtype[0] != 0 )
        {
            // 获取VID/PID
            int vid = 0;
            int pid = 0;
            char * next = (char*)product;
            vid = strtol(product, &next, 16);

                        //char pre[]="sVe.GT";
            ++next;
            pid = strtol(next, NULL, 16);

            SLOGD("== current usb device: %04X/%04X ===", vid, pid);

            char configure_file[2048];


            sprintf(configure_file, "/etc/usb_modeswitch.d/%04x_%04x", vid, pid);
            if( access(configure_file, 0) == 0 )
            {
                sprintf(modeswitch_cmd, "/system/bin/usb_modeswitch -W -v %04x -p %04x -c %s &", vid, pid,configure_file);
                SLOGD("=== USB Switch: %s", modeswitch_cmd);
                system(modeswitch_cmd);
            }
        }
        }

    return 0;
}
```

usb_modeswitch 已经支持市面上的大部分 dongle 的模式切换，相关配置文件可以查看：external/usb_modeswitch/usb_modeswitch.d/目录，配置文件命名方式为 pid_vid。

usb_modeswitch already supports the mode switch for most dongle in the market. Relative configuration files refer to the files which are named with pid_vid in the directory of external/usb_modeswitch/usb_modeswitch.d/.

如果所使用的 dongle 没有在 SDK 支持范围，可以按照《3G 数据卡 USB 切换文件制作说明_v1.2.pdf》来制作配置文件。

If the dongle used is not covered by SDK, you can make the configuration file according to the file 《3G 数据卡 USB 切换文件制作说明_v1.2.pdf》.

2.2 拨号上网 Dial-up networking

Dongle 拨号上网我们使用的是 Android 自带的 3G 上网流程。（相应的流程都是 Android 标准的，可自行网上查看）

We use Android built-in 3G networking process for dongle dial-up networking. (the processes are all Android standard, you can search through internet by self)

主要涉及代码：

Main relative code:

hardware/ril/ril-rk29-dataonly

external/ppp/chat

external/ppp/pppd

ril-rk29-dataonly 是 RK 根据 Android 上网流程实现的 vendor ril，用于和 dongle 通信，接收 Android 命令并调用 chat 和 pppd 实现网上功能。chat 是拨号工具。pppd 是点对点协议(Point to Point Protocol)；

ril-rk29-dataonly is the vendor ril developed by RK according to Android networking process. It is

used to communicate with dongle, receive Android commands and invoke chat and pppd to implement networking function. Chat is the dial-up tool. Pppd is the point to point protocol.

3 Android 部分移植涉及到的文件目录 Relative file directory for porting Android part

3.1 Vendor 目录 Vendor directory

该目录下的 vendor/rockchip/common/phone/文件夹内包含了 usb_modeswitch、chat、RIL 库的编译以及 PPP 拨号脚本的拷贝，这些拷贝的文件最终在 system/etc/ 目录下，如果手动改写了这些文件，可以通过以下命令修改权限：

The vendor/rockchip/common/phone/ folder under the directory includes the copies of usb_modeswitch, chat, RIL libs compiling scripts and PPP dial-up scripts, which will finally be in the system/etc/ directory. If these files are modified manually, you can modify the authority through the following commands:

chown root /system/bin/pppd

chmod 4755 /system/bin/pppd

chown root /system/bin/chat

chmod 4755 /system/bin/chat

chmod 755 /system/etc/ppp/ip-up

3.2 hardware/ril

负责 RILD 的启动以及 ril-rk29-dataonly 库的启动。

Responsible for the boot-up of RILD and ril-rk29-dataonly lib.

Rild 服务是在 init.rc 中开启。

Rild service is enabled in init.rc.

```
service ril-daemon /system/bin/rild
socket rild stream 660 root radio
socket rild-debug stream 660 radio system
user root group radio cache inet misc
```

RILD 目录是 google 原生态目录，RK 做了如下修改：

RILD directory is the original directory of Google. RK made the following change:

RILD 启动方式，

RILD enable method

RIL so 文件调用，

RIL so file invocation

3G dongle VID PID 识别，

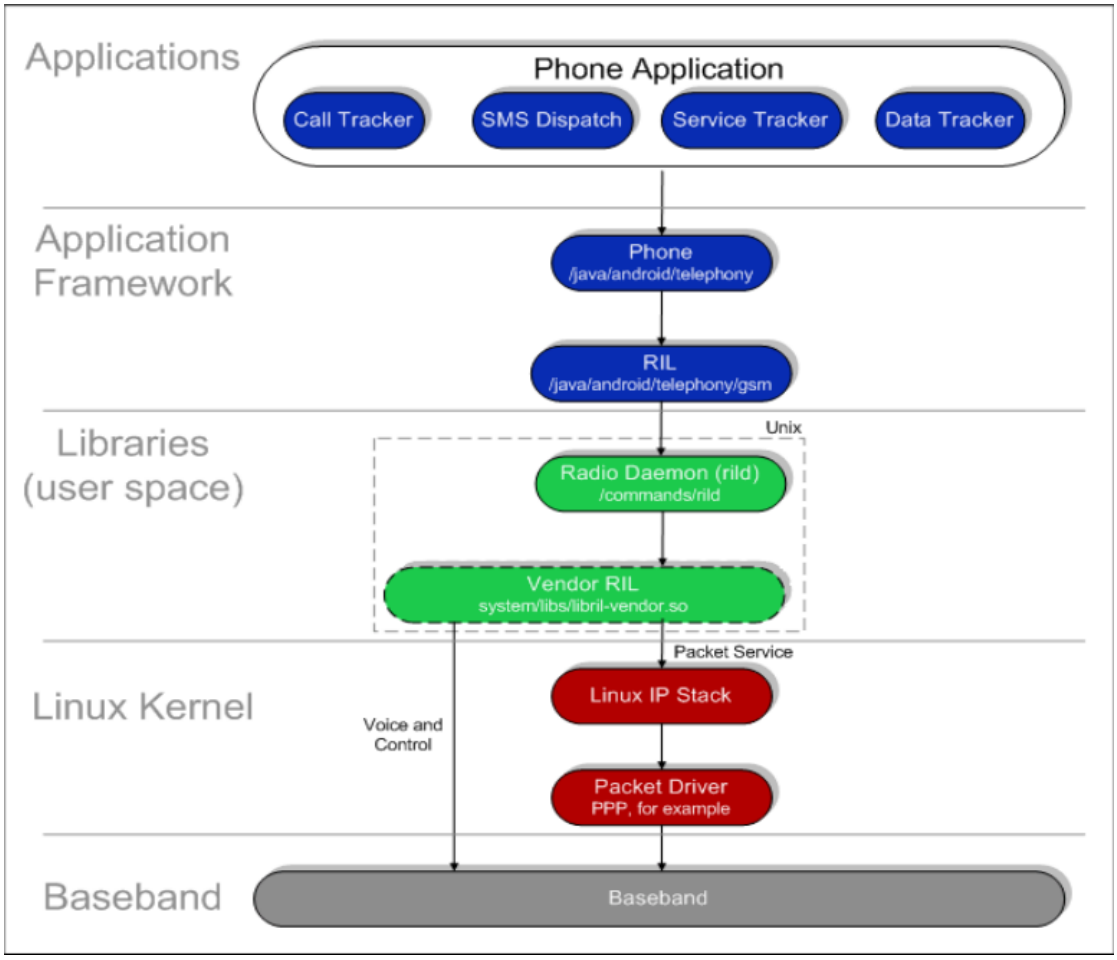
3G dongle VID PID recognition

当模块驱动被内核加载并正确驱动后，3G 模块才能进行无线通信功能的应用开发。这在 Android 系统下称为无线接口层——RIL。即该文档所要说明的 RIL 驱动。android 的 ril 位于应用程序框架与内核之间，分成了两个部分，一个部分是 rild,它负责 socket 与应用程序框架进行通信。另外一个部分是 Vendor RIL，通过这两种方式与 radio 进行通信。通信通道有两个，AT 指令通道和用于传输数据包的通道，数据通道用于上网功能。 也就是 RK 提供的 RIL 驱动，是实现通信业务的核心功能模块，AT 通道用于直接与模块通信，控制模块。

3G module will perform the application development of the wireless communication function only after the module driver is loaded by kernel and driven correctly. It is called wireless interface layer--RIL in android system. That is the RIL driver described in this document. Android ril is between application framework and kernel, and it is divided into two parts, one part is rild, which is responsible for communication between socket and application framework. The other part is Vendor RIL, communicating with radio by these two methods. There are two communication channels, AT command channel and the channel used to transmit data package. The data channel is used for networking function. That means, RIL driver provided by RK is the core function module for implementing communication service. AT channel is used to directly communicate with the module and control the module.

对于 RIL 的 java 框架部分，也被分成了两个部分，一个是 RIL 模块，这个模块主要用于与下层的 rild 进行通信，另外一个是 Phone 模块，这个模块直接暴露电话功能接口给应用开发用户，供他们调用以进行电话功能的实现。这是属于 Android 应用程序的开发部分。

RIL java framework is also divided into two parts, one is RIL module, which is mainly used to communicate with rild of bottom layer, and the other is Phone module, which directly exposes the telephone function interface for application developers to invoke and implement the telephone function. This belongs to the development part of Android application.



所以 RIL 驱动模块，必需是针对不同的 3G 模块（dongle）指令和通信业务功能定制的，以满足不同应用需求。建议开发人员先了解下“3G 模块的特点和构造”。

So RIL driver module must be customized to meet different application requirements according to different 3G module (dongle) commands and communication services. Recommend developers understand “3G module feature and structure” first.

3.3 system/vold

vold 负责监视系统是否有 3G dongle 设备出现，并调用 usb_modeswitch 进行 USB 模式切换，包含以下源文件：

Vold is responsible for monitoring whether there is 3G dongle existing, and invoking usb_modeswitch to switch USB mode, including the following source files:

G3dev.cpp，G3dev.h ,Misc.h ,Misc.cpp,MiscManage.cpp ,MiscManager.h, NetlinkHander.cpp

3.4 external/ppp

该目录包含 pppd 程序和 chat 程序，pppd 辅助 PPP 进行 LCP/NCP 的配置以及身份证，chat 程序则辅助 pppd 程序进行拨号，pppd 可执行程序位于/system/bin/目录，pppd 的参数很多，其中，“/dev/ttyUSB*”就是用于 PPP 协商的设备节点，“connect”后所带的是拨号脚本，“disconnect”后所带的是断开连接的脚本，这两个脚本都是通过 chat 程序来执行的，其它的参数，可以查看 pppd

帮助文档。当 ppp 协商完成后，会调用/etc/ppp/ip-up 脚本来设置 android 中的属性值 IP、DNS 等。

This directory includes pppd program and chat program. Pppd assists PPP to do LCP/NCP configuration and ID confirm, while chat program assists pppd program to dial up. Pppd executable program is in /system/bin/ directory, pppd has many parameters, among which, "/dev/ttyUSB*" is the device node used for PPP coordination, "connect" is followed by dial-up script, "disconnect" is followed by disconnection script, these two scripts are both executed by chat program. For other parameters, you can refer to pppd help document. After ppp coordination is finished, it will invoke /etc/ppp/ip-up script to set IP, DNS and other attribute values in android.

3.5 frameworks/opt/telephony

该目录主要在原生的基础上做修改以符合 dongle 的需求，具体可以 git log 查看提交记录。

This directory is mainly modified to meet the dongle requirement on the original basis. git log can check the detailed submit record.

3.6 packages/services/Telephony

该目录主要在原生的基础上做修改以符合 dongle 的需求，具体可以 git log 查看提交记录。

This directory is mainly modified to meet the dongle requirement on the original basis. git log can check the detailed submit record.

4 Dongle 相关日志的获取 Dongle related log acquisition

4.1 使用串口抓取 log 信息 Use serial port to capture log information

打开串口，输入以下命令，并把串口输出的信息保存成文件。

Open the serial port, input the following command, and save the output formation of the serial port as the file.

logcat –b radio & //ril log

logcat –s pppd & //ppp 拨号 log ppp dial-up log

logcat –c –b radio & //清除以前 radio log clean previous radio log

4.2 使用 adb 工具抓取 log 信息 Use adb tool to capture log information

打开 adb shell，输入以下命令：

Open adb shell, and input the following command:

$ logcat –b radio > /data/radio.log &

$ logcat –s pppd > /data/pppd.log &

抓取 kernel 的打印：

Capture the print of kernel:

cat /proc/kmsg > /data/kernel.log &

退出 adb shell，把机器中的 log 文件 pull 到本地：

Exit adb shell, and pull log file in the device to PC:

adb pull /data/*.log d:\

5 Dongle 常见问题 Dongle common issues

5.1 无信号图标 No signal icon

在串口或者 ADB 上输入 logcat –b radio & 出现“not support modem”，说明目前 RIL 库不支持该 dongle。

Input logcat –b radio & through serial port or ADB, if “not support modem” appears, it means current RIL lib doesn’t support this dongle.

5.2 出现 3G 图标但是上不了网 Networking failed with 3G icon existing

1. 请先检查 ppp 网络接口是否存在：

Firstly check whether ppp network interface existing or not:

busybox ifconfig

ppp0 Link encap:Point-to-Point Protocol

inet addr:10.119.45.174 P-t-P:192.200.1.21 Mask:255.255.255.255

UP POINTOPOINT RUNNING NOARP MULTICAST MTU:1500 Metric:1

RX packets:4 errors:0 dropped:0 overruns:0 frame:0

TX packets:7 errors:0 dropped:0 overruns:0 carrier:0

collisions:0 txqueuelen:3

RX bytes:58 (58.0 B) TX bytes:135 (135.0 B)

A. ppp0 存在，说明 3G 网络连接还存在，此时再作如下检查：

If ppp0 exists, it means 3G network connection exists, then check as following:

使用 ping 命令来检查网络情况：

Use ping command to check the network status:

ping -c 4 www.baidu.com

a) ping 网络正常（正常情况下响应时间几十个毫秒），则可能是上层浏览器的问题，请检查或者更换其它浏览器

ping the network normally (the normal response time should be within dozens of milliseconds), then there may be the problem with upper layer browser, please check or change other browser.

b) ping 不通，则可能是当前的网络存在异常，比如信号弱、或者网络拥塞，获取的 DNS 不正确；可以通过 getprop 查看 DNS，net.dns1 和 net.dns2,目前 RK 的 RIL 库中有 DNS 检测的功能，当获取到 10.11.12.13 或者 10.11.12.14 无效的 DNS，会断开上次拨号连接重新拨号，一般后两次拨号都会获取到正确的 DNS。

Ping failed, then maybe current network acquired incorrect DNS due to some abnormality, such as weak signal, or network congestion. Use getprop can check DNS, net.dns1 and net.dns2. Current RK RIL lib supports the function to detect DNS, when acquiring 10.11.12.13 or 10.11.12.14 invalid DNS, it will disconnect last dial-up and then re-dial, and generally the correct DNS will be acquired after two times dial-up.

B. ppp0 不存在，说明 3G 网络连接已经断开，但上层没有接收到相应消息，错误认为 3G 连接还存在。

If ppp0 not exist, it means 3G network is disconnected, but upper layer doesn't receive the corresponding message, and mistakenly think 3G connection still existing.

2. SIM 卡无数据业务。

SIM card has no data service.

5.3 有信号无 3G 图标 Signal is normal but without 3G icon

1. APN 信息是否正确

Check whether APN information is correct or not

进入设置-> 无线和网络->接入点名称 查看是否有 APN，如果没有，可能是没有正确拷贝 apns-conf.xml 请确认 device/rockchip/rkxxsdk /common/rkxxsdk.mk
PRODUT_COPY_FILES:=
Device/rockchip/rkxxsdk/ common/phone/etc/apns-full-conf.xml:system/etc/apns-conf.xml

Enter setting->wireless and network->access point name to check whether APN existing or not. If not, maybe apns-conf.xml is not correctly copied. Please confirm device/rockchip/rkxxsdk /common/rkxxsdk.mk
PRODUT_COPY_FILES:=
Device/rockchip/rkxxsdk/ common/phone/etc/apns-full-conf.xml:system/etc/apns-conf.xml

检查该文件中是否包含所使用的运营商 APN 信息，如果没有，添加上相应的 APN 信息。比如：<apn carrier="Operator" mcc="" mnc="" apn="" type="default,supl,mms"/>

Check if this file involves the APN information of the carrier used, if not, add the corresponding APN information. For example: <apn carrier="Operator" mcc="" mnc="" apn="" type="default,supl,mms"/>

使用 MCC/MNC 来确认，而 MCC/MNC 的值是通过模块查询到的 IMSI 码的前五位来确定的。

Use MCC/MNC to confirm and MCC/MNC value is determined by the first five digits of IMSI code queried by the module.

2. SIM 卡是否有数据流量。

   Check SIM card data service.

3. SIM 卡与 dongle 是否匹配。

   Check whether SIM card matches with dongle.

4. 若中途有单独修改过 apns-full-con.xml，需要单独 mmm 模块编译 packages/providers/TelephonyProvider/src/com/android/providers/telephony 目录或者去掉 out 目录重新编译 system.img，否则 APN 不会重新生成 telephony.db 数据库,导致系统找不到 APN 信息。

   If apns-full-con.xml is modified separately, need separate mmm module to compile packages/providers/TelephonyProvider/src/com/android/providers/telephony directory or remove out directory and re-compile system.img, otherwise APN will not re-generate telephony.db data library, which will cause the system cannot find APN information.

5.4 radio log 中不断打印“Do not switch user to radio” Continuously print “Do not switch user to radio” in radio log

这是由于 RIL 库路径不正确，在串口或者 adb 中输入 getprop 查看 gsm.version.ril-impl 属性值，是否正确调用了 RIL 库，

This is because RIL lib path is incorrect. Input getprop through serial port or adb to check the attribute value of gsm.version.ril-impl, to see whether the RIL lib is invoked correctly:

[gsm.version.ril-impl]: [libril-rk29-dataonly.so 2.2.08]

检查系统路径中是否有：/system/lib/libril-rk29-dataonly.so

Check if the system path includes /system/lib/libril-rk29-dataonly.so

5.5 识别不到 dongle Dongle cannot be recognized

在/dev 下没有找到 ttyUSB* 设备，此时可通过观察内核 LOG 来定位问题：

ttyUSB* device cannot be found in /dev. Now you can observe kernel log to locate the issue:

1. USB 设备枚举失败或者系统根本就没有发现 USB 设备，此时应检查硬件电路；

   When USB device enumeration fails or the system doesn’t find USB device at all, first check the hardware circuit.

2. USB 枚举成功，但没有注册到 ttyUSB*设备，此时应检查内核：

   If USB enumeration succeeds, but it fails to register ttyUSB* device, now need to check kernel:

a) 内核没有开启 usb serial 功能

If kernel doesn't enable usb serial function

b) 内核代码中的 usb serial 相应驱动中没有添加该设备的 VID/PID，请修改 kernel/drivers/usb/serial/option.c，在数组 static struct usb_device_id option_ids[] 的末尾添加上新设备的 VID/PID 。USB 枚举成功，且相关配置且 ID 都已添加，但还是不出来 ttyUSB*设备，此时可观察系统是否有对它执行 usb mode switch，可通过 logcat–s Vold &观察是否有调用了 usb_modeswitch 程序，如果没有执行，则检查如下：

If the VID/PID of the device is not added in the corresponding usb serial driver in kernel code, please modify kernel/drivers/usb/serial/option.c, and add the VID/PID of new device at the end of static struct usb_device_id option_ids[] array. If USB enumeration succeeds, relative configuration and ID are all added, but ttyUSB* device still cannot appear, now you can observe whether usb mode switch is executed by the system, use logcat–s Vold & can observe whether usb_modeswitch program is invoked or not. If not executed, then check as following:

1) 检查一些必要的文件是否存在：

Check if some necessary files existing or not:
ls /system/bin/usb_modeswitch
ls /etc/usb_modeswitch.d

2) VOLD 中关于 usb_modeswitch 这部分的代码没有被编译，可查看 Vold 的 log 中是否有"Start Misc devices Manager…"的字样，如果没有这串字符，请检查你的/system/vold/下的代码。

usb_modeswitch related code in VOLD is not compiled. You can check if there is "Start Misc devices Manager…" existing in vold log. If not existing, please check your code in /system/vold/.

5.6 Dongle 上电硬件排查 Dongle power on hardware analyzing

在 Dongle 插入瞬间会有塌陷和较为可观的瞬态电流；在 Dongle 插入后，OTG_5V 输出趋于稳定，出现/dev/ttyUSB*节点，浏览网页时电流小于 200mA，输出电压波动峰峰值小于 0.1V。如果在使用过程中或者插上 3G dongle 后 ttyUSB 设备节点出现，然后又消失，可能是硬件供电不足或者电压塌陷引起，导致 3G dongle 不工作。Dongle 插入瞬间都会有比较大的瞬间电流和电压塌陷，如果持续时间较长，会对 dongle 的识别和使用造成影响。可以使用外部供电的方法来排查是否 OTG 供电是否有问题。

There will be collapse and relatively large transient current at the moment of inserting dongle. After the dongle is inserted, OTG_5V output tends to be stable, /dev/ttyUSB* node appears, the current when browsing the webpage is less than 200mA, and the peak-to-peak value of the output voltage fluctuation is less than 0.1V. If ttyUSB device node appears and then disappear during the use or after 3G dongle is inserted, it may be caused by insufficient hardware power supply or the voltage collapse, which will lead to 3G dongle not working. Relatively large transient current and voltage collapse will definitely happen at the moment of inserting dongle, and if it lasts for a relatively long time, it will influence the dongle recognition and usage. You can use external power supply to check if there is problem with OTG power

supply.

3G dongle 机器休眠前后的 DP 电压说明如下：

DP voltage of 3G dongle before and after the device enters sleep mode is described as below:

3G dognle 待机唤醒后就开始传送数据了，如果是高速的 3G dongle，唤醒后高电平有 0.4V 左右。如果是全速的 3G dongle，唤醒后高电平会有 3V 左右。其他的 dongle 二级待机时 3G dongle 的 DP 电平正常一直为高，大概 3V，唤醒后为低，大概 0.4V,如果电平出现异常，USB 会重新去枚举 ttyUSB 节点，3G 会重新去初始化一些 AT 指令，在 UI 界面上就会出现 3G 图标消失一会儿才会出现。

3G dongle starts to transmit data after wake up from standby. If it is high speed 3G dongle, the high level after wake up should be around 0.4V. If it is full speed 3G dongle, the high level after wake up should be around 3V. For other dongles, DP level of 3G dongle in deep sleep mode normally is always high, around 3V, and changed to low after wake up, around 0.4V. If there is abnormal with the level, USB will re-enumerate ttyUSB node, 3G will re-initialize some AT commands, and 3G icon will disappear for a while and then appear again on UI.

Log 如果出现如下信息：

If log appears the following information:

DWC_OTG: dwc_otg_core_host_init: Halt channel 4

DWC_OTG: dwc_otg_core_host_init: Halt channel 5

DWC_OTG: dwc_otg_core_host_init: Halt channel 6

DWC_OTG: dwc_otg_core_host_init: Halt channel 7

DWC_OTG: dwc_otg_core_host_init: Halt channel 8

DWC_OTG: dwc_otg_core_host_init: Halt channel 9

DWC_OTG: dwc_otg_core_host_init: Halt channel 10

DWC_OTG: dwc_otg_core_host_init: Halt channel 11

DWC_OTG: dwc_otg_core_host_init: Halt channel 12

DWC_OTG: dwc_otg_core_host_init: Halt channel 13

DWC_OTG: dwc_otg_core_host_init: Halt channel 14

是 USB 驱动问题出问题概率较大。

It probably has something wrong with USB driver.

Log 如果出现如下信息：

If log appears the following information:

hub 2-0:1.0: Cannot enable port 1. Maybe the USB cable is bad?

hub 2-0:1.0: Cannot enable port 1. Maybe the USB cable is bad?

hub 2-0:1.0: Cannot enable port 1. Maybe the USB cable is bad?

hub 2-0:1.0: Cannot enable port 1. Maybe the USB cable is bad?

该问题是 USB 信号问题，请检查 USB 供电电路的电信号是否符合 USB spec 规定的值，比如 USB Host 电压，DM/DM 信号，USB 阻抗是否匹配等。

This is USB signal problem. Please check whether the signal of USB power supply circuit meets the value specified by USB spec, such as USB Host voltage, DM/DM signal, whether USB impedance matching or not, and so on.