Configuring Linux ‘pppd’ for a Skywire® Global LTE CAT-M1 NL-SW-LTE-QBG96

NimbeLink Corp
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Table of Contents

1. Introduction 3
   1.1 Applies to the Following Part Numbers: 3
   1.2 Prerequisites 3

2. PPP 4
   2.1 Overview 4
   2.2 Elevate to root 4
   2.3 Check for Updates 4
   2.4 Install the “ppp” Package 4
   2.5 Verify The Modem is Connected 4
   2.6 Load the “option” Driver 5
   2.7 Write PPP Scripts 5
   2.8 Take Down the Ethernet Interface 7
   2.9 Bring Up the PPP Interface 7
   2.10 Troubleshooting 7
1. Introduction

1.1 Applies to the Following Part Numbers:

<table>
<thead>
<tr>
<th>Orderable Device</th>
<th>Description</th>
<th>Carrier</th>
<th>Network Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>NL-SWDK</td>
<td>Skywire Development Kit</td>
<td>Any</td>
<td>Any</td>
</tr>
<tr>
<td>NL-AB-BBBC</td>
<td>Skywire BeagleBone Black Cape</td>
<td>Any</td>
<td>Any</td>
</tr>
<tr>
<td>NL-AB-BBCL</td>
<td>Skywire BeagleBone Black Cape Lite</td>
<td>Any</td>
<td>Any</td>
</tr>
<tr>
<td>NL-AB-RPI</td>
<td>Skywire Raspberry Pi Adapter</td>
<td>Any</td>
<td>Any</td>
</tr>
<tr>
<td>NL-AB-MPCIE</td>
<td>Mini-PCI Express Adapter Board</td>
<td>Any</td>
<td>Any</td>
</tr>
<tr>
<td>NL-SW-LTE-QBG</td>
<td>LTE CAT M1</td>
<td>Any</td>
<td>LTE</td>
</tr>
</tbody>
</table>

1.2 Prerequisites

This document assumes you have completed the initial setup of your modem and development kit. If you have not completed those steps, refer to the Skywire® Development Kit User Manual and complete the modem setup before proceeding.

If you are using a device that is communicating via SSH, Telnet, or any other type of Ethernet interface, you must connect to it via USB or serial. Section 2.8 requires the Ethernet interface to be taken down.
2. PPP

2.1 Overview

This example has been tested on the following distributions of Linux:

- Ubuntu Linux 18.04 LTS
- Raspberry Pi Raspbian 9.x

using a Skywire® NL-LTE-QBG96 4G LTE modem.

This example is written using Debian and Ubuntu. Some additional steps are necessary to get PPP working on Ubuntu, and those steps will be covered in their respective sections.

2.2 Elevate to root

In order to make the changes necessary, it is necessary to login to the root account. To do so, type the following command into the Terminal:

For Debian:

$ su -

For Ubuntu:

$ sudo -i

followed by the Enter key. You will be prompted to enter your password: enter it, followed by the Enter key.

2.3 Check for Updates

Make sure that your Debian or Ubuntu system is up to date using the following commands:

# apt-get update
# apt-get upgrade

2.4 Install the “ppp” Package

To install the ppp package, type the following command:

# apt-get install ppp

2.5 Verify The Modem is Connected

To verify that our system can see the Skywire modem, type the following command:

# lsusb

followed by the enter key, and you should have an entry similar to the one below:
2.6 Load the “option” Driver

The Skywire modem may not properly enumerate automatically on some Linux distributions. To enumerate the device, we need to load the “option” driver.

To get our device’s ID, type the following command:

```
# lsusb:
```

followed by the Enter key. There should be a device listed according to the following format that says “Future Technology Devices”:

```
Bus 001 Device 006: ID 2c7c:0296
```

Make note of the eight-character hex code right before “Future”. In the case of a SW-LTE-QBG96, it is “2c7c:0296”.

To load the option driver, type the following into the Terminal:

```
# modprobe option
# echo 2c7c 0296 > /sys/bus/usb-serial/drivers/option1/new_id
```

2.7 Write PPP Scripts

We need to write two scripts for PPP to reference when initializing the connection.

**Note:** We have a GitHub page with the necessary PPP files available for customers to use located here:

[https://github.com/NimbeLink/skywire-ppp-scripts](https://github.com/NimbeLink/skywire-ppp-scripts)

We highly recommend downloading that repo and following the instructions in the files related to your modem. The other recommended option is to click on the file you want and copy and paste directly from GitHub.

First, clone the repo and navigate to the cloned repo. Next, as superuser (root) copy the file:

```
vzw-QBG96
```

to:

```
/etc/ppp/peers/
```

or copy-and-paste the contents of:

```
vzw-QBG96
```

from the GitHub repo to
/etc/ppp/peers/vzw-QBG96

The contents of vzw-QBG96 are shown below:

/dev/ttyUSB0
115200
connect "/usr/sbin/chat -v -f /etc/ppp/peers/vzw-QBG96-chat"
noauth
crtstcs
defaultroute
userpeerdns
local
debug
updetach
persist
+ipv6

Next, copy:

vzw-QBG96-chat

to:

/etc/ppp/peers/

or copy-and-paste the contents of

vzw-QBG96-chat

from the GitHub repo to

/etc/ppp/peers/vzw-QBG96-chat

Make sure to replace [apn] with your APN. The contents of vzw-QBG96-chat are shown below:

TIMEOUT 3
ECHO ON
'' AT
OK AT+CGDCONT=3,"IPV4V6","[apn]"
OK AT+CFUN=1
OK AT+QCSQ:+CEREG?;+COPS?;+CGDCONT?
OK ATD*99#
CONNECT 150000000 ''
2.8 Take Down the Ethernet Interface

A PPP connection requires that any existing Ethernet connection be taken down. To bring down the Ethernet connection, type the following command:

```
# ifconfig eth0 down
```

(Optional) To verify that the Ethernet connection is down, type:

```
# ifconfig
```

followed by the Enter key. eth0 should not be listed.

2.9 Bring Up the PPP Interface

To enable the PPP interface, type the following commands:

For Debian:

```
# pon vzw-QBG96
```

For Ubuntu:

```
# pppd call vzw-QBG96
```

followed by the enter key. You will see the second script you wrote appear on the screen, followed by the network communication the Skywire modem is going through to get connected.

Once the process is complete, test the connection:

```
# ping –c 2 www.google.com
```

and you should receive a response similar to this:

```
PING www.google.com (216.58.216.196) 56(84) bytes of data.
64 bytes from ord31s21-in-f4.1e100.net (216.58.216.196): icmp_seq=1 ttl=50 time=47.8 ms
64 bytes from ord31s21-in-f4.1e100.net (216.58.216.196): icmp_seq=2 ttl=50 time=90.6 ms

--- www.google.com ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 47.818/69.237/90.656/21.419 ms
```

This indicates that your PPP connection is up and connected to the network.

2.10 Troubleshooting

- If your PPP fails with the error 0x1 in Section 2.9, chances are your vzw-QBG96 file cannot see your vzw-QBG96 chat file. Ensure that the last part of line 3 of the vzw-QBG96 file:
has the same name as your `vzw-QBG96-chat` file. The tool `xxd` may be beneficial to ensure that there are no extra characters in the file and that the files are named the same:

```bash
$ xxd vzw-QBG96
```

If you are still having issues, rename the last part of line 3 in the verizon file to:

```bash
.../vzw
```

and rename `vzw-QBG96-chat` to `vzw` and try again.

- If your PPP fails with the error 0x3 in Section 2.9, you may have poor signal strength. Move the unit closer to a window for a better signal strength.

- If your PPP still fails with error 0x3 in Section 2.9, your APN may be incorrect. Verify that your APN is correct in your `vzw-QBG96-chat` file.