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Version Verification

To ensure you have the latest version of this document, visit the Verizon Wireless support site at: https://www.verizonwireless.com/support/verizon-global-usb-modem-usb730l/.
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Introduction

Overview
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Overview

This guide outlines the basic information needed to successfully integrate the USB730L 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:
  
  ```bash
  # sudo apt-get install usb_modeswitch
  ```

- **Linux Kernel source files**—Files required to enable the USB730L to enumerate the Modem interface. Download the files from this site: [https://www.kernel.org/](https://www.kernel.org/).
Known Issues

The `usb_modeswitch` utility has crashed on some Linux distributions presenting the following error message.

![Image](image.png)

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.
End User Mode

Enumerating CDC-ECM Interface
Enumerating CDC-ECM Interface

By default, the USB730L 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 1410:9030 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 0x9030 -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 USB730L 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 USB30L, you must modify the kernel source on your Linux server by adding the Vendor ID (VID) and Product ID (PID) of the USB30L.

**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_U730L 0x9032
      ```
   
   d. Find "static const struct usb_device_id option_ids[]" structure, and add:
      
      ```
      {USB_DEVICE_AND_INTERFACE_INFO(NOVATELWIRELESS_VENDOR_ID,
      NOVATELWIRELESS_PRODUCT_ENTERPRISE_U730L, 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 1410:9030  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 0x9030 -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 1410:9032 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 USB730L 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 USB730L by issuing the following command:

      # sudo modprobe usbserial vendor=0x1410 product=0x9032

   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 -1 /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.