MiFi 4G LTE Global USB Modem U620L

Linux Integration Guide

NOVATEL WIRELESS™

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Version Verification

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Introduction

Overview

The MiFi U620L implements the Remote Network Driver Interface Specification (RNDIS) network interface based on Microsoft RNDIS 6.0. Although this integration may not be supported in the Linux environment, the MiFi U620L does support Linux configurations.

This guide outlines the basic information needed to successfully integrate the MiFi U620L into a Linux platform. The two main sections in the guide are:

- End-User Mode: Enumerating CDC-ECM interface

  In this mode, the device is used for a WWAN connection to the Internet for such activities as browsing or connecting to a VPN.

- Enterprise Mode: Enumerating CDC-ECM and Modem interfaces (Optional)

  In this mode, the Modem interface allows users to send AT commands to the device to configure, query, or manage the Internet connection.

NOTE: The information included in this guide is based on Ubuntu running a Kernel version **3.16.0-30.generic** and these instructions can be extended to other kernel versions with no or minimum changes (as appropriate).

Prerequisites

The following items are prerequisites for the Linux integrations:

- **usb_modeswitch**—Utility used for switching USB configurations. This utility should be installed on the Linux machine.

  NOTE: An Internet connection is required for this installation.

  To install the utility:

  ▸ Enter the following command:

    ```
    # sudo apt-get install usb_modeswitch
    ```

- **Linux Kernel source files**—Files required to enable the MiFi U620L to enumerate the Modem interface. Download the files from this site: https://www.kernel.org/.

Known Issues

The **usb_modeswitch** utility has crashed on some Linux distributions presenting the following error message.
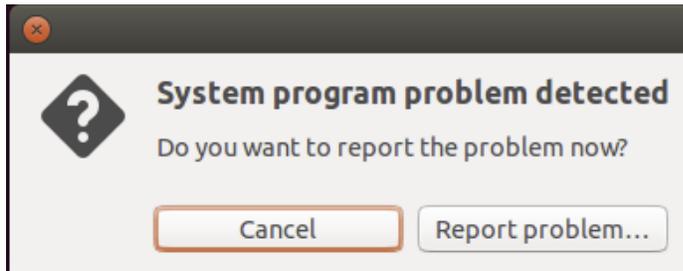
Despite receiving this message, the Ethernet Interface gets enumerated correctly and the laptop gets an IP address from the device. This is a tool-related issue and you can safely ignore this error.

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End User Mode

Enumerating CDC-ECM Interface

Enumerating CDC-ECM Interface

By default, the MiFi U620L device is in End-User Mode. This means that only the RNDIS configuration is exposed. For the device to get a WWAN IP Address assignment, you must switch the configuration to CDC-ECM.

To switch the configuration and initiate the DHCP request:

1. Verify that your device is in End-User Mode by issuing the following command:

   ```
   # lsusb
   ```

   If the device is in End-User Mode, the response is:

   ```
   ID 1410:9020 Novatel Wireless
   ```

2. If the device is in End-User Mode, uninstall the RNDIS driver by issuing the following command:

   ```
   # sudo rmmod rndis_host
   ```

3. Switch the device to CDC-ECM configuration by issuing the following command:

   ```
   # sudo usb_modeswitch -v 0x1410 -p 0x9020 -u 2
   ```

   Once these steps are complete, the CDC-ECM interface is enabled on the device and the device expects a DHCP Request from the Linux server.

4. Initiate the DHCP Request to the U620L to get the WWAN IP Addresses assigned to Linux by issuing the following command:

   ```
   # sudo dhclient eth1
   ```

   NOTE: Replace **eth1** with the appropriate Ethernet interface enumeration on your setup.

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Enterprise Mode

Enumerating CDC-ECM + Modem Interfaces

Enumerating CDC-ECM + Modem Interfaces

To add support for the MiFi U620L, you must modify the kernel source on your Linux server by adding the Vendor ID (VID) and Product ID (PID) of the MiFi U620L.

NOTE: The following instructions assume that your kernel version is **3.16.0-x-generic** (To verify the kernel version, run the command **uname –r**.)

To modify the kernel source:

1. Download the Linux distribution-specific kernel sources with patches into your working directory by issuing the following command:

    ```
    # sudo apt-get source linux-image-$(uname –r)
    ```

    NOTE: You can find files **option.c** and **usb-wwan.h** under "Linux-<*distro*>-3.16.0 /drivers/usb/serial".

2. Modify the **option.c** file:

    a. [Optional] Back up the original **option.c** file.

    b. [Optional] Add "`#define DRIVER_VERSION "v0.7.2.xx"`" to differentiate from the official version.

    c. Under the `/* NOVATEL WIRELESS PRODUCTS */` section, add:

    "`#define NOVATELWIRELESS_PRODUCT_ENTERPRISE_U620L 0x9022`"

    d. Find "`static const struct usb_device_id option_ids[ ]`" structure, and add:

    "`{USB_DEVICE_AND_INTERFACE_INFO(NOVATELWIRELESS_VENDOR_ID, NOVATELWIRELESS_PRODUCT_ENTERPRISE_U620L, 0xff, 0x0, 0x0)}`"

3. Generate the **option.ko** driver:

    a. Copy the modified **option.c** and (unmodified/original) **usb-wwan.h** files to **/usr/src/linux-headers-3.16.0-x-generic/drivers/usb/serial/**

    b. Change the directory:

    ```
    # cd /lib/modules/3.16.0-x-generic
    ```

    c. Make sure the build folder under **/lib/modules/3.16.0-x-generic** points to **/usr/src/linux-headers-3.16.0-x-generic**.

    If not, create a link from the build to **/usr/src/linux-headers-3.16.0-x-generic**.

    d. Change the directory:

    ```
    # cd /lib/modules/3.16.0-x-generic/build/drivers/usb/serial
    ```

e. Save the original Makefile and create a new Makefile that contains the only rule for **option.o**:

```
obj-m += option.o
```

f. Change the directory:

```
# cd /lib/modules/3.16.0-x-generic/build
```

g. Build the driver by issuing the following command:

```
# sudo make -C /lib/modules/3.16.0-x-generic/build/
M=/usr/src/linux-headers-3.16.0-x-generic/drivers/usb/serial/
```

4. Add or replace **option.ko** in system modules directory:

a. Check if option.ko is loaded by issuing the following command:

```
# lsmod | grep option.ko
```

b. If the output shows "option" loaded, then remove or unload it by issuing the following command:

```
# sudo modprobe -r option
```

c. Copy the build by issuing the following command:

```
# sudo cp /usr/src/ linux-headers-3.16.0-x-
generic/drivers/usb/serial/option.ko /lib/modules/3.16.0-
x.generic/kernel/drivers/usb/serial/
```

d. Deploy the build by issuing the following command:

```
# sudo depmod -a
```

To enable the Modem Interface:

1. Verify that your device is in End-User Mode by issuing the following command:

```
# lsusb
```

If the device is in End-User Mode, the response is:

```
ID 1410:9020 Novatel Wireless
```

2. If the device is in End-User Mode, uninstall the RNDIS driver by issuing the following command:

```
# sudo rmmod rndis_host
```

3. Switch the device to Enterprise Mode configuration by issuing the following command:

```
# sudo usb_modeswitch -v 0x1410 -p 0x9020 -u 4
```

4. Wait a few minutes for the device to switch to Enterprise Mode and then verify again that your device is in Enterprise Mode by issuing the following command:

```
# lsusb
```

If the device is in Enterprise Mode, the response is:

```
ID 1410:9022 Novatel Wireless
```

Once these steps are complete, the CDC-ECM interface is enabled on the device and the device expects a DHCP Request from the Linux server.

5. Initiate the DHCP Request to the U620L to get the WWAN IP Addresses assigned to Linux by issuing the following command:

```
# sudo dhclient eth1
```

NOTE: Replace **eth1** with the appropriate Ethernet interface enumeration on your setup.

6. Verify that **option.ko** is loaded by issuing the following command:

```
# lsmod | grep option
```

If it is already loaded, skip to step 8.

7. If the **option.ko** driver is not loaded, follow these steps to load the driver:

   a. Load the USB serial driver module with the VID and PID parameters corresponding to the MiFi U620L by issuing the following command:

   ```
   # sudo modprobe usbserial vendor=0x1410 product=0x9022
   ```

   b. If necessary, load **usb_wwan** by issuing the following command:

   NOTE: This is applicable in case the kernel version is later than 3.xx since option.c uses functions from the usb_wwan module.

   ```
   # sudo insmod usb_wwan.ko
   ```

   c. Load the option driver by issuing the following command:

   ```
   # sudo insmod option.ko
   ```

8. Check for the Novatel Modem ports by issuing the following command:

```
# ls –l /dev/ttyUSB*
```

The modem port should be /dev/ttyUSB0.

NOTE: You can use PuTTY or a similar tool to open the modem port and use the AT commands.