



NL-SW-LTE-QC1BISWWG

Networking Guide





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1 Introduction

1.1 Scope

This guide shows how to implement the following protocols with the NL-SW-LTE-QC1bisWWG Skywire® modem (QC1bisWWG) for both Windows and Linux operating systems:

- Ethernet Control Model (ECM)
- Remote Network Driver Interface Specification (RNDIS)
- Qualcomm MSM Interface (QMI)
- Point-to-Point Protocol (PPP)

Please check Airgain's website for the latest version of this guide:

[NL-SW-LTE-QC1bisWWG Product Page](#)

1.2 Prerequisites

To implement these network protocols on QC1bisWWG, ensure you have the appropriate Quectel drivers for your OS:

Windows Drivers

- **ECM:**
https://www.quectel.com/download/quectel_windows_usb_driverq_ecm_v1-0_en/
- **RNDIS:**
https://www.quectel.com/download/quectel_lte_windows_usb_driver_rndis_v1-1/

Note: Only one driver can be used at a time. For example, if using ECM, the RNDIS driver must be uninstalled and vice versa.

Linux Drivers

- **USB:** https://www.quectel.com/download/quectel_lte5g_linux_usb_driver_v1-0-2/

Notes:

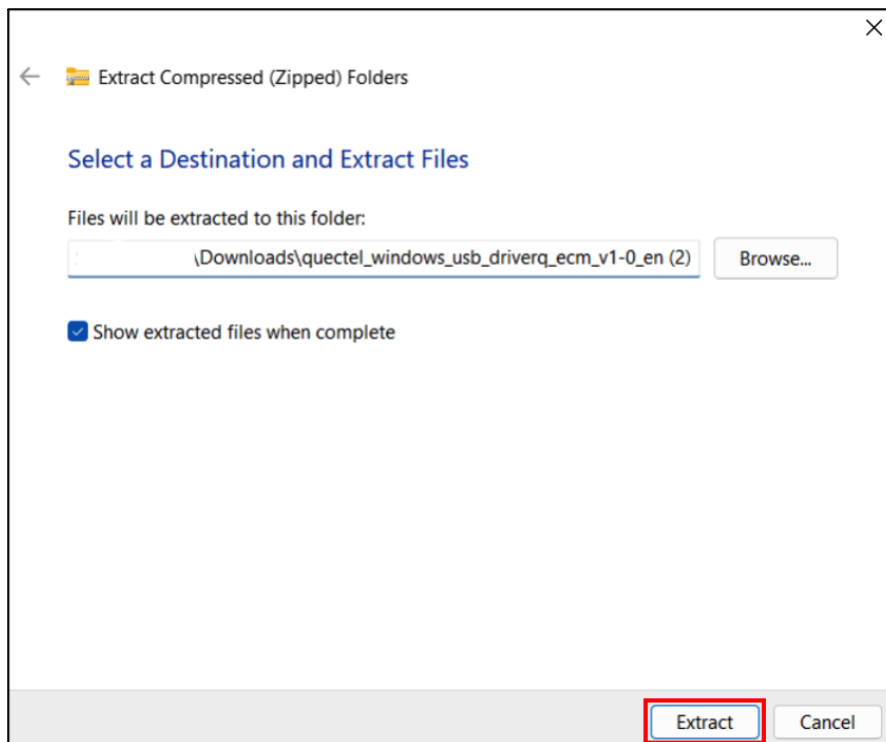
- Quectel login credentials may be required to download the drivers.
- The installation process may differ depending on your Linux distribution and processor.

1.3 Windows Driver Installation

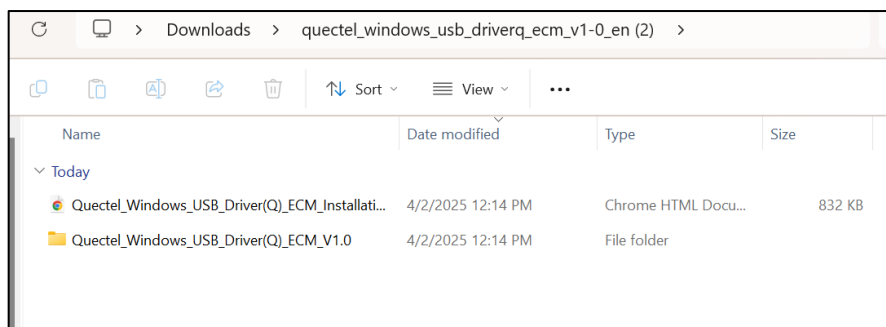
Follow the steps below to install Windows drivers for ECM:

Note: This process is the same for other drivers such as RNDIS.

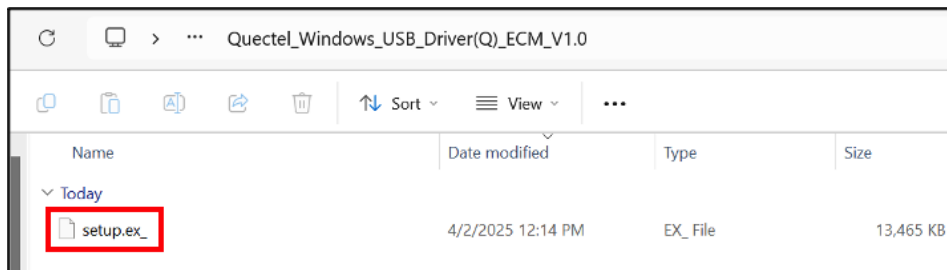
1. Download the ECM driver for Windows listed in the Section 1.2 above.
2. Right-click on the ZIP file and click **Extract All...**
3. Choose the location to extract the ZIP file to and click **Extract**.



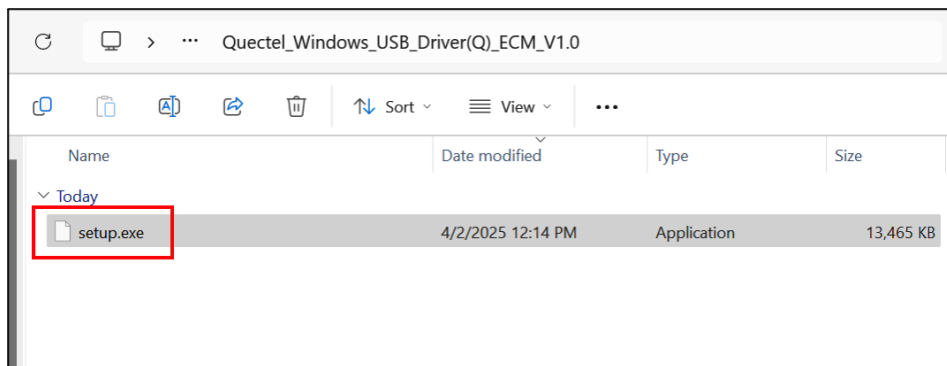
The extracted folder opens and shows an installation guide and driver subfolder.



4. Double-click the subfolder and locate the file: **setup.ex_**:



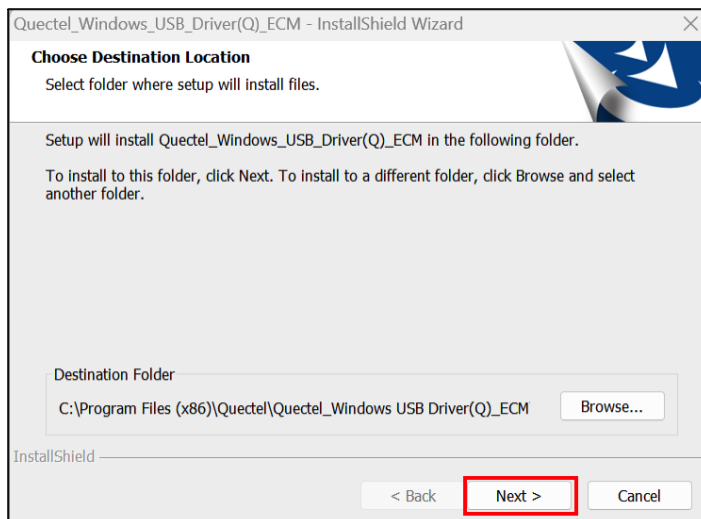
5. Right-click the file, click **Rename**, and rename the file to **setup.exe**:



6. Double-click the .exe file to start driver installation.

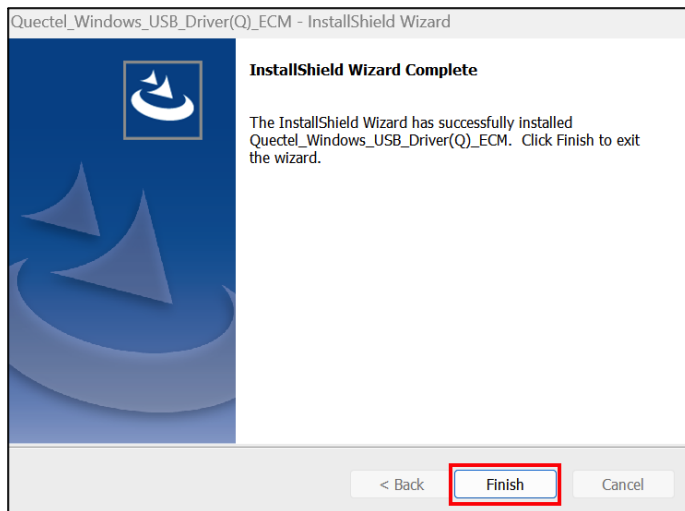
Note: If Windows indicates the file is from an unknown publisher, click **Run anyway**.

7. When the installation wizard appears, click **Next>** or choose a different installation folder.



8. Click **Next >** again to continue with the installation.

9. After the driver is installed, click **Finish** when you should see this message:



The driver installation is now complete!

1.4 Linux Driver Installation

For Linux, follow Quectel's USB Driver user guide within the following package:

https://www.quectel.com/download/quectel_lte5g_linux_usb_driver_v1-0-2/

Notes:

- Linux driver Installation may differ based on your Linux distribution or processor.
- These drivers may not be required if your Linux PC recognizes the device. To check, open a terminal and invoke the following command to enable kernel/driver logs:

```
dmesg -Tw
```

The modem should appear as below:

```
[Fri Apr 4 12:28:07 2025] usb 3-4: new high-speed USB device number 12 using xhci_hcd
[Fri Apr 4 12:28:07 2025] usb 3-4: New USB device found, idVendor=2c7c, idProduct=6007, bcdDevice= 2.00
[Fri Apr 4 12:28:07 2025] usb 3-4: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[Fri Apr 4 12:28:07 2025] usb 3-4: Product: EG916Q-GL
[Fri Apr 4 12:28:07 2025] usb 3-4: Manufacturer: Quectel
```

If the Quectel module (EG916Q-GL) is not recognized, the drivers need to be installed.

2 Windows Guide

The following subsections provide setup instructions for the protocols on Windows:

- Ethernet Control Model (ECM)
- Remote Network Driver Interface (RNIS) Specification
- Point-to-Point (PPP) Dial-up

2.1 Ethernet Control Model (ECM)

This section assumes that the Quectel ECM drivers have already been installed, and the modem is registered on the network. If this driver has not been installed, see Section 1.2.

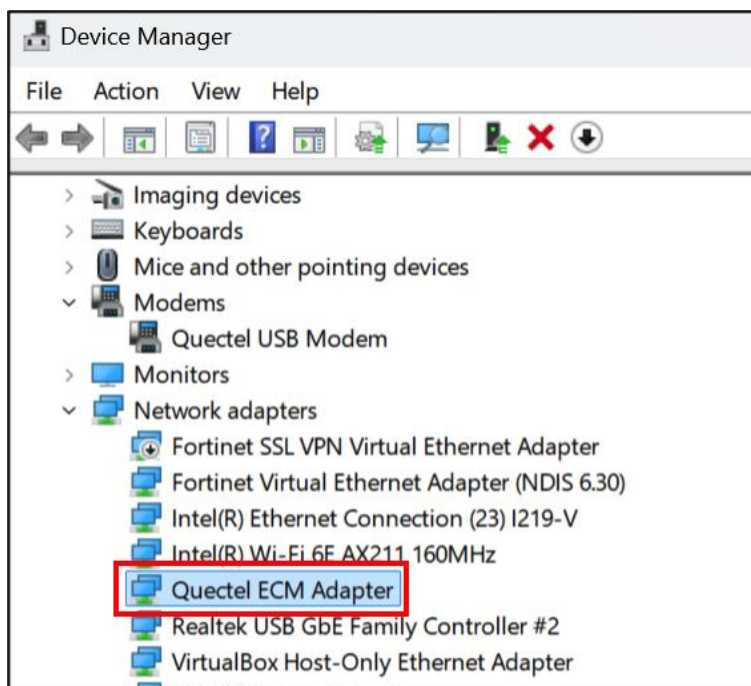
The ECM enables the QC1bisWWG to act as a network interface over USB. When configured as an ECM, the modem creates a network adapter on Windows to provide internet connectivity over USB.

Follow the steps below to set up the modem as an ECM:

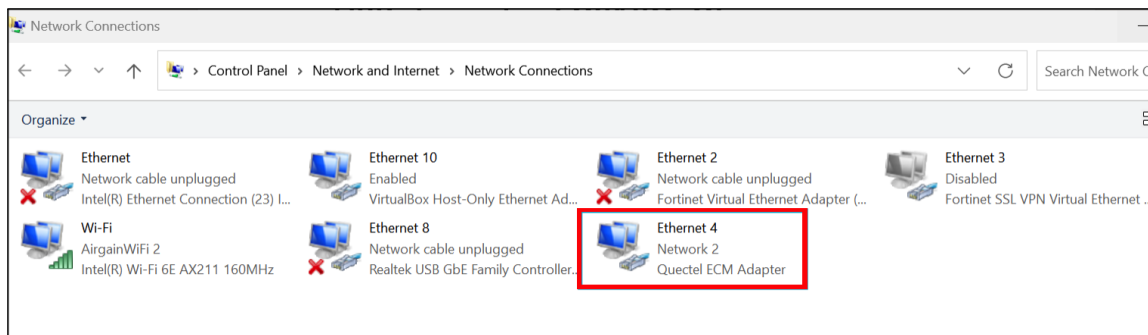
1. Connect the QC1bisWWG modem to a Windows PC and verify registration with the cellular network. Once registration is verified, enter the following command to set the modem to ECM mode:

```
AT+QCFG="usbnet",1
```

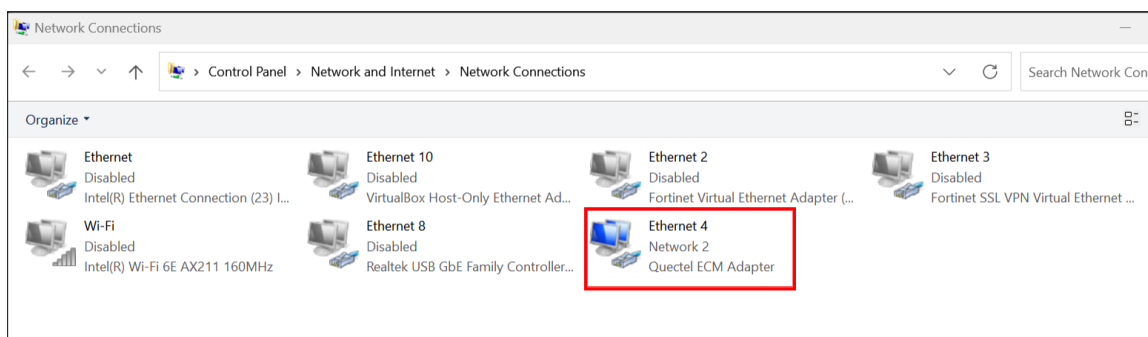
2. Open **Device Manager** in Windows, and confirm the modem appears as below:



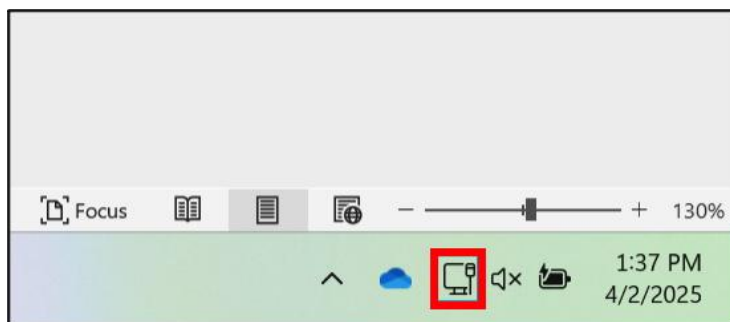
- Once this is verified, search for “network connections” in the Windows search bar. Click **View network connections** when it appears and verify that an Ethernet connection named “Quectel ECM Adapter” is present:



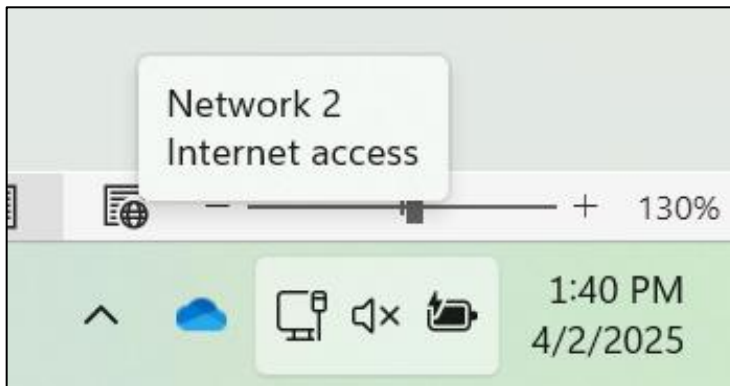
- Disable any network adapter(s) that already provide an internet connection, such as other Ethernet adapters or Wi-Fi connections. Only the **Quectel ECM Adapter** must be enabled:



Your Windows PC should now be connected to the Internet via the QC1bisWWG. To verify, hover over the network indicator on the Windows taskbar:



A popup indicates the PC is connected to the Internet via **Network 2**, which corresponds to the Quectel ECM Adapter:



2.2 Remote Network Driver Interface (RNDIS) Specification

RNDIS enables the QC1bisWWG to act as a virtual Ethernet adapter, communicating with TCP/IP protocols over USB to the Windows PC. The steps below illustrate how to set up the modem with RNDIS:

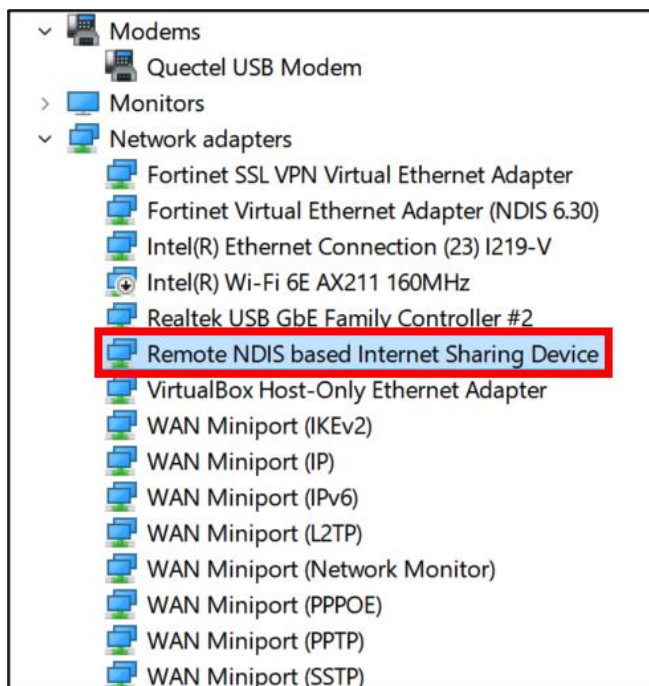
Notes:

- This section assumes that Quectel RNDIS drivers have already been installed, and the modem is registered on the network. If this driver has not been installed, see Section 1.2. The installation for the RNDIS drivers is the same process as with the ECM's.
- Verify that the ECM drivers are uninstalled before continuing with RNDIS driver installation.

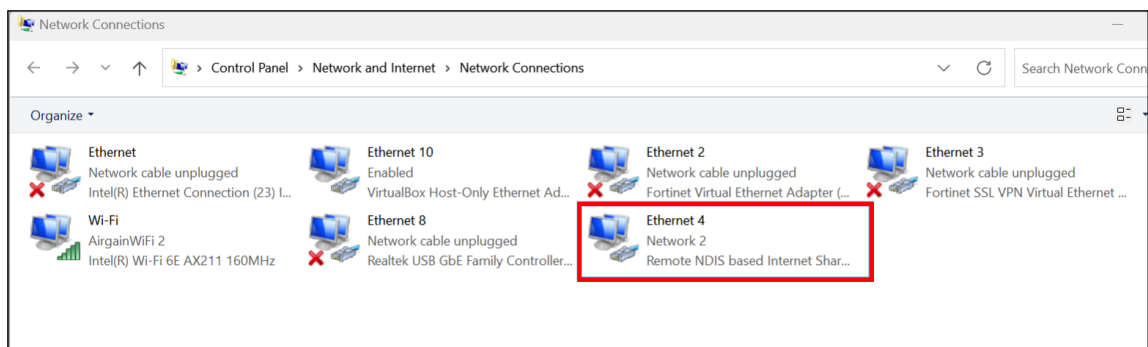
1. Connect the QC1bisWWG modem to a Windows PC and verify registration with the cell network. Once registration is verified, enter the following command to set the modem to RNDIS mode:

```
AT+QCFG="usbnet", 3
```

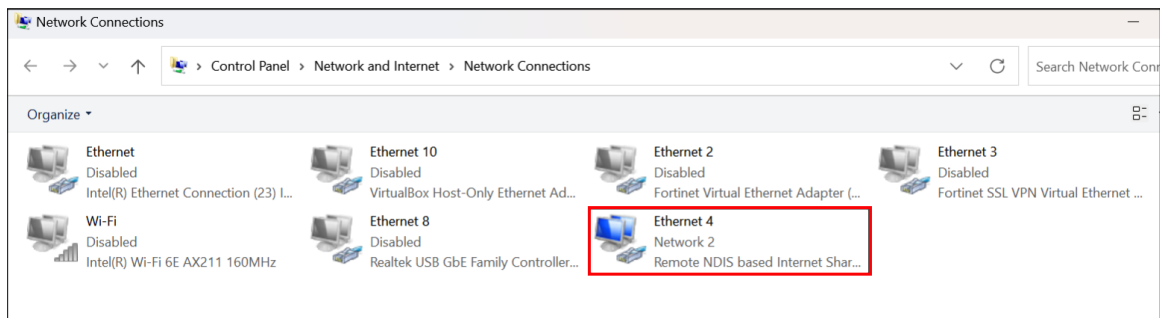
2. Open **Device Manager** in Windows, and confirm that the modem appears as below:



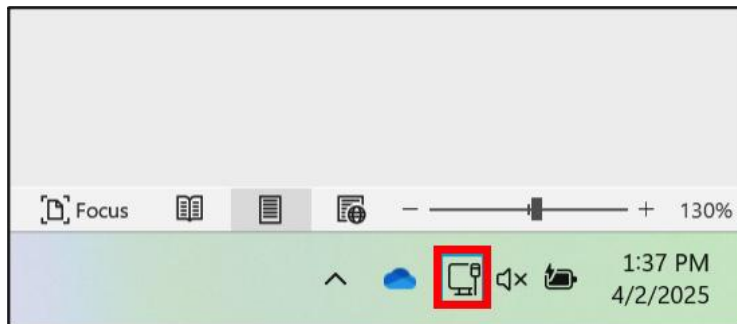
3. Once verified, search for “network connections” in the Windows search bar.
4. Click **View network connections** when it appears and verify that an Ethernet connection named “Remote NDIS Based Internet Sharing Device” is present:



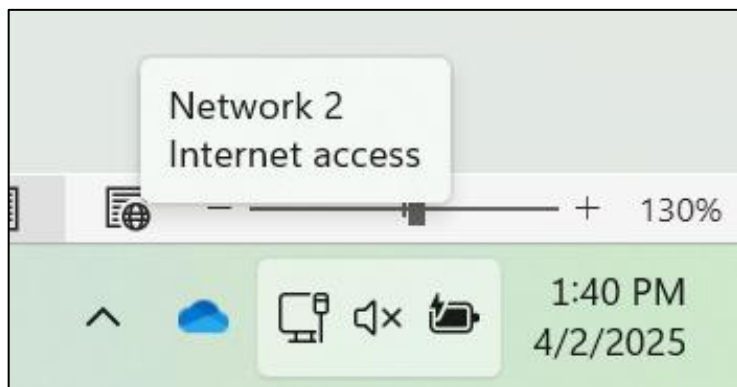
5. Disable any network adapter(s) that already provide an internet connection, such as other Ethernet adapters or Wi-Fi connections. Only the **Remote NDIS Based Internet Sharing Device** must be enabled:



Your Windows PC should now be connected to the Internet via the QC1bisWWG. To verify, hover over the network indicator on the windows taskbar:



A popup indicates the PC is connected to the Internet via **Network 2**, which corresponds to the RNDIS device:



2.3 Point-to-Point (PPP) Dial-up

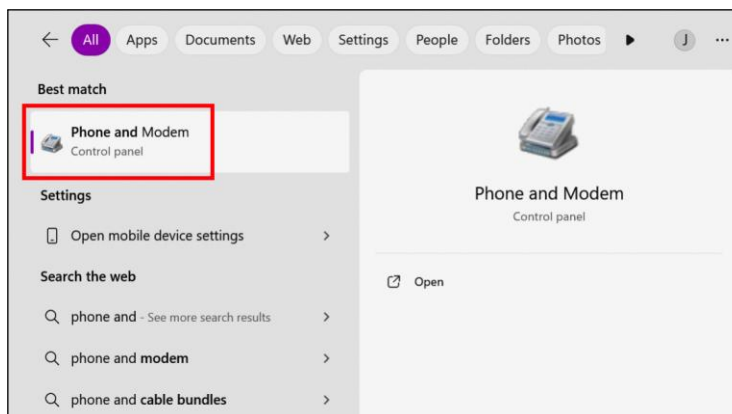
The QC1bisWWG modem can also be used with PPP dial-up in Windows. The steps below show how to set up the QC1bisWWG as a dial-up connection:

Note: These steps use the Quectel ECM drivers, but the RNDIS drivers work as well.

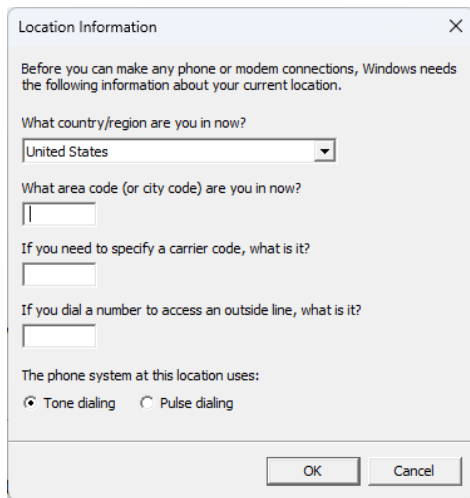
1. Power on the modem and open **Device Manager**.
2. Navigate to **Modems** and ensure the **Quectel USB Modem** is present:



3. Once verified, search for “Phone” in the Windows search bar, and click **Phone and Modem**:



4. If prompted for an area code, enter the corresponding area code (or city code) in which you are testing; leave the other fields blank:



Location Information

Before you can make any phone or modem connections, Windows needs the following information about your current location.

What country/region are you in now?
 United States

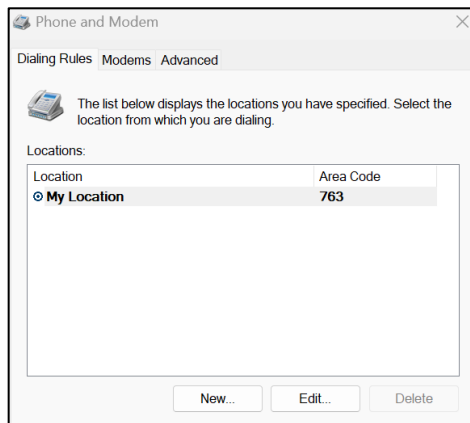
What area code (or city code) are you in now?

If you need to specify a carrier code, what is it?

If you dial a number to access an outside line, what is it?

The phone system at this location uses:
☒ Tone dialing ☐ Pulse dialing

OK Cancel



Phone and Modem

Dialing Rules Modems Advanced

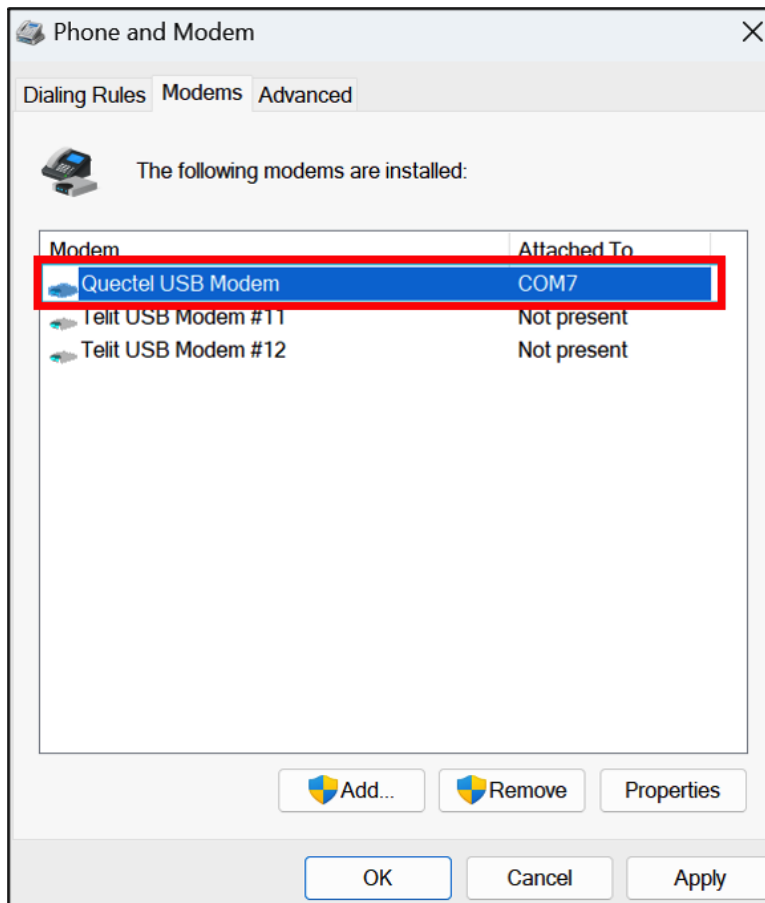
The list below displays the locations you have specified. Select the location from which you are dialing.

Locations:

Location	Area Code
My Location	763

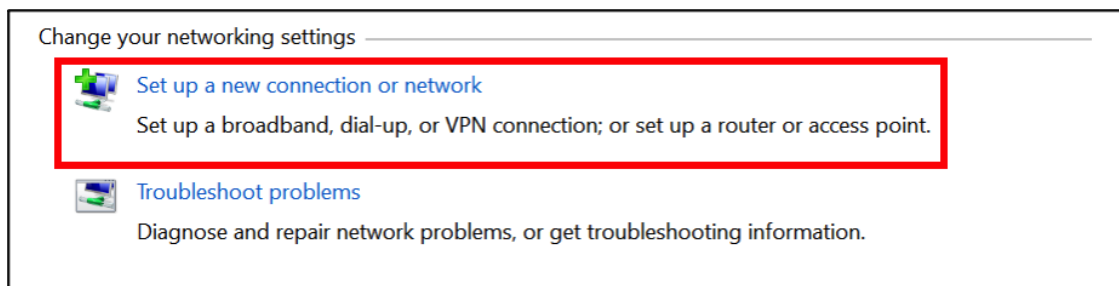
New... Edit... Delete

5. Select the **Modems** tab and verify that your modem appears as below:

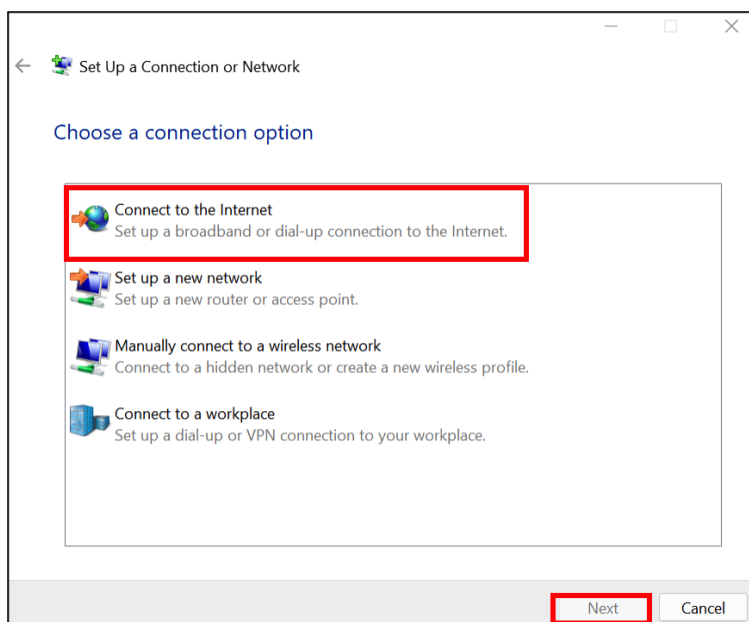


Note: The COM port may vary depending on your system.

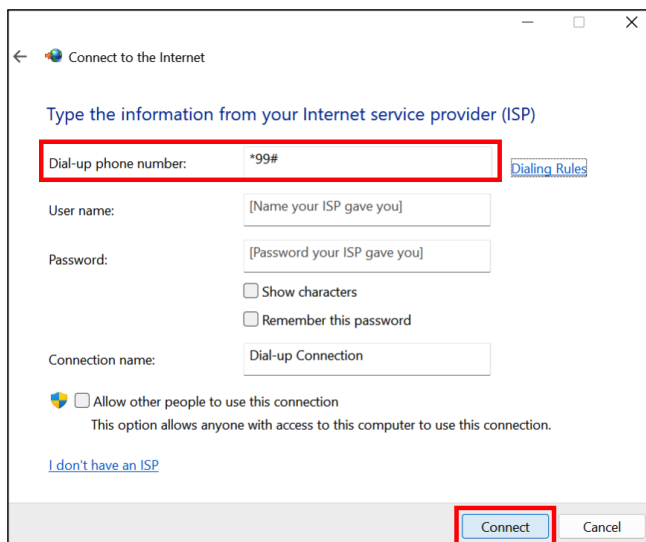
6. Open **Control Panel**, navigate to **Network and Internet > Network and Sharing Center**, and click **Set up a new connection or network**:



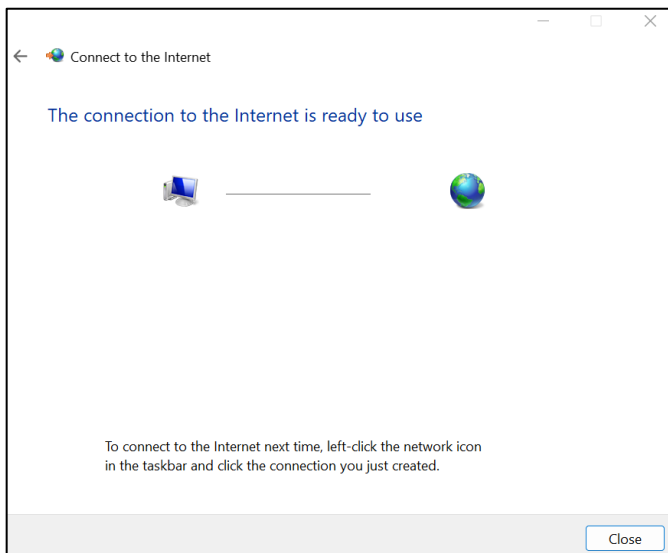
7. In the **Set Up a Connection or Network** window that appears, select **Connect to the internet** and click **Next**:



8. Click **Set up a new connection anyway** and then click **"Dial-up"**:
9. In the **Dial-up phone number** field, enter a number such as **"*99#"**, and click **Connect**:



A message stating “The connection to the Internet is ready to use” appears:



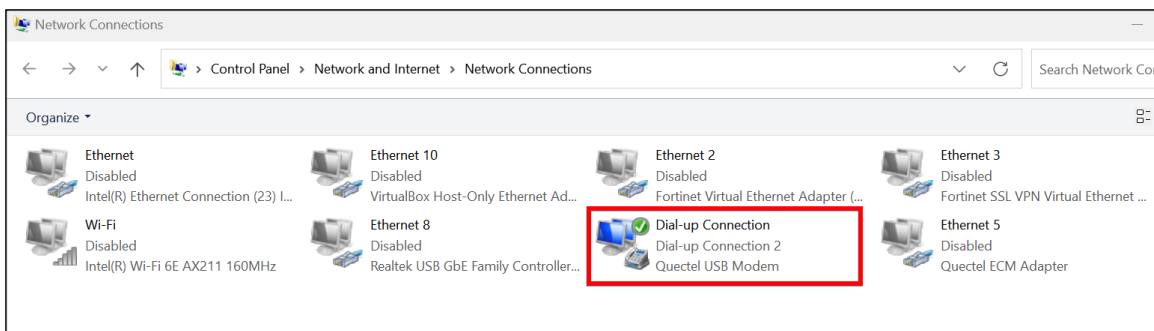
Note: If this step fails, verify the Quectel driver (ECM/RNDIS) installation and ensure the AT+QCFG=”usbnet” command is set to the correct protocol:

AT+QCFG=”usbnet”, 1 – sets the device to ECM mode

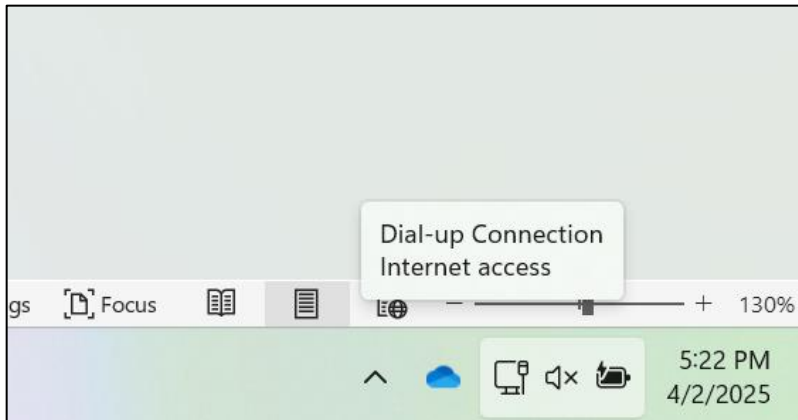
AT+QCFG=”usbnet”, 3 – sets the device to RNDIS mode.

Reboot the device after issuing the command.

10. Open **Network Connections** in Windows and ensure that the **Dial-up Connection** is shown with the **Quectel USB Modem**:



11. Hover over the Windows network icon to display the dial-up connection:



A dial-up connection is now successfully set up. If the popup shows another network, ensure that other network adapters are disabled.

3 Linux Guide

The following subsections provide setup instructions for the protocols on Linux:

- Ethernet Control Model (ECM)
- Remote Network Driver Interface (RNDIS) Specification
- Point to Point Protocol (PPP) Introduction

3.1 Ethernet Control Model (ECM)

ECM enables the QC1bisWWG to act as a network interface over USB. When configured for ECM, the modem creates a network adapter on Linux to provide internet connectivity over USB. The steps below illustrate how to set up the modem as an ECM:

Notes:

- This section assumes that Quectel Linux USB drivers have already been installed, and the modem is registered on the network. If this driver has not been installed, see Section 1.3.
 - To issue commands to the modem, you can use a terminal emulator program of your choice. For this documentation we used Picocom, a Linux terminal emulator program. For more information regarding Picocom setup/usage, visit Picocom's [GitHub](#).
1. Open two terminals and invoke the following command in the first terminal to stream messages generated by the kernel and device drivers:

```
dmesg -Tw
```

Note: The second terminal is used to issue subsequent commands in the steps below.

2. Connect the QC1bisWWG modem to a Linux PC over serial/USB and verify registration with the cell network.
3. Enter the following command to set the modem to ECM mode:

```
AT+QCFG="usbnet",1
```



The output should look similar to the following:

```
Type [C-a] [C-h] to see available commands
Terminal ready
at+qcfg="usbnet",1
OK
at
OK
at+qpowd
OK

POWERED DOWN
^bootrom[00]v[00]!\n
RDY
at
OK
at+qcfg="usbnet"
+QCFG: "usbnet",1
OK
```

4. Enter the following command to reboot the modem:

AT+CFUN=1,1

The modem should now be configured to ECM mode.

The terminal that outputs the kernel and device drivers, updates when the device reboots and displays messages similar to the following:

```
[Frl Apr 4 12:28:07 2025] usb 3-4: new high-speed USB device number 12 using xhci_hcd
[Frl Apr 4 12:28:07 2025] usb 3-4: New USB device found, idVendor=2c7c, idProduct=6007, bcdDevice= 2.00
[Frl Apr 4 12:28:07 2025] usb 3-4: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[Frl Apr 4 12:28:07 2025] usb 3-4: Product: EG916Q-GL
[Frl Apr 4 12:28:07 2025] usb 3-4: Manufacturer: Quectel
[Frl Apr 4 12:28:07 2025] cdc_ether 3-4:1.4 usb0: register 'cdc_ether' at usb-0000:00:14.0-4, CDC Ethernet Device, 22:89:84:6a:96:ab
[Frl Apr 4 12:28:08 2025] cdc_ether 3-4:1.4 enp0s20u4l4: renamed from usb0
```

This indicates that the kernel recognized the EG916Q-GL module and loaded the `cdc_ether` driver for use in ECM mode.

5. Invoke `ifconfig` to display all active network adapters connected to the system:



Note: If the command isn't available, invoke `sudo apt install net-tools` to install it.

```
root@nimbelink-test-4:/etc/ppp/peers# ifconfig
enp0s20u4i4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.10.2 netmask 255.255.255.0 broadcast 192.168.10.255
    inet6 fe80::32e7:e1bd:d9fe:ed92 prefixlen 64 scopeid 0x20<link>
    ether 22:89:84:6a:96:ab txqueuelen 1000 (Ethernet)
    RX packets 2 bytes 356 (356.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 38 bytes 5528 (5.5 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enp4s0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    ether b4:b5:2f:7a:36:a8 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enx8cae4cfa6bba: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    ether 8c:ae:4c:fa:6b:ba txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

wlo1: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.1.109 netmask 255.255.252.0 broadcast 192.168.3.255
    inet6 fe80::4946:21ba:eae7:97eb prefixlen 64 scopeid 0x20<link>
    ether 08:3e:8e:87:b5:01 txqueuelen 1000 (Ethernet)
    RX packets 923378 bytes 1213134699 (1.2 GB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 435613 bytes 44670575 (44.6 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@nimbelink-test-4:/etc/ppp/peers#
```

The `enp0s20u4i4` adapter corresponds to the modem as shown above:

```
[Fri Apr 4 12:28:07 2025] cdc_ether 3-4:1.4 usb0: register 'cdc_ether' at usb-0000:00:14.0-4, CDC Ethernet Device, 22:89:84:6a:96:ab
[Fri Apr 4 12:28:08 2025] cdc_ether 3-4:1.4 enp0s20u4i4: renamed from usb0
```

6. If the `enp0s20u4i4` adapter isn't shown, enter the following command to activate the network adapter:

```
ifconfig enp0s20u4i4 up
```

Note: Network adapter naming may vary based on your system. View the kernel log to see applicable adapter naming.

7. Enter the following command to test the internet connection:

```
ping 8.8.8.8 -I <network adapter name>
```

This command pings a publicly-accessible IP, in this case: `8.8.8.8`, which is one

of Google's primary DNS servers.

The following screenshot shows an example of pinging via the ECM adapter where, <network adapter name> is set to enp0s20u4i4:

```
root@nimbelink-test-4:/# ping 8.8.8.8 -I enp0s20u4i4
PING 8.8.8.8 (8.8.8.8) from 192.168.10.2 enp0s20u4i4: 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=114 time=271 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=114 time=111 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=114 time=148 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=114 time=128 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=114 time=126 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=114 time=125 ms
64 bytes from 8.8.8.8: icmp_seq=7 ttl=114 time=144 ms
64 bytes from 8.8.8.8: icmp_seq=8 ttl=114 time=125 ms
64 bytes from 8.8.8.8: icmp_seq=9 ttl=114 time=122 ms
^C
--- 8.8.8.8 ping statistics ---
9 packets transmitted, 9 received, 0% packet loss, time 8008ms
rtt min/avg/max/mdev = 111.027/145.114/271.739/46.040 ms
root@nimbelink-test-4:/#
```

3.2 Remote Network Driver Interface (RNDIS) Specification

RNDIS enables the QCIbisWWG to act as a virtual Ethernet adapter and communicate with TCP/IP protocols over USB to the Linux PC. The steps below show how to set up the modem with RNDIS:

Notes:

- These steps assume that the Quectel Linux USB drivers have already been installed, and the modem is registered on the network. If this driver has not been installed, see Section 1.3.
- To issue commands to the modem, you can use a terminal emulator program of your choice. For this documentation we used Picocom, a Linux terminal emulator program. For more information regarding Picocom setup/usage, visit Picocom's [GitHub](#).

1. Open two terminal windows and issue the following command in the first terminal:

```
issue "dmesg -Tw"
```

This streams messages generated by the kernel and device drivers.

Note: The second terminal is used to issue subsequent commands in the steps below.



2. Connect the QC1bisWWG modem to a Linux PC over serial/USB and verify registration with the cellular network.
3. Invoke the following command to set the modem to RNDIS mode:

```
AT+QCFG="usbnet",3
```

The output should look similar to the following:

```
Type [C-a] [C-h] to see available commands
Terminal ready
at
OK
at+qcfg="usbnet"
+QCFG: "usbnet",1
OK
at+qcfg="usbnet",3
OK
at
OK
at+qpowd
OK
POWERED DOWN
^bootrom[00]v[00]!\n
RDY
at
OK
at+qcfg="usbnet"
+QCFG: "usbnet",3
OK
```

4. Invoke the following command to reboot the modem:

```
AT+CFUN=1,1
```

The modem should now be configured in RNDIS mode.

The terminal that outputs kernel and device drivers, updates when the device reboots and displays messages similar to the following:

```
[Fri Apr 4 13:39:07 2025] usb 3-4: new high-speed USB device number 19 using xhci_hcd
[Fri Apr 4 13:39:07 2025] usb 3-4: New USB device found, idVendor=2c7c, idProduct=6007, bcdDevice= 2.00
[Fri Apr 4 13:39:07 2025] usb 3-4: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[Fri Apr 4 13:39:07 2025] usb 3-4: Product: EG916Q-GL
[Fri Apr 4 13:39:07 2025] usb 3-4: Manufacturer: Quectel
[Fri Apr 4 13:39:07 2025] rndis_host 3-4:1.0 usb0: register 'rndis_host' at usb-0000:00:14.0-4, RNDIS device, 92:60:59:c9:97:6d
[Fri Apr 4 13:39:08 2025] rndis_host 3-4:1.0 enp0s20u4: renamed from usb0
```

This indicates that the kernel recognized the EG916Q-GL module and loaded the `rndis_host` driver for use with RNDIS mode.

5. Invoke `ifconfig` to display all active network adapters connected to the system:

Note: If the command isn't available, invoke `sudo apt install net-tools` to install it.

```
root@nimbelink-test-4:/# ifconfig
enp0s20u4: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.10.2 netmask 255.255.255.0 broadcast 192.168.10.255
    inet6 fe80::10cd:968f:cd54:c805 prefixlen 64 scopeid 0x20<link>
    ether a6:9d:f9:cc:fc:c4 txqueuelen 1000 (Ethernet)
    RX packets 3 bytes 684 (684.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 40 bytes 8380 (8.3 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enp4s0: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    ether b4:b5:2f:7a:36:a8 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

enx8cae4cfa6bba: flags=4099<UP,BROADCAST,MULTICAST> mtu 1500
    ether 8c:ae:4c:fa:6b:ba txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@nimbelink-test-4:/#
```

The `enp0s20u4` adapter corresponds to the modem as shown above:

```
[Fri Apr 4 13:39:07 2025] rndis_host 3-4:1.0 usb0: register 'rndis_host' at usb-0000:00:14.0-4, RNDIS device, 92:60:59:c9:97:6d
[Fri Apr 4 13:39:08 2025] rndis_host 3-4:1.0 enp0s20u4: renamed from usb0
```

6. If the `enp0s20u4` adapter isn't shown, enter the following command to activate the network adapter:

```
ifconfig enp0s20u4 up
```

Note: Network adapter naming may vary based on your system. View the kernel log to see applicable adapter naming.

7. Enter the following command to test the internet connection by pinging via the adapter:

```
ping 8.8.8.8 -I <network adapter name>
```

This command pings a publicly-accessible IP, in this case: 8.8.8.8, which is one of Google's primary DNS servers.

The following screenshot shows an example of pinging through the RNDIS adapter where, <network adapter name> is set to enp0s20u4:

```
root@nimbelink-test-4:/# ping 8.8.8.8 -I enp0s20u4
PING 8.8.8.8 (8.8.8.8) from 192.168.10.2 enp0s20u4: 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=114 time=261 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=114 time=121 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=114 time=111 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=114 time=139 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=114 time=130 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=114 time=130 ms
64 bytes from 8.8.8.8: icmp_seq=7 ttl=114 time=130 ms
64 bytes from 8.8.8.8: icmp_seq=8 ttl=114 time=151 ms
^C
--- 8.8.8.8 ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 7001ms
rtt min/avg/max/mdev = 111.996/147.421/261.035/44.319 ms
root@nimbelink-test-4:/#
```

3.3 Point to Point Protocol (PPP) Introduction

PPP is a communications protocol used to directly connect two devices together without any other networking devices placed in between. PPP is a data link layer protocol and is designed to work with multiple network layer protocols, such as Internet Protocol (IP).

The following subsections describe how to set up PPP on a NL-SW-LTE-QC1bisWWG modem and Linux PC:

- PPP Script GitHub Repository
- Create PPP Scripts
- Edit the “x-QC1bisWWG-chat” Script
- Edit the “x-QC1bisWWG” Script

3.3.1 PPP Script GitHub Repository

Airgain provides the following library of PPP scripts on GitHub for customer use:

<https://github.com/NimbeLink/skywire-ppp-scripts>

To clone the repository, navigate to any desired directory, and invoke the following command in the terminal:

```
git clone https://github.com/NimbeLink/skywire-ppp-scripts.git
```

Airgain recommends downloading this repository and following the instructions on the GitHub page to set up the scripts.

Alternatively, copy the contents of the PPP scripts directly from an internet browser into /etc/ppp/peers on the Linux PC's filesystem.



3.3.2 Create PPP Scripts

To create PPP scripts, ensure you're the root user, identify the pair of PPP scripts that correspond to your SIM card carrier, and copy them into the `/etc/ppp/peers` directory.

The commands below demonstrate this operation, assuming that the PPP script repository was cloned into the root user's home directory.

Invoke the command below to change the path to the `skywire-ppp-scripts` repository:

Verizon Users:

```
cp ~/skywire-ppp-scripts/vzw-QC1bisWWG* /etc/ppp/peers
```

AT&T Users:

```
cp ~/skywire-ppp-scripts/att-QC1bisWWG* /etc/ppp/peers
```

Copy both AT&T and Verizon scripts:

```
cp ~/skywire-ppp-scripts/*QC1bisWWG* /etc/ppp/peers
```

To verify if the copy operation was successful, check that the relevant NL-SW-LTE-QC1bisWWG PPP scripts listed below are present in `/etc/ppp/peers`:

Required Verizon PPP Scripts:

```
vzw-QC1bisWWG-chat  
vzw-QC1bisWWG
```

Required AT&T PPP Scripts:

```
att-QC1bisWWG-chat  
att-QC1bisWWG
```

3.3.3 Edit the “x-QC1bisWWG-chat” Script

Before using the scripts, edit the x-QC1bisWWG-chat file and add the proper access point name (APN) for the cellular connection:

1. Replace "x" in the filename with either "att" or "vzw", depending on the SIM card being used, so the filename becomes att-QC1bisWWG-chat or vzw-QC1bisWWG-chat.
2. Open the file in a text editor, and find one of the following lines based on your provider:

AT&T Users:

```
OK AT+CGDCONT=1,"IP","[apn]"
```

Verizon Users:

```
OK AT+CGDCONT=3,"IP","[apn]"
```

3. Replace "[apn]" with the proper APN for the chosen SIM card and cellular carrier.

For example, the screenshot below shows an edited att-QC1bisWWG-chat file with the proper APN configured for an AT&T SIM card purchased through Airgain:

```
#
# Description
# This file is the PPP file for the following modem:
#       Skywire LTE CAT1 bis Global Modem: NL-SW-LTE-QC1bisWWG
#       This file is specifically for using the NL-SW-LTE-QC1bisWWG on AT&T
#
# Instructions
#     1.   You will need to add your APN in this file.
#           Replace:
#           [apn]
#           with your APN.
#
TIMEOUT 3
ECHO ON
'' AT
#OK AT+CGDCONT=1,"IPV4V6","iot0718.com.attz"
OK AT+CGDCONT=1,"IP","iot0718.com.attz"
OK AT+CFUN=1
OK AT+QCSQ;+CEREG?;+COPS?;+CGDCONT?
OK ATD*99#
CONNECT 150000000 '
"att-QC1bisWWG-chat" 42L, 1675C
```

3.3.4 Edit the “x-QC1bisWWG” Script

You may need to update the x-QC1bisWWG file to reflect the proper port for the PPP session:

1. Replace "x" in the filename with either "att" or "vzw", depending on the SIM card in use, so the filename becomes att-QC1bisWWG or vzw-QC1bisWWG.
2. Open the file in a text editor, and if necessary, change the line with /dev/ttyUSB3 to reflect the port to which the modem is enumerated. For example, if the modem is enumerated to the /dev/ttyACM0 port, then specify /dev/ttyACM0 in the file.

3.4 PPP Procedure

The subsections below describe how to set up and work with PPP on Linux:

- Take Down Network Interfaces
- Start the PPP Session
- Test the PPP Session
- Close the PPP Session

3.4.1 Take Down Network Interfaces

Taking down other network interfaces is a quick way to ensure that internet traffic is routed through the PPP interface. Other methods can be used as well.

Follow the steps below to sever the communication path over Ethernet with the Linux PC:

1. Invoke `ifconfig` to list all currently active network interfaces.

Note: If the command isn't available, invoke `sudo apt install net-tools` to install it.

2. Take note of each populated entry in the output from `ifconfig`.
3. Invoke the following command to take down each interface that may provide an internet connection to the Linux PC:

```
ifconfig [interface] down
```

Replace `[interface]` with the name of the interface to disable. Common network interfaces are `eth#`, `enp#s#`, `wlan#`, `wwan#`, etc.

4. Once the network interfaces have been disabled, invoke the following command to check the PC's internet connectivity:

```
ping 8.8.8.8 -c 5
```



This instructs the Linux PC to ping Google's public DNS server five times. If all the relevant network interfaces have been disabled, the ping attempts fail.

If the ping attempts succeed, invoke `ifconfig [interface] down` to verify that all relevant network interfaces are disabled.

Once all sources of internet connectivity are disabled, the PPP session can be tested properly.

3.4.2 Start the PPP Session

Invoke the following command to start the PPP session:

```
pon [ppp script]
```

Replace "[ppp script]" with one of the following filenames, depending on the carrier of the chosen SIM card:

Verizon Users:

```
vzw-QC1bisWWG
```

AT&T Users:

```
att-QC1bisWWG
```

This command starts the `pppd` daemon to configure the PPP connection, and sets it as the default network connection.

Note: Ensure the modem does not have an active PDP context when starting the PPP script. This causes the PPP script to encounter an error and freeze up.

3.4.3 Test the PPP Session

Invoke `ping 8.8.8.8 -c 5` again to test that the PPP connection is working properly. If the PPP session is successful, the response looks similar to the following:

```
root@nimbelink-test-4:/etc/ppp/peers# ping 8.8.8.8 -c 5
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=27 time=1573 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=27 time=555 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=27 time=243 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=27 time=139 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=27 time=122 ms

--- 8.8.8.8 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4021ms
rtt min/avg/max/mdev = 122.174/526.873/1573.843/546.062 ms, pipe 2
root@nimbelink-test-4:/etc/ppp/peers#
```

3.4.4 Close the PPP Session

To close the PPP connection, invoke the following command:

```
poff
```

Note: It's a good idea to close a PPP session whenever it's no longer needed. This prevents accidental usage of cellular data.

3.5 PPP Troubleshooting

If the PPP scripts become unresponsive:

Ensure the modem is freshly powered up, or rebooted each time a PPP session is started.

If the PPP scripts timeout:

This type of error is generally caused by attempting to start the PPP session too soon after the modem has booted:

```
root@nimbelink-test-4:/etc/ppp/peers# pon att-QC1bisWWG

RDY
Script /usr/sbin/chat -v -f /etc/ppp/peers/att-QC1bisWWG-chat finished (pid 9474), status = 0x3
Connect script failed
root@nimbelink-test-4:/etc/ppp/peers#
```

To fix this, wait 5 to 10 seconds after the modem becomes responsive before starting the PPP scripts.

4 Document Version Information

Revision	Description	Date
1	Initial Release	04/07/2025
1.1	Airgain updates	07/03/2025