

# Skywire<sup>®</sup> NL-SW-LTE-QBG96 and NL-SW-LTE-QBG95

## PPP Application Note

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# 1. Introduction

## 1.1. Scope

This document serves as a guide for implementing Point-to-Point Protocol (PPP) on the NL-SW-LTE-QBG96 and NL-SW-LTE-QBG95 Skywire modems.

## 1.2. Orderable Part Numbers:

Orderable Device	Description	Carrier	Network Type
NL-SWDK	Skywire Development Kit	Any	Any
NL-SW-LTE-QBG96	LTE CAT M1	Any	LTE-M, GSM
NL-SW-LTE-QBG95	LTE-M (CAT M1), NB-IoT (NB1, NB2)	Any	LTE-M, NB-IoT, GSM

## 1.3. Prerequisites



This document assumes that the initial setup of the requisite modem and development kit has been completed using the [Skywire® Development Kit User Manual](#).

If these steps are incomplete, please refer to the link above and complete the modem setup before proceeding

**Note:** It is possible to leave network interfaces enabled on the Linux PC, while ensuring that the cellular data connection is the primary source of Internet connectivity. This involves replacing the default route in the kernel's IP routing table with the connection you want to use. However, these steps are not covered by this application note.

## 2. PPP

### 2.1. Overview

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

- Ubuntu Linux 20.04 LTS
- Raspberry Pi Raspbian 10.x

The tests were done on a Skywire® NL-LTE-QBG95 4G LTE-M modem with an AT&T SIM.

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:

**Bus 001 Device 002: ID 0403:6001 Future Technology Device...**

If so, the modem is connected properly. If not, verify the modem is connected properly and run the command again.

## 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 0403:6001
```

Make note of the eight-character hex code right before “Future”. In the case of a SW-LTE-QBG95, it is “0403:6001”.

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

```
# modprobe option
```

```
# echo 0403 6001 > /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:** NimbeLink has a GitHub page with the necessary PPP files available for customers to use located here: <https://github.com/NimbeLink/skywire-ppp-scripts>

The table below contains a list of each device and carrier combination and the ppp scripts that should be used with that specific combination:

Device	Carrier	PPP Scripts
NL-SW-LTE-QBG96	Verizon	vzw-QBG96, vzw-QBG96-chat
NL-SW-LTE-QBG96	AT&T	att-QBG96, att-QBG96-chat
NL-SW-LTE-QBG95	Verizon	vzw-QBG95, vzw-QBG95-chat
NL-SW-LTE-QBG95	AT&T	att-QBG95, att-QBG95-chat

**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:

```
att-QBG95
```

to:

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

or copy-and-paste the contents of:

```
att-QBG95
```

from the GitHub repo to

```
/etc/ppp/peers/att-QBG95
```

The contents of att-QBG95 are shown below:

```
/dev/ttyUSB0  
115200  
connect "/usr/sbin/chat -v -f /etc/ppp/peers/att-QBG95-chat"  
noauth  
crtscts  
defaultroute  
userpeerdns  
local  
debug  
updetach  
persist  
+ipv6
```

Next, copy:

```
att-QBG95-chat
```

to:

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

or copy-and-paste the contents of

```
att-QBG95-chat
```

from the GitHub repo to

```
/etc/ppp/peers/att-QBG95-chat
```

Make sure to replace "[apn]" with your APN. The contents of att-QBG95-chat are shown below:

```
TIMEOUT 3  
ECHO ON
```

```
' ' AT
OK AT+CGDCONT=1,"IPV4V6","[apn]"
OK AT+CFUN=1
OK AT+QCSQ;+CEREG?;+COPS?;+CGDCONT?
OK ATD*99#
CONNECT 150000000 ' '
```

## 2.8. Take Down the Ethernet Interface

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 att-QBG95
```

For Ubuntu:

```
# pppd call att-QBG95
```

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 att-QBG95 file cannot see your att-QBG95-chat file. Ensure that the last part of line 3 of the att-QBG95 file:

```
.../att-QBG95-chat
```

has the same name as your att-QBG95-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:

```
$ xxd att-QBG95
```

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

```
.../att
```

and rename att-QBG95-chat to att and try again.

If your PPP fails with the error 0x3 in Section 2.9, there may be a variety of issues related to your connection. A few solutions are detailed below.

- Move the unit to a location with a stronger signal.
- Make sure the correct APN is being used.
- Ensure that the COM port is available and not being used by another program such as a terminal emulator.



### 3. Document Version Information

Version	Notes	Date
5	-Updated document to include QBG95 support and document version information	2020-09-02
6	-Fixed spacing in Table 1.2	2020-09-29
7	-Added note about bringing down Ethernet	2020-12-30