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FIBOCOM NL668 Application Guide_ Linux GobiNet Driver Loading

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Applicability type

S/N	Product Model	Description
1	NL668-CN-00	MCP is 4+2, supports MAIN_ANT、DIV_ANT、GNSS_ANT
2	NL668-CN-01	MCP is 2+1, supports MAIN_ANT
3	NL668-CN-02	MCP is 2+1, supports MAIN_ANT、DIV_ANT
4	NL668-EAU-00	MCP is 4+2, supports MAIN_ANT、DIV_ANT、GNSS_ANT



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Versions

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1 GobiNet Dial Principle

This document describes GobiNet driver loading and dial for the NL668-CN series wireless module. Gobi is actually a series of Qualcomm data cards and modules, including Gobi2000/Gobi3000/Gobi4000 series. The GobiNet driver is the NDIS network card driver for the Qualcomm Gobi series. It is actually the Qualcomm CDC/ECM driver (also called RmNet driver). After the dial is successful, the client application system obtains the IP address allocated by the DHCP server of the module through the DHCP client.

2 USB Port Information

Vendor ID: 0x1508 Product ID:0x1001		
Interface Number	Interface Function	Interface Name
0	Debug	Device Diagnostic Interface
1	Modem	Modem Connector
2	AT	Device Application Interface
3	Pipe	Device Pipe
4	NDIS	Wireless Data Device Ethernet Adapter
5	Adb	Android Composite ADB Interface Ic

3 USB Enumeration Mode Confirmation

Use AT+GTUSBMODE? to query the current USB mode. (USBNET mode default is RMNET)

```
AT+GTUSBMODE?
+GTUSBMODE: 17
OK
```

If the return value is not 17, it indicates that the module has not entered the RmNet mode. Please send AT+GTUSBMODE=17 to return, and restart the module to switch the module to RmNet mode.

4 NDIS Drive Loading Method

The GobiNet driver is the NDIS network card driver for the Qualcomm Gobi series. It is actually the Qualcomm CDC/ECM driver (also called RmNet driver). The GobiNet driver loading in this document is described as NDIS driver loading.

4.1 NDIS Driver Adds System Components

The NDIS driver needs the kernel's usbnet driver support, so you need to configure the Linux kernel. The configuration method is as follows:

```
cd kernel
```

```
make menuconfig
```

```
device drivers->Network device support->usb Network Adapters
```

Select the following components:

```
Multi-purpose USB Networking Framework
```

Save the configuration after selecting and recompile the kernel.

4.2 NDIS Code Structure

As shown below, the driver is provided in the form of source code and compiled by users in their own systems.

Driver/

├─ GobiUSBNet.c

├─ Makefile

├─ QMI.c

├─ QMIDevice.c

├─ QMIDevice.h

├─ QMI.h

├─ Structs.h

4.3 NDIS Driver Compilation

Users can compile as *.ko, or they can put code into the kernel and compile them as *.o.

4.3.1 Compile as *.ko

- 1: Modify the kernel's compilation path in the KDIR of Makefile;
- 2: Execute the make command in the directory of the driver. If the compilation is successful, the GobiNet.ko driver can be generated.

4.3.2 Compile as *.o

Copy the code file to the drivers/net/usb directory of the user's kernel code;

Add the following to drivers/net/usb/Makefile:

```
Obj-m += GobiNet.o
```

```
GobiNet-objs := GobiUSB.o QMIDevice.o QMI.o
```

Each time the kernel is compiled, the NDIS driver is automatically compiled too.

4.4 NDIS Driver Loading

Load the NDIS driver through the insmod command:

```
sudo insmod GobiNet.ko
```

The driver default debug is turned off. It can be turned on as follows:

```
ehco 1 > /sys/module/GobiNet/parameters/debug
```

Load the NDIS driver through the modprobe command:

Run the make install command in the driver directory.

```
sudo make install
```

The driver is installed into the system's module directory, and the dependencies are analyzed and the relevant modules are loaded at the same time.

Use the ifconfig command to view the network card information. The usb0 indicates that the driver is loaded successfully, and the GobiNet driver is loaded successfully.

```
usb0      Link encap:Ethernet  HWaddr 52:f4:dc:d6:ce:0a
          inet6 addr: fe80::50f4:d6:ce0a/64 Scope:Link
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
```

5 USB Serial Port Driver Loading Method

An ordinary 3G data card (modem) uses a USB interface, and the functional interface to the upper layer is a serial port. In a Linux system, a USB to serial port driver is usually used.

5.1 USB Serial Port Driver Adds System Components

To add a USB serial port driver, you need to configure the Linux kernel. The configuration method is as follows:

```
cd kernel
make menuconfig
device drivers->usb support->usb serial converter support
Select the following components:
USB driver for GSM and CDMA modems
Save the configuration after selecting it.
```

5.2 Add Device Support

1: Open the kernel source code file option.c (the path is generally drivers/usb/serial/option.c). Find the option_ids array in the source code. Add the VID (0x1508) and PID (0x1001) of the NL668 product to the array;

```
static const struct usb_device_id option_ids[] = {
... ..
#if 1
    { USB_DEVICE(0x1508, 0x1001) },
#endif
... ..
```

2: In the USB serial port driver, filter the NDIS interface. As the USB serial port and the NDIS are non-standard CDC devices, it is necessary to prevent the NDIS port from being loaded by the USB serial port driver, which may result in abnormal loading of the NDIS port driver. There are three ways to solve it:

A: In relatively new kernel version (3.8 or above), blacklist is added to option_ids in option.c. On loading, the driver automatically skips the interface specified by blacklist, and sets interface 4 to not load option driver. The code is as follows:

```
#if 1
```

```
static const struct option_blacklist_info fibocom_blacklist = {
    .reserved = BIT(4),
};
#endif
```

Add blacklist to the option_ids array, the code is as follows:

```
#if 1
{ USB_DEVICE(0x1508, 0x1001),
    .driver_info = (kernel_ulong_t)&fibocom_blacklist
}
#endif
```

B: (Recommended) For the previous kernel, setting the blacklist in the option_ids array is not supported.

First add the PID/VID of the NL668 series, the details are as follows:

```
static const struct usb_device_id option_ids[] = {
#if 1
{ USB_DEVICE(0x1508, 0x1001)}
#endif
```

In the probe function, judge the current interface num and filter, as follows:

```
#if 1
    if (serial->dev->descriptor.idVendor == cpu_to_le16(0x1508) &&
        serial->dev->descriptor.idProduct == cpu_to_le16(0x1001) &&
        serial->interface->cur_altsetting->desc.bInterfaceNumber >= 4) {
        printk(KERN_INFO "Discover the 4th interface for fibocom\n");
        return -ENODEV;
    }
#endif
```

C: (Not recommended) For users using the usb-serial.ko driver, at the beginning of the usb_serial_probe() function in the usb-serial.c file, add the following judgment to filter the NDIS interface as follows:

```
#if 1
    if (serial->cur_altsetting->desc.bInterfaceNumber >= 4) {
        printk(KERN_INFO "Discover the 4th interface for fibocom\n");
        return -ENODEV;}
#endif
```

5.3 USB Serial Port Driver Loading

Execute the sudo modprobe option and use the lsusb and ls /dev/ttyUSB* commands to check whether the loading is successful, as follows:

```
root@ubuntu:/# lsusb
Bus 001 Device 005: ID 1508:1001
Bus 002 Device 002: ID 0e0f:0003 VMware, Inc. Virtual Mouse
Bus 002 Device 003: ID 0e0f:0002 VMware, Inc. Virtual USB Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 001: ID 1d6b:0001 Linux Foundation 1.1 root hub
Bus 002 Device 004: ID 0e0f:0008 VMware, Inc.
root@ubuntu:/# modprobe usbserial vendor=0x1508 product=0x1001
root@ubuntu:/# ls /dev/ttyUSB*
/dev/ttyUSB0 /dev/ttyUSB1 /dev/ttyUSB2 /dev/ttyUSB3
```

6 NDIS Dial Process

The NL668 series supports two dial modes: speed dial and QMI dial.

6.1 Speed Dial

1: Set the APN and configure the APN through AT+CGDCONT. For details, please refer to the Fibocom Communication Module AT Manual.

2: Dial by AT\$QCRMCALL=1,1. For details, please refer to the Fibocom Communication Module AT Manual.

3: Disconnect the network by AT\$QCRMCALL=0,1. For details, please refer to the Fibocom Communication Module AT Manual.

Example:

```
ate0
OK
at+cops?
+COPS: 0,0,"CHN-UNICOM",7
OK
at$qcrmcalls=1,1,1,2,1
```

```
$QCRMCALL:1, V4
OK
# udhcpc -i usb0 -s /usr/share/udhcpc/usb0.sh
/usr/share/udhcpc/usb0.sh: exec: line 3:
/usr/share/udhcpc/usb0.deconfig: not found
*****

sysconf conn dhcp usb0 10.60.236.82 255.255.255.252 10.60.236.81
221.11.1.67 221.11.1.68
*****
```

6.2 QMI Dial

In order to support QMI dial and avoid the trouble of the client's QMI TLV package, NL668 provides a set of QMI SDK and a QMI Dial Demo. Complete the dial function and other information acquisition. (After the QMI dial is completed, you need to run `dhcpc` to obtain the IP)

1: Run the test program

Run `dial_demo` with administrator privileges and dial NDIS to enter the following command:

```
sudo apt-get install udhcpc
sudo ./dial_demo
```

After the initialization is completed, enter 24 to dial, enter 25 to disconnect the network, and -1 to exit the program.

After the successful dial, manually enable the dhcp client to obtain the IP address and DNS address, as follows:

A: On Ubuntu PC, execute the following command:

```
ubuntu@ubuntu~# dhclient usb0
Listening on LPF/usb0/52:f4:dc:d6:ce:0a
Sending on LPF/usb0/52:f4:dc:d6:ce:0a
Sending on Socket/fallback
DHCPDISCOVER on usb0 to 255.255.255.255 port 67 interval 8
DHCPOFFER of 10.10.29.194 from 10.10.29.193
DHCPPREQUEST of 10.10.29.194 on usb0 to 255.255.255.255 port 67
DHCPPACK of 10.10.29.194 from 10.10.29.193
bound to 10.10.29.194 – renewal in 2840 seconds.
```

B: If you are on an embedded system, you need to configure your kernel to support the dhcp client function, and configure busybox to support udhcpc command. Due to the limit of length, this document will not describe it in detail. The specific operation is as follows:

```
#udhcpc -i usb0 -s /var/udhcpc.script  
#route add default dev usb0  
#iptables -t nat -A POSTROUTING -o usb0 -j MASQUERADE  
#echo 1 > /proc/sys/net/ipv4/ip_forward
```

2: Check the IP address

Enter the ifconfig command to check the usb0's IP address as follows:

```
usb0      Link encap:Ethernet  HWaddr 52:f4:dc:d6:ce:0a  
          inet addr:10.10.29.194 Bcast:10.10.29.195 Mask:255.255.255.252  
          inet6 addr: fe80::50f4:dcff:fed6:ce0a/64 Scope:Link  
          UP BROADCAST MULTICAST  MTU:1500  Metric:1  
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0  
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0  
          collisions:0 txqueuelen:1000  
          RX bytes:7170 (7.1 KB)  TX bytes:12201 (12.2 KB)
```

3: Test Internet connection

Enter the ping www.baidu.com command to test whether the website can be pinged; or run the browser to test Internet connection.