

# Guide to Kernel Driver Integration in Android for Huawei WCDMA & CDMA & LTE Modules

Issue 1.2.6

Date 2013-09-06

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#### **About This Document**

#### **Revision History**

Document Version	Date	Chapter	Change Description
V1.0	2010-11-29		Completed the draft
V1.0.1	2011-05-03		Add the method of modifying the kernel files to support new PIDs and to enable the autosuspend feature
V1.2.1	2011-08-25		Add the method to solve upgrade problem in android system used by MC509
V1.2.3	2011-11-10		Enable zero Packet feature.
V1.2.4	2013-01-31		Update the comment scope
V1.2.6	2013-09-06	2	Updated Table 2-1 Linux kernel driver architecture supporting Huawei modules in Android
		All	Added the description related to the CDC ECM Driver
		All	Added the product scope of LTE
		5	Added chapter Appendix



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## 1 Purpose

This guide instructs the kernel driver integration development for Huawei modules based on Android operating system (OS). It is intended for the driver developers of the products based on Android OS.



## 2 Scope

#### This guide applies to:

- Embedded Linux with kernel version 2.6.35 or later<sup>[1]</sup>
- Android 2.3 (Linux kernel 2.6.35) or later
- Huawei LTE, WCDMA and CDMA Modules



[1]: If the host does not care power consumption of Huawei modules, the Linux can be integrated with kernel version 2.6.18 or later.



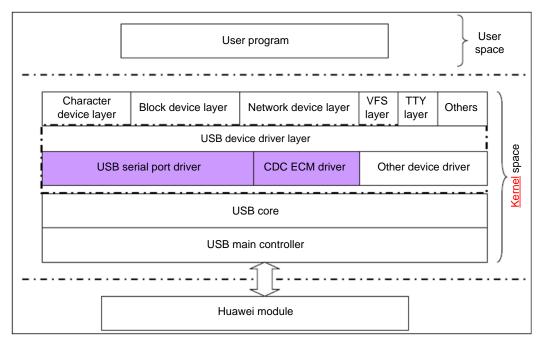
## 3 Overview

### 3.1 Linux Kernel Driver Architecture Supporting Huawei Modules in Android

Huawei modules communicate with Android mainly over Universal Serial Bus (USB) ports. Linux kernel of Android needs to load USB drivers according to the information about the USB device ports reported by Huawei modules. Huawei modules can work normally only after the correct USB drivers are loaded.

Figure 3-1 shows the Linux kernel driver architecture supporting Huawei modules in Android.

Figure 3-1 Linux kernel driver architecture supporting Huawei modules in Android





As shown in Figure 3-1, in the USB driver architecture of Linux, the drivers related to Huawei modules are the USB serial port driver and CDC ECM driver.

- USB serial port driver: supports the ports such as the modem port and the AT command port. The code file (option.c) of this driver has been added into the source code of Linux kernel.
- CDC ECM driver: works as a standard ECM network port driver for USB and is used to transport network data.



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#### Android's Linux Kernel Driver Integration Scheme

#### 4.1 USB Serial Port Driver of Android Kernel

This integration scheme involves the following Linux kernel source code files:

- drivers/usb/serial/option.c
- drivers/usb/serial/usb\_wwan.c

#### 4.1.1 Revision on USB Serial Port Driver Integration

- Linux kernels in version 2.6.35 or later versions have the selective suspend feature for USB serial port drivers. Therefore, enable this feature and the USB serial port drivers will support the selective suspend feature for power management.
- To enable this feature, add the contents enclosed in the red rectangle in the following figure into the option\_attach () function in the option.c file in /drivers/usb/serial/. As the following figure illustrates, first add the macro of #define HUAWEI\_VENDOR\_ID 0x12d1.

```
if (serial->dev->descriptor.idVendor == HUAWEI_VENDOR_ID) {
    if ( 0 != (serial->dev->config->desc.bmAttributes & 0x20)){
        usb_enable_autosuspend(serial->dev);
    }
}]
data = serial->private = kzalloc(sizeof(struct usb_wwan_intf_private), GFP_KERNEL);
if (! data)
    return -ENOMEM;
```

#### Copy and paste the following contents:

```
if (serial->dev->descriptor.idVendor == HUAWEI_VENDOR_ID) {
   if ( 0 != (serial->dev->config->desc.bmAttributes & 0x20)) {
      usb_enable_autosuspend(serial->dev);
   }
}
```



3. To invoke the **reset\_resume** function, add the sentence enclosed in the red rectangle in the following figure. (If this operation is cancelled in some versions, the sentence enclosed in the red rectangle does not need to be added.)

#### Copy and paste the following contents:

```
.reset resume = usb serial resume,
```

- Add new supporting declarations for Huawei modules. Modifications are as follows:
  - Add the macro definition enclosed in the red rectangle in the following figure.

#### Copy and paste the following contents:

Add the following sentences to the static const struct usb\_device\_id option\_ids[] id list:

```
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0xff, 0xff) }, 
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x01, 0x01) }, 
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x01, 0x02) }, 
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x01, 0x03) }, 
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x01, 0x04) },
```



```
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x01, 0x05) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x01, 0x06) },
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{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x04) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x05) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x06) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x31) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x32) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x33) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x34) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x35) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x36) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x61) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x62) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x63) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x64) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x65) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x66) },
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{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x0B) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x0D) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x0E) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x0F) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x3A) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR_ID, 0xff, 0x04, 0x3B) },
{ HW USB DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x04, 0x3D) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x3E) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x3F) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x6A) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x04, 0x6B) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x6D) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x6E) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x6F) },
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{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x12) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x13) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x04, 0x14) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x15) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x17) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x04, 0x18) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x04, 0x19) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x1A) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x1B) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x1C) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x1D) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x48) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x49) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x04, 0x4A) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x4B) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x4C) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x4D) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x78) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x79) },
```



```
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x7A) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x7B) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR ID, 0xff, 0x04, 0x7C) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x04, 0x7D) },
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{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x02) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x03) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x04) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x05) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x06) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x31) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x32) },
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{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x34) },
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{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x36) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x61) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x62) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x63) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x64) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x05, 0x65) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x66) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x0A) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x0B) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x0D) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x0E) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x0f) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x05, 0x3A) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x3B) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x3D) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x3E) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x05, 0x3F) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x6A) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x6B) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x6D) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x6E) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x6F) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x10) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x05, 0x12) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x13) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x14) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x05, 0x15) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x05, 0x17) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x18) },
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{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x1B) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x1C) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x1D) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x05, 0x48) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x49) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x4A) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x4B) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x4C) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x4D) },
```



```
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x78) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x79) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR ID, 0xff, 0x05, 0x7A) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x7B) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x7C) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x05, 0x7D) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x01) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x02) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x03) },
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{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x06) },
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{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x35) },
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{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x61) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x62) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x63) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x64) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x65) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x66) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x0A) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x0B) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x0D) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x0E) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x0f) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x3A) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x3B) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x3D) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x3E) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x3F) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x6A) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x6B) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x6D) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x6E) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x6F) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x10) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x12) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x13) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x14) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x15) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x17) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x18) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x19) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x1A) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x1B) },
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x1C) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x1D) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x48) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x49) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x4A) },
{ HW USB DEVICE AND INTERFACE INFO(HUAWEI VENDOR ID, 0xff, 0x06, 0x4B) },
```



```
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x4C) }, 
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x4D) }, 
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x78) }, 
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x79) }, 
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x7A) }, 
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x7B) }, 
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x7C) }, 
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x7C) }, 
{ HW_USB_DEVICE_AND_INTERFACE_INFO(HUAWEI_VENDOR_ID, 0xff, 0x06, 0x7C) },
```

- 5. Enable the zero packet feature to solve problems caused by module upgrades. The file to be modified is in the **drivers/usb/serial/usb\_wwan.c** directory.
  - Add the definition of the bcdUSB value (#define HW\_bcdUSB 0x0110) and the definition of the Huawei vid value (#define HUAWEI\_VENDOR\_ID 0x12d1), as shown in the red rectangle in the following figure.

```
#include #include 'usb-wwan.h'

static int debug;

#define HW_bcdUSB 0x0110

#define HUAWEI_VENDOR_ID 0x12d1

void USb_wwan_dtr_rts(struct usb_serial_port *port, int on)
```

#### Copy and paste the following contents:

```
#define HW_bcdUSB 0x0110
#define HUAWEI VENDOR ID 0x12d1
```

 Add the definition of "struct usb\_host\_endpoint \*ep" in the usb\_wwan\_write function. Then add the judgment of ZERO\_PACKET in the usb\_wwan\_write function, as shown in the red rectangle in the following figure.

spin\_lock\_irqsave(&intfdata->susp\_lock, flags);

#### Copy and paste the following contents:

```
if((HUAWEI_VENDOR_ID == port->serial->dev->descriptor.idVendor)
   && (HW_bcdUSB != port->serial->dev->descriptor.bcdUSB)) {
   ep = usb_pipe_endpoint(this_urb->dev, this_urb->pipe);
   if(ep && (0 != this_urb->transfer_buffer_length)
        && (0 == this_urb->transfer_buffer_length % ep->desc.wMaxPacketSize)) {
        this_urb->transfer_flags |= URB_ZERO_PACKET;
    }
}
```



- Modify the compilation configuration of Android kernel (in the .config file in the kernel root directory), and ensure that the following configuration options are enabled. For detailed configuration operations, see section 4.1.2 "Configuration Procedures for USB Serial Port Driver Integration."
  - Configuration options related to USB power management:

```
CONFIG USB SUSPEND=y
```

Configuration options related to the USB serial port driver:

```
CONFIG_USB_SERIAL=y
CONFIG_USB_SERIAL_OPTION=y
CONFIG_USB_SERIAL_WWAN=y
```

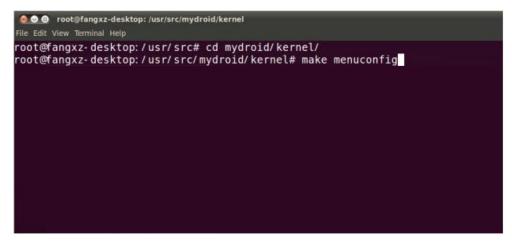
Configuration options related to PPP dial-up connections:

```
CONFIG_PPP=y
CONFIG_PPP_MULTILINK=y
CONFIG_PPP_FILTER=y
CONFIG_PPP_ASYNC=y
CONFIG_PPP_SYNC_TTY=y
CONFIG_PPP_DEFLATE=y
CONFIG_PPP_BSDCOMP=y
```

### 4.1.2 Configuration Procedures for USB Serial Port Driver Integration

To configure USB serial port driver integration, perform the following steps:

Step 1 Run the **Terminal** tool, enter the **kernel** directory (assume that the kernel is in the **/usr/src/myandroid/** directory, that is, **cd /usr/src/myandroid/kernel**), and then run the **make <configuration>** command (in this guide, assume that the standard **make menuconfig** command is used).



- Step 2 Select related configuration options.
  - 1. Configuration options related to USB power management:



```
Arrow keys navigate the menu. <Enter> selects submenus --->. Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes, <M> modularizes features. Press <Esc> to exit, <?> for Help, </> for Search. Legend: [*] built-in [] excluded <M> module <> module capable

General setup --->
[*] Enable loadable module support --->
[*] Enable the block layer --->
System Type --->
Bus support --->
Nernel Features --->
Root options --->
CPU Power Management --->
Ploating point emulation --->
Userspace binary formats --->
Power management options --->
[*] Networking support --->
I *Networking support --->
Security options --->
Kernel hacking --->
Security options --->
Library routines --->
Load an Alternate Configuration File
V(+)

Select> < Exit > < Help >
```



2. Configuration options related to the USB serial port driver:



3. Configuration options related to PPP dial-up connections:



```
Linux Kernel Configuration

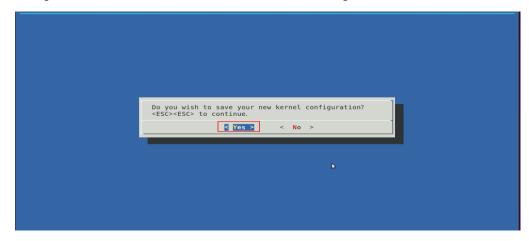
Arrow keys navigate the menu. <Enter> selects submenus --->. Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes, <M> modularizes features. Press <Esc>Esc> to exit, <?> for Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module <> module capable

General setup --->
[*] Enable loadable module support --->
[*] Enable the block layer --->
System Type --->
Bus support --->
Kernel Features --->
Boot options --->
CPU Power Management --->
Power management options --->
Power management options --->
I*] Networking support --->
File systems --->
Kernel hacking --->
Security options --->
Security options --->
Library routines --->
Load an Alternate Configuration File
V(+)

Select> < Exit > < Help >
```



Step 3 Select **Exit** to exit all configuration screens. Then, in the window for saving the configuration, select **<Yes>** to exit and save the configuration.



Step 4 After the configuration is completed, run the **make** command to compile the revised kernel version.

----End

#### 4.2 Android's Linux Kernel CDC ECM Driver Integration

This integration scheme involves the following Linux kernel source code file:

drivers/net/usb/usbnet.c.

#### 4.2.1 Revision on CDC ECM Driver Integration

To enable this feature, add the contents enclosed in the red rectangle in the following figure into the **usbnet\_probe** () function in the **usbnet.c** file in **drivers/net/usb/**. As shown in the following figure, first add the macro of #define HUAWEI\_VENDOR\_ID 0x12d1.

```
usb_set_intfdata (udev, dev);

if(xdev->descriptor.idVendor == HUAWEI_VENDOR_ID){
    if( 0 != (xdev->config->desc.bmAttributes & 0x20)){
        usb_enable_autosuspend(xdev);
    }
}

netif_device_attach (net);

if (dev->driver_info->flags & FLAG_LINK_INTR)
    netif_carrier_off(net);

return 0;
```

#### Copy and paste the following contents:

```
if(xdev->descriptor.idVendor == HUAWEI_VENDOR_ID) {
   if( 0 != (xdev->confiq->desc.bmAttributes & 0x20)) {
```



```
usb_enable_autosuspend(xdev);
}
```

#### 4.2.2 Configuration Procedures for CDC ECM Driver Integration

To configure CDC ECM driver integration, perform the following steps:

Step 1 Modify the compilation configuration of Android kernel (in the **.config** file in the kernel root directory), and ensure that the following configuration options are enabled.

Relevant configuration options related to CND ECM driver integration:

```
CONFIG_USB_USBNET=y
CONFIG_NETDEVICES=y
CONFIG_USB_NET_CDCETHER=y
```

- Step 2 Specific operations are as follows:
  - 1. Run the **Terminal** tool, enter the **kernel** directory (assume that the kernel is in the **/usr/src/myandroid/** directory, that is, **cd /usr/src/myandroid/kernel**), and then run the **make <configuration>** command (in this guide, assume that the standard **make menuconfig** command is used).



Configure the CDC ECM driver configuration options, as shown in the following figures.



```
onfig - Linux/i386 3.8.0-rc2 Kernel Configuration
 Arrow keys navigate the menu. <Enter> selects submenus --
 Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes, <M> modularizes features. Press <Esc> to exit, <?> for Help, </>
 for Search. Legend: [*] built-in [ ] excluded <M> module < >
          General setup --->
      [*] Enable loadable module support --->
      -*- Enable the block layer --->
          Processor type and features --->
          Power management and ACPI options --->
          Bus options (PCI etc.)
          Executable file formats / Emulations --->
          Networking support --->
         Device Drivers --->
           irmware Drivers
                     <Select>
                                  < Exit > < Help >
```

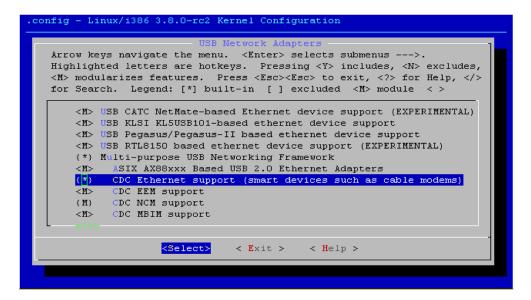
```
config - Linux/i386 3.8.0-rc2 Kernel Configuration
   Arrow keys navigate the menu. <Enter> selects submenus --->.
   \label{eq:highlighted} \mbox{Highlighted letters are hotkeys.} \quad \mbox{Pressing} \ \mbox{<Y> includes,} \ \mbox{<N> excludes,} \ \mbox{}
   <M> modularizes features. Press <Esc><Esc> to exit, <?> for Help, </>>
   for Search. Legend: [*] built-in [ ] excluded <M> module < >
       [*] Multiple devices driver support (RAID and LVM)
        <M> Generic Target Core Mod (TCM) and ConfigFS Infrastructure
       [*] Fusion MPT device support --->
            IEEE 1394 (FireWire) support --->
        < > I20 device support
        [*] Macintosh device drivers
        -*- Network device support --->
Input device support --->
            Character devices --->
       (M) I2C support --->
                       <Select>
                                     < Exit > < Help >
```



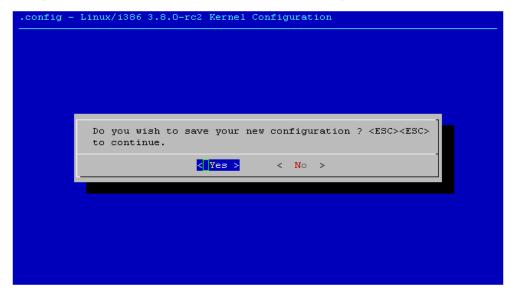
```
onfig - Linux/i386 3.8.0-rc2 Kernel Configuration
  Arrow keys navigate the menu. <Enter> selects submenus -
 Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes, <M> modularizes features. Press <Esc><to exit, <?> for Help, </>
 for Search. Legend: [*] built-in [ ] excluded <M> module < >
               PPP over L2TP (EXPERIMENTAL)
      <M>
               PPP support for asvnc serial ports
      < M >
      < M >
               PPP support for sync tty ports
             SLIP (serial line) support
      < M >
             CSLIP compressed headers
             Keepalive and linefill
              ix bit SLIP encapsulation
             USB Network Adapters --->
Wireless LAN --->
             WiMAX Wireless Broadband devices --->
                      <Select>
                                    < Exit > < Help >
```

```
- Linux/i386 3.8.0-rc2 Kernel Configuration
Arrow keys navigate the menu. <Enter> selects submenus -
Highlighted letters are hotkeys. Pressing <Y> includes, <N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for Help, </>
for Search. Legend: [*] built-in [ ] excluded <M> module < >
    <M> USB CATC NetMate-based Ethernet device support (EXPERIMENTAL)
    <M>> USB KLSI KL5USB101-based ethernet device support
    <M>> USB Pegasus/Pegasus-II based ethernet device support
    \leqM> USB RTL8150 based ethernet device support (EXPERIMENTAL)
    (*) Multi-purpose USB Networking Framework
          ASIX AX88xxx Based USB 2.0 Ethernet Adapters
    <M>
    ( * )
           CDC Ethernet support (smart devices such as cable modems)
    < M >
           CDC EEM support
    \{M\}
           CDC NCM support
    <M>
          CDC MBIM support
                    <Select>
                                 < Exit >
                                               < Help >
```





Step 3 Select **Exit** to exit all configuration screens. Then, in the window for saving the configuration, select **<Yes>** to exit and save the configuration.



Step 4 After the configuration is completed, run the **make** command to compile the revised kernel version.

----End



## 5 Appendix

### 5.1 Checking Whether the Correct USB Serial Port Driver Exists in the Kernel

Run the following command to check the kernel log information:

dmeso

If the following information (or similar information) exists in the kernel log, the correct USB serial port driver has been integrated into the kernel.

```
1.755889] usb usb1: New USB device strings: Mfr=3, Product=2, SerialNumber=1
1.755893] usb usb1: Product: EHCI Host Controller
1.755897] usb usb1: Manufacturer: Linux 2.6.36.3 ehci_hcd
1.755900] usb usb1: SerialNumber: 0000:00:1a.0
1.755994] hub 1-0:1.0: USB hub found
1.755998] hub 1-0:1.0: 3 ports detected
1.756049] ehci_hcd 0000:00:1d.0: PCI INT A -> GSI 23 (level, low) -> IRQ 23 1.756061] ehci_hcd 0000:00:1d.0: EHCI Host Controller
1.756066] ehci_hcd 0000:00:1d.0: new USB bus registered, assigned bus number 2
1.756085] ehci_hcd 0000:00:1d.0: debug port 2
1.760048] ehci_hcd 0000:00:1d.0: irq 23, io mem 0xfe526000
1.769818] ehci_hcd 0000:00:1d.0: USB 2.0 started, EHCI 1.00
1.769854] usb usb2: New USB device found, idVendor=1d6b, idProduct=0002
1.769858] usb usb2: New USB device strings: Mfr=3, Product=2, SerialNumber=1
1.769862] usb usb2: Product: EHCI Host Controller
1.769866] usb usb2: Manufacturer: Linux 2.6.36.3 ehci_hcd
1.769869] usb usb2: SerialNumber: 0000:00:1d.0
1.769951] hub 2-0:1.0: USB hub found
1.769953] hub 2-0:1.0: 3 ports detected
1.770011] usbcore: registered new interface driver usbserial
1.770018] USB Serial support registered for generic
1.770025] usbcore: registered new interface driver usbserial_generic
1.770026] usbserial: USB Serial Driver core
1.770032] USB Serial support registered for GSM modem (1-port)
1.770044] usbcore: registered new interface driver option
```

### 5.2 Checking Whether the Correct CDC ECM Driver Exists in the Kernel

Run the following command to check the kernel log information:



dmesa

If the information in the red rectangle in the following figure exists in the kernel log, the correct CDC ECM driver has been integrated into the kernel.

```
usb 2-1.2: USB disconnect, device number 3
 226.170773] cdc_ether 2-1.2:2.0 eth0: unregister 'cdc_ether' usb-0000:00:1d.0
1.2, CDC Ethernet Device
 226.177183] option1 ttyUSBO: GSM modem (1-port) converter now disconnected fr
 ttvUSBO
 226.177198] option 2-1.2:2.2: device disconnected
 257.419920] usb 2-1.2: new high-speed USB device number 4 using ehci-pci
 257.536485] usb 2-1.2: New USB device found, idVendor=12d1, idProduct=1573
 257.536489] usb 2-1.2: New USB device strings: Mfr=2, Product=3, SerialNumber
 257.536493] usb 2-1.2: Product: HUAWEI Mobile
 257.536496] usb 2-1.2: Manufacturer: HUAWEI Technology
 257.536498] usb 2-1.2: SerialNumber: 0123456712ABCA17
 257.595410] cdc ether 2-1.2:2.0 eth0: register 'cdc ether' at usb-0000:00:1d
1.2, CDC Ethernet Device, 00:1e:10:1f:00:00
 257.608340] option 2-1.2:2.2: GSM modem (1-port) converter detected
             usb 2-1.2: GSM modem (1-port) converter now attached to
```

#### 5.3 Obtaining the Port Mapping Information of the Board

Run the **dmesg** command to check whether the driver for Huawei modules has been loaded successfully. If the information in the red rectangle in the following figure exists in the kernel log, the correct driver has been loaded successfully. (The value of **idProduct** varies with the actual product.)

```
26.168555] usb 2-1.2: USB disconnect, device number 3
 226.170773] cdc ether 2-1.2:2.0 eth0: unregister 'cdc ether' usb-0000:00:1d.
1.2, CDC Ethernet Device
 226.177183] option1 ttyUSBO: GSM modem (1-port) converter now disconnected f
 ttyUSBO
 226.177198] option 2-1.2:2.2: device disconnected
 257.419920] usb 2-1.2: new high-speed USB device number 4 using ehci-pci
 257.536485] usb 2-1.2: New USB device found, idVendor=12d1, idProduct=1573
 257.536489] usb 2-1.2: New USB device strings: Mfr=2, Product=3, SerialNumbe
 257.536493] usb 2-1.2: Product: HUAWEI Mobile
 257.536496] usb 2-1.2: Manufacturer: HUAWEI Technology
 257.536498] usb 2-1.2: SerialNumber: 0123456712&BC&17
 257.595410] cdc_ether 2-1.2:2.0 eth0: register 'cdc_ether' at usb-0000:00:1d
1.2, CDC Ethernet Device, 00:1e:10:1f:00:00
 257.608340] option 2-1.2:2.2: GSM modem (1-port) converter detected
  57.6087351 usb 2-1.2: GSM modem (1-port) converter now attached to ttyUSBO
```

To query the device file names of Huawei modules' ports (such as the modem and pcui ports), run the following command:

```
ls /dev/ttyUSB*
```

```
# ls /dev/ttyU*
/dev/ttyUSB0
/dev/ttyUSB1
/dev/ttyUSB2
/dev/ttyUSB3
/dev/ttyUSB4
```