Guide to Driver Integration in QNX for Huawei Modules

Issue V1.0

Date 2014-12-11

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About This Document

Revision History

Document Version	Date	Chapter	Descriptions
V1.0	2014-12-11	-	Creation

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1 Purpose

Huawei modules communicate with the QNX system using USB ports. Therefore, the communication can be normal only after the USB drivers are correctly loaded.

This document explains how to integrate USB and ECM drivers with the QNX system to communicate with Huawei modules. The intended audience of this document is the driver developers of the QNX-based product vendors.

2 Scope

This document is applicable to the following system and modules:

- QNX Neutrino RTOS 6.5 SP1
- Huawei module: HUAWEI ME909Tu/ME909Au series (ME909Tu-120/ME909Tu-565/ME909Tu-820/ME909Au-821)

The HUAWEI ME909Tu/ME909Au series modules (hereinafter referred to as the ME909Tu/ME909Au) provide three USB configuration descriptors. Before integrating the USB serial port driver with the QNX system, select the second configuration descriptor by configuring the ME909Tu/ME909Au or using a third-party tool.

3 USB Serial Port Driver Integration

3.1 About This Chapter

This chapter describes how to integrate the Huawei-supplied USB serial port driver with the QNX system.

Driver name: **devu-usbserial**

This driver supports the following ports : PCUI, Diag, modem, GPS

3.2 Starting the Driver

Step 1 Place the USB serial port driver in a folder in the QNX system.

Step 2 In the folder, run the following command in super user mode to start the driver:

```
./devu-usbserial
```

Step 3 Insert the module into your computer.

If any of the module files listed in Table 3-1 is displayed in the **dev** folder, you have inserted the module properly. The file displayed depends on the port your module provides.

Table 3-1 Files in the dev folder

Port	Module File
PCUI	usb-pcui
Diag	usb-diag
Modem	usb-modem
GPS	usb-gps

NOTE

- The USB serial port driver can be started only in super user mode.
- To enable the USB serial port driver to run at startup, modify the QNX startup configuration file.
- To help ensure the system performance, the log output function is disabled by default in the USB serial port driver. To enable that function, run **./devu-usbserial debug=1**.

3.3 Communicating with Huawei modules

Communicate with Huawei modules by reading or writing the **usb-pcui** file and running AT commands on the QNX terminal.

Read command: **cat /dev/usb-pcui**

Write command: **echo –e "ATI\r\n" > /dev/usb-pcui**

In Figure 3-1 , commands are executed to query the network registration status.

Figure 3-1 Querying the network registration status

```
$ echo -e "AT+COPS?\r\n" > /dev/usb-pcui
$ cat /dev/usb-pcui
AT+COPS?
+COPS: 0,0,"HUAWEI TEST W09",7

OK
```

3.4 Uninstalling the Driver

Step 1 Run **pidin a \ grep devu-usbserial** to query the process number of the USB serial port driver.

Step 2 Run "**slay** process number of the USB serial port driver" to uninstall the USB serial port driver.

NOTE

The USB serial port driver can be uninstalled only in super user mode.

3.5 Obtaining Logs

Run **sloginfo** > **/tmp/log.txt** and use a log export tool, such as the QNX Momentics IDE or FTP tool, to export the logs.

4 One ECM Driver Integration

4.1 About This Chapter

This chapter describes how to integrate the Ethernet Control Model (ECM) driver for one ECM port with the QNX system.

Driver name: **devnp-usbecm.so**

4.2 Starting the Driver

Step 1 Place the ECM driver file **devnp-usbecm.so** in a folder.

In this procedure, the file is placed in the **tmp** folder.

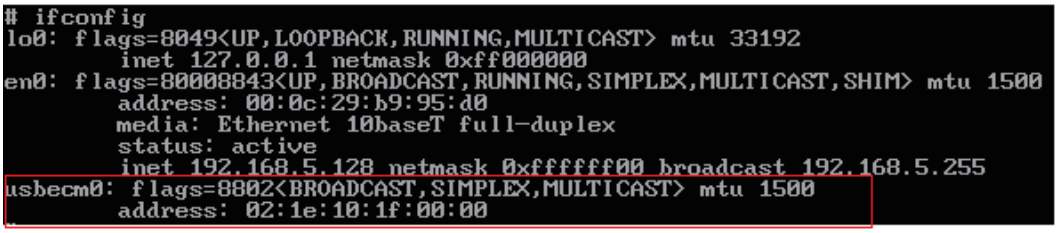
Step 2 Run the following command to start the ECM driver:

```
mount -T io-pkt /tmp/devnp-usbecm.so
```

Step 3 Run **ifconfig** to check whether an ECM port named **usbecm0** is available.

If the port is available, as shown in Figure 4-1 , the ECM driver has started properly.

Figure 4-1 ECM port available



```
# ifconfig
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 33192
        inet 127.0.0.1 netmask 0xff000000
en0: flags=80008843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST,SHIM> mtu 1500
        address: 00:0c:29:b9:95:d0
        media: Ethernet 10baseT full-duplex
        status: active
        inet 192.168.5.128 netmask 0xffffff00 broadcast 192.168.5.255
usbecm0: flags=8802<BROADCAST,SIMPLEX,MULTICAST> mtu 1500
        address: 02:1e:10:1f:00:00
```

NOTE

- Because the ECM driver file is a dynamic link library (DLL) file, it is recommended that you place it under **/lib/dll**, where DLL files are stored.
- To enable the ECM driver to run at startup, modify the QNX startup configuration file.
- To set up a dial-up connection, start the USB serial port driver before starting the ECM driver.
- To help ensure the system performance, the log output function is disabled by default in the ECM driver. To enable that function, run **mount –T io-pkt –o debug=1 /tmp/devnp-usbecm.so.**

4.3 Communicating with Huawei modules

4.3.1 Setting Up an NDIS Dial-up Connection

After starting the USB serial port driver and ECM driver, send the following command to the PCUI port:

```
echo -e "AT^NDISDUP=1,1,\"apn\"\r\n" > /dev/usb-pcui
```

To query the dial-up connection status, run **AT^NDISSTATQRY?**.

NOTE

- Before setting up a dial-up connection, check whether the module has registered with the network by running **AT+COPS?** or **AT+CGREG?**.
- The **echo –e "AT^NDISDUP=1,1,\"apn\"\r\n" > /dev/usb-pcui** command can only be sent to the PCUI port.

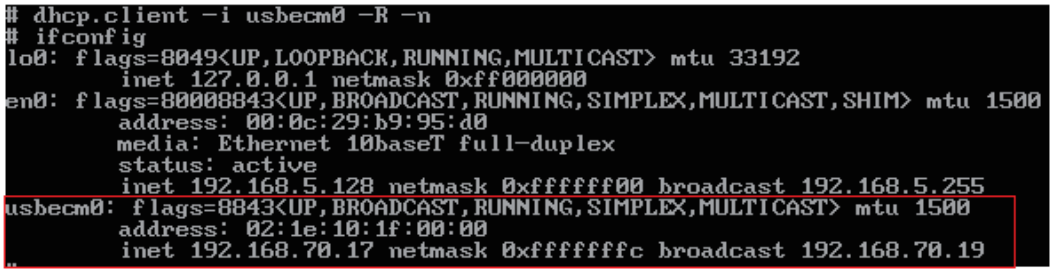
4.3.2 Starting the DHCP Client Service

Run the following command to start the DHCP client service and obtain an IP address:

```
dhcp.client -i usbecm0 -R -n
```

Figure 4-2 shows the assigned IP address.

Figure 4-2 Querying the assigned IP address



4.3.3 Configuring the Route

Network data is transmitted using a fixed route. Before using the ECM port, activate the route for the network adapter.

Step 1 Run **route show** to check the current routing.

- Before setting up a dial-up connection, run **route show**.

  As shown in Figure 4-3 , the route for the en0 network adapter is currently used.

Figure 4-3 Checking the current route (1)

```
# route show
Routing tables

Internet:
Destination         Gateway             Flags
default             192.168.5.2         UG
localhost.localdom  127.0.0.1           UH
192.168.5.0/24      link#2              U
192.168.5.1         00:50:56:c0:00:08   UHL
192.168.5.2         link#2              UHL
192.168.5.254       00:50:56:e9:10:15   UHL
# _
```

- After setting up a dial-up connection, starting the DHCP client service, and obtaining an IP address, run **route show** again.

  As shown in Figure 4-4 , the route for the **usbecm0** network adapter (gateway IP address is 192.168.70.16/30) has been added, but has not been activated.

Figure 4-4 Checking the current route (2)

```
# ifconfig
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 33192
        inet 127.0.0.1 netmask 0xff000000
en0: flags=80008843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST,SHIM> mtu 1500
        address: 00:0c:29:b9:95:d0
        media: Ethernet 10baseT full-duplex
        status: active
        inet 192.168.5.128 netmask 0xffffff00 broadcast 192.168.5.255
usbecm0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        address: 02:1e:10:1f:00:00
        inet 192.168.70.17 netmask 0xfffffffc broadcast 192.168.70.19
# route show
Routing tables

Internet:
Destination         Gateway             Flags
default             192.168.5.2         UG
localhost.localdom  127.0.0.1           UH
192.168.5.0/24      link#2              U
192.168.5.1         00:50:56:c0:00:08   UHL
192.168.5.2         00:50:56:f6:8a:d6   UHL
192.168.70.16/30    link#3              U
```

Route for the **usbecm0** network adapter

Step 2 Activate the route for the **usbecm0** network adapter.

1. Run the following command to delete the current route:

   ```
   route delete default
   ```

2. Run the following command to add the route for the network adapter you want to use as the default route:

   ```
   route add default <gateway>
   ```

   In this example, the value of **<gateway>** is **192.168.70.16**.

Figure 4-5 Activating the route for the usbecm0 network adapter

```
# route delete default
delete net default
# route add default 192.168.70.16
add net default: gateway 192.168.70.16
# route show
Routing tables

Internet:
Destination        Gateway            Flags
default            192.168.70.16      UG
localhost.localdom 127.0.0.1          UH
192.168.5.0/24     link#2             U
192.168.5.1        00:50:56:c0:00:08  UHL
192.168.5.2        00:50:56:f6:8a:d6  UHL
192.168.70.16      link#3             UHL
192.168.70.16/30   link#3             U
# _
```

After activated, the route for the **usbecm0** network adapter is used for data services at the application layer.

4.3.4 Initiating Data Services

Ping a computer on the Internet and check whether the ping is successful.

Figure 4-6 Checking whether the ping is successful

```
# ifconfig
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 33192
        inet 127.0.0.1 netmask 0xff000000
en0: flags=80008843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST,SHIM> mtu 1500
        address: 00:0c:29:b9:95:d0
        media: Ethernet 10baseT full-duplex
        status: active
        inet 192.168.5.128 netmask 0xffffff00 broadcast 192.168.5.255
usbecm0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        address: 02:1e:10:1f:00:00
        inet 192.168.70.17 netmask 0xfffffffc broadcast 192.168.70.19
# ping 172.22.44.33
PING 172.22.44.33 (172.22.44.33): 56 data bytes
64 bytes from 172.22.44.33: icmp_seq=0 ttl=128 time=763 ms
64 bytes from 172.22.44.33: icmp_seq=1 ttl=128 time=407 ms
64 bytes from 172.22.44.33: icmp_seq=2 ttl=128 time=210 ms
64 bytes from 172.22.44.33: icmp_seq=3 ttl=128 time=310 ms
64 bytes from 172.22.44.33: icmp_seq=4 ttl=128 time=210 ms

---172.22.44.33 PING Statistics---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max = 210/380/763 ms   variance = 52529 ms^2
# _
```

4.3.5 Terminating the NDIS Dial-up Connection

Run the following command to terminate the NDIS dial-up connection:

```
echo -e "AT^NDISDUP=1,0\r\n" > /dev/usb-pcui
```

4.4 Uninstalling the ECM Driver

To uninstall the ECM driver for one ECM port, run the following command:

```
ifconfig usbecm0 destroy
```

5 Dual ECM Driver Integration

5.1 About This Chapter

This chapter describes how to integrate the ECM driver for dual ECM ports with the QNX system.

Driver name: **devnp-usbecms.so**

5.2 Starting the Driver

Step 1 Copy the ECM driver file **devnp-usbecm.so** to a folder.

In this procedure, the file is placed in the **tmp** folder.

Step 2 Run the following command to start the ECM driver:

```
mount -T io-pkt /tmp/devnp-usbecms.so
```

Step 3 Run **ifconfig** to check whether two ECM ports named **ecm0** and **ecm1** are available.

If the ports are available, as shown in Figure 5-1 , the ECM driver has started properly.

Figure 5-1 ECM ports available

```
# mount -T io-pkt /tmp/devnp-usbecms.so
# ifconfig
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 33192
        inet 127.0.0.1 netmask 0xff000000
en0: flags=80008843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST,SHIM> mtu 1500
        address: 00:0c:29:b9:95:d0
        media: Ethernet 10baseT full-duplex
        status: active
        inet 192.168.5.128 netmask 0xffffff00 broadcast 192.168.5.255
ecm0: flags=8802<BROADCAST,SIMPLEX,MULTICAST> mtu 1500
        address: 02:1e:10:1f:00:00
        media: Ethernet 100baseTX full-duplex
ecm1: flags=8802<BROADCAST,SIMPLEX,MULTICAST> mtu 1500
        address: 02:1e:10:1f:00:01
        media: Ethernet 100baseTX full-duplex
```

NOTE

- To enable the ECM driver to run at startup, modify the QNX Neutrino RTOS's startup configuration file.
- To set up a dial-up connection, start the USB serial port driver before starting the ECM driver.
- To help ensure the system performance, the log output function is disabled by default in the ECM driver. To enable that function, run **mount –T io-pkt –o debug=1 /tmp/devnp-usbecms.so.**

5.3 Communicating with Huawei modules

5.3.1 Setting Up an NDIS Dial-up Connection

Run the following command to set up an NDIS dial-up connection:

```
echo -e "AT^NDISDUP=<CID>,1,\"APN\"\r\n" > /dev/usb-pcui
```

After the dial-up connection is set up, **^NDISSTATEX** is reported. To query the dial-up status, run **AT^NDISSTATQRY=<CID>**.

NOTE

- Before setting up a dial-up connection, check whether the module has registered with the network.
- The access point names (APNs) used for dial-up connections with different CIDs must be different.

5.3.2 Starting the DHCP Client Service

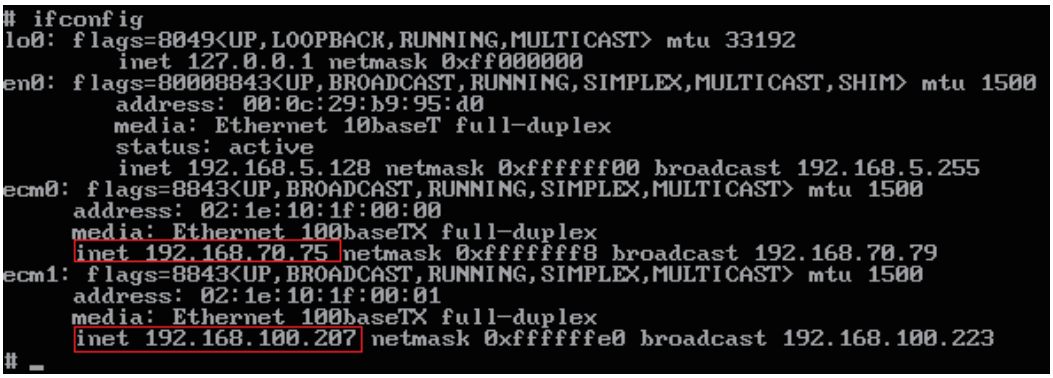
After dial-up connection is set up, run the following command to start the DHCP client service and obtain the ECM port IP addresses:

```
dhcp.client -i <interface> -R -n
```

where, the value of **<interface>** is either **ecm0** or **ecm1**.

The IP address of the specified network port is returned within a few seconds, as shown in Figure 5-2 .

Figure 5-2 Obtaining the ECM port IP addresses



```
# ifconfig
lo0: flags=8049<UP,LOOPBACK,RUNNING,MULTICAST> mtu 33192
        inet 127.0.0.1 netmask 0xff000000
en0: flags=80008843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST,SHIM> mtu 1500
        address: 00:0c:29:b9:95:d0
        media: Ethernet 10baseT full-duplex
        status: active
        inet 192.168.5.128 netmask 0xffffff00 broadcast 192.168.5.255
ecm0: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
     address: 02:1e:10:1f:00:00
     media: Ethernet 100baseTX full-duplex
     inet 192.168.70.75 netmask 0xfffffff8 broadcast 192.168.70.79
ecm1: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
     address: 02:1e:10:1f:00:01
     media: Ethernet 100baseTX full-duplex
     inet 192.168.100.207 netmask 0xffffffe0 broadcast 192.168.100.223
# _
```

5.3.3 Configuring the Route

Step 1 Before setting up a dial-up connection, run **route show** to check the current route.

As shown in Figure 5-3 , the route for the en0 network adapter is currently used.

Figure 5-3 Checking the current route (1)

```
# route show
Routing tables

Internet:
Destination         Gateway             Flags
default             192.168.5.2         UG
localhost.localdom  127.0.0.1           UH
192.168.5.0/24      link#2              U
192.168.5.1         00:50:56:c0:00:08   UHL
192.168.5.2         link#2              UHL
192.168.5.254       00:50:56:e9:10:15   UHL
# _
```

Step 2 After the dial-up connection is set up and DHCP client service starts, check the current route again.

Figure 5-4 Checking the current route (2)

```
# route show
Routing tables

Internet:
Destination         Gateway             Flags
default             192.168.5.2         UG
localhost.localdom  127.0.0.1           UH
192.168.5.0/24      link#2              U
192.168.5.1         00:50:56:c0:00:08   UHL
192.168.5.2         00:50:56:f6:8a:d6   UHL
192.168.5.254       00:50:56:e9:10:15   UHL
192.168.70.72/29    link#3              U
192.168.100.192/27  link#4              U
# _
```

Route for the **usbecm0** network adapter

Route for the **usbecm1** network adapter

As shown in Figure 5-4 , the currently used route is the default route.

Step 3 Activate the route for the desired ECM port.

1. Run the following command to delete the current route:

   ```
   route delete default
   ```

2. Add the route for the network adapter you want to use as the default route.

   To add the route for the **usbecm0** network adapter, run the following command:

   ```
   route add default 192.168.70.72
   ```

   To add the route for the **usbecm1** network adapter, run the following command:

   ```
   route add default 192.168.100.192
   ```

   In this procedure, the route for the **usbecm0** network adapter is added, as shown in Figure 5-5 .

Figure 5-5 Adding the route for the usbecm0 network adapter

```
# route delete default
delete net default
# route show
Routing tables

Internet:
Destination         Gateway             Flags
localhost.localdom  127.0.0.1           UH
192.168.5.0/24      link#2              U
192.168.5.1         00:50:56:c0:00:08   UHL
192.168.5.2         00:50:56:f6:8a:d6   UHL
192.168.5.254       00:50:56:e9:10:15   UHL
192.168.70.72/29    link#3              U
192.168.100.192/27  link#4              U
# route add default 192.168.70.72
add net default: gateway 192.168.70.72
# route show
Routing tables

Internet:
Destination         Gateway             Flags
default             192.168.70.72       UG
localhost.localdom  127.0.0.1           UH
192.168.5.0/24      link#2              U
192.168.5.1         00:50:56:c0:00:08   UHL
192.168.5.2         00:50:56:f6:8a:d6   UHL
192.168.5.254       00:50:56:e9:10:15   UHL
192.168.70.72       link#3              UHL
192.168.70.72/29    link#3              U
192.168.100.192/27  link#4              U
```

After activated, the route for the **usbecm0** network adapter is used for data services at the application layer.

5.3.4 Initiating Data Services

Ping a computer on the Internet and check whether the ping is successful.

Figure 5-6 Checking whether the ping is successful

```
# ping 172.22.44.3
PING 172.22.44.3 (172.22.44.3): 56 data bytes
64 bytes from 172.22.44.3: icmp_seq=0 ttl=128 time=676 ms
64 bytes from 172.22.44.3: icmp_seq=1 ttl=128 time=324 ms
64 bytes from 172.22.44.3: icmp_seq=2 ttl=128 time=124 ms
64 bytes from 172.22.44.3: icmp_seq=3 ttl=128 time=123 ms
```

5.3.5 Terminating the NDIS Dial-up Connection

Run the following command to terminate the NDIS dial-up connection:

```
echo -e "AT^NDISDUP=<CID>,0\r\n" > /dev/usb-pcui
```

To query the dial-up connection status, run **AT^NDISSTATQRY=<CID>**.

5.4 Uninstalling the ECM Driver

To uninstall the ECM driver for dual ECM ports, run the following commands:

```
ifconfig ecm0 destroy
ifconfig ecm1 destroy
```

6 Restrictions

This chapter describes the current limitations of the drivers' functions and features.

6.1 Power Supply Management

The QNX system does not support dynamic power supply management, so the drivers do not provide the power supply management function.

6.2 ECM Data Transfer Performance

Limited by the virtual machines, the highest performance of the ECM driver in LTE cannot be tested. After the physical machines are used, the highest performance can be tested in the collaboration with customers.

6.3 IPv4 and IPv6

Currently, the drivers only support IPv4. Support for IPv6 will be developed if necessary.

7 Abbreviations

Abbreviation	Expansion
APNs	Access Point Names
DLL	Dynamic Link Library
ECM	Ethernet Control Model
GPS	Global Positioning System
USB	Universal Serial Bus