EC200U&EG915U Series

PPP Application Note

LTE Standard Module Series

Version: 1.1

Date: 2021-08-17

Status: Released

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About the Document

Revision History

Version	Date	Author	Description
-	2021-04-16	Baron ZHENG	Creation of the document
1.0	2021-05-10	Baron ZHENG	First official release
1.1	2021-08-17	Baron ZHENG	Added an applicable module series EG915U.

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1 Introduction

This document briefly introduces the PPP functions of Quectel's EC200U and EG915U series modules, including PPP application modes, setting procedures, connection modes, termination steps and dialing examples.

2 PPP Application Mode

The usage of PPP (Point-to-Point Protocol) is illustrated in the following figure. Use UART port or USB port for PPP connection. The module provides a PPP server for application, and the application provides a PPP client for the module. Meanwhile, the application must provide protocols such as TCP/IP, HTTP(S), etc. When PPP connection is established, the IP packet data stream from the application will be transmitted to the Internet through the module.

Most standard operating systems (e.g. Windows, Unix/Linux) include the PPP protocol stack. For operating systems that have no available applications for PPP connection, it is necessary to develop applicable application software first.

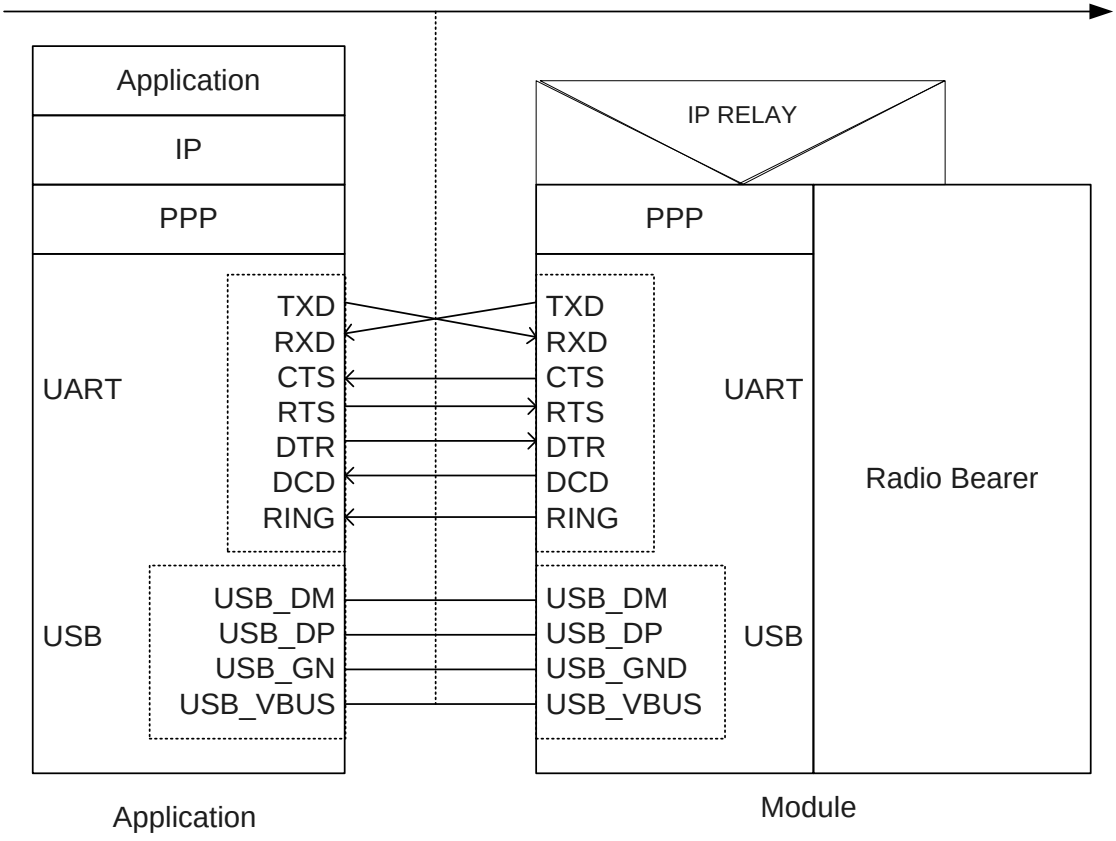

Figure 1: PPP Application Mode

3 PPP Setting

3.1. General Procedures for PPP Setting

After the module registers on GPRS network, it is necessary to set the APN for PPP by **AT+CGDCONT** and to start PPP by **ATD*99#**. After executing **ATD*99#**, the module will enter the PPP frame interaction process, which is based on standard PPP protocol. The module data packet interaction description is shown in the figure below. For more details about standard PPP, see *RFC 1661*.

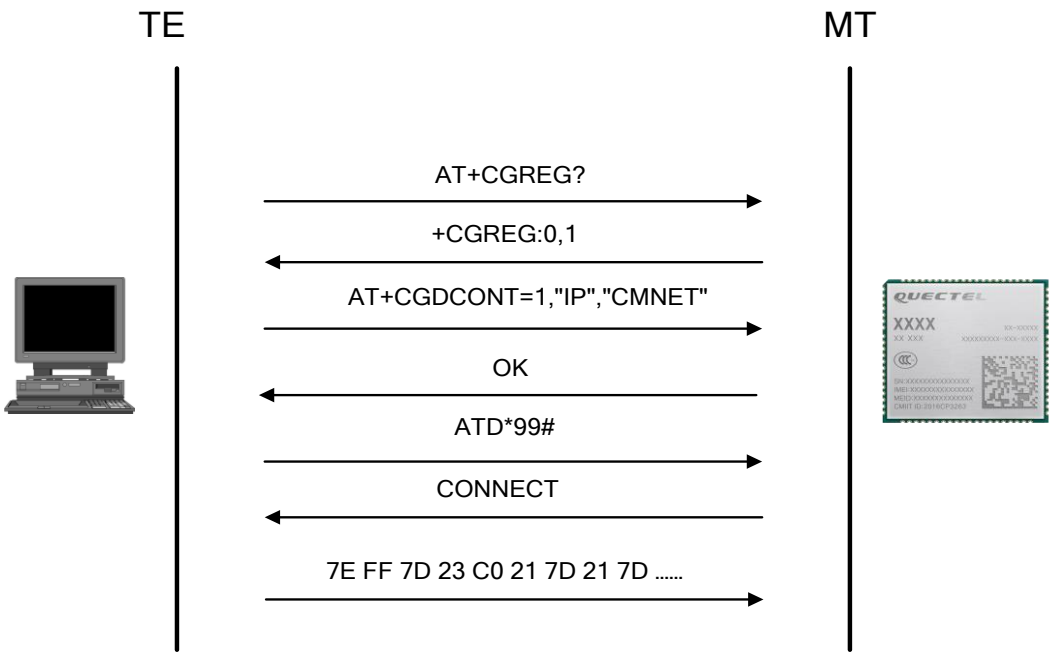

Figure 2: General Procedures for PPP Setting

3.2. Recommended Procedures for PPP Setting

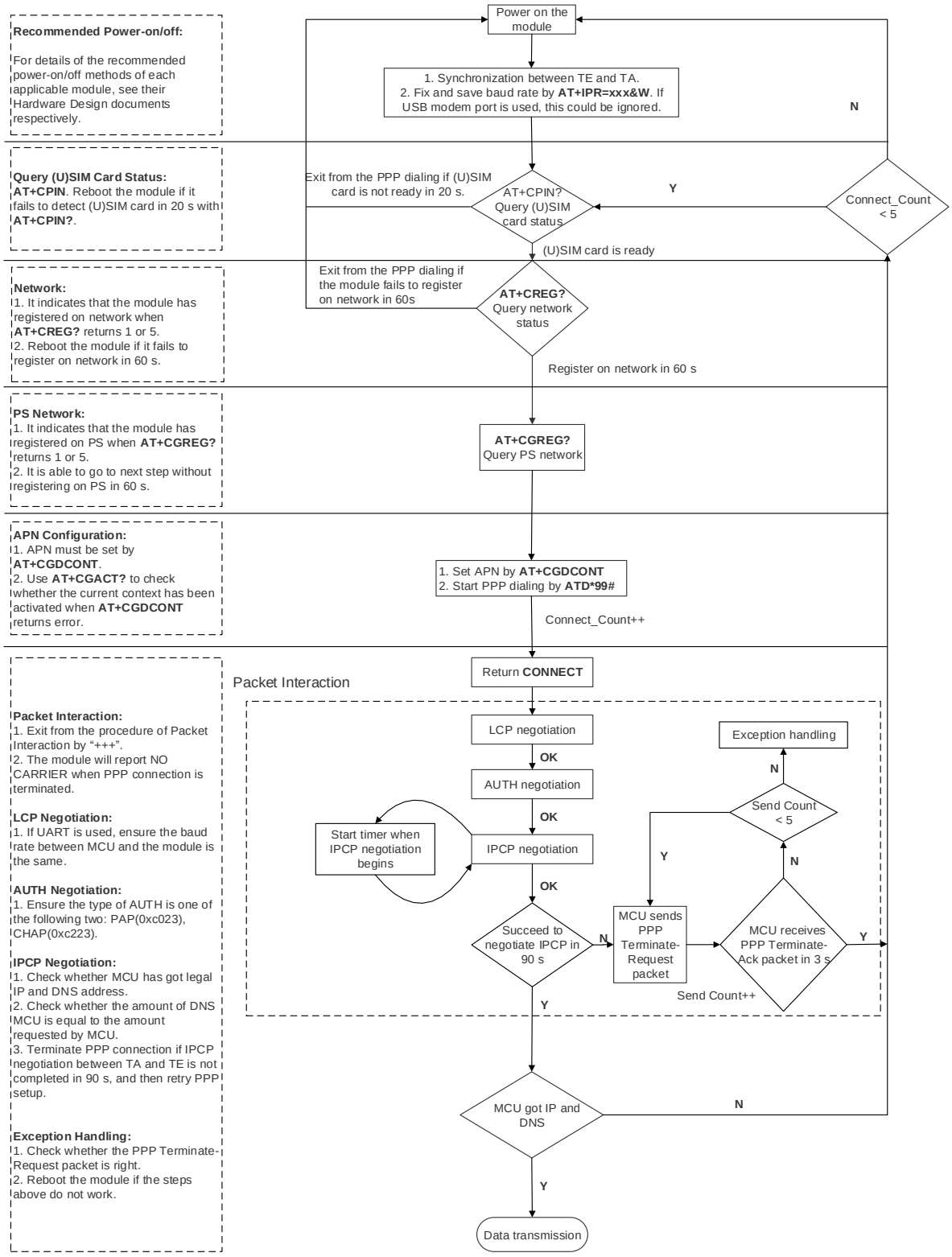

Figure 3: Flowchart of Recommended Procedures for PPP Setting

When the module is powered on, if the main UART is used, set the baud rate by executing **AT+IPR=xxx;&W**. Before executing **ATD*99#** to set PPP, you must check the status of the (U)SIM card by **AT+CPIN?**. When the (U)SIM card is ready, please periodically check the network registration status by **AT+CREG?** and **AT+CGREG?** until the network is prepared.

NOTES

1. Please ensure MCU and the module are synchronized successfully after rebooting the module. MCU sends **AT<CR><LF>** to the module every 100 ms until it receives **OK** reported by the module. If the main UART is used, the MCU will execute **AT+IPR=xxx;&W** to set and save the baud rate after successfully synchronizing the baud rate.
2. Before inputting the next AT command, the MCU needs to wait for the response to the previous AT command (such as response **OK**, **CME error**, **CMS error**). If there is no response within 60 seconds, the module can be restarted.
3. It is strongly recommended NOT to power on/off the module frequently. If 3 consecutive dialing retries fail, you can immediately power on/off (reset) the module for the first time. After resetting, if the dialing retry fails, you need to wait 10 minutes for the second reset, 30 minutes for the third reset, and one hour for the fourth reset.
4. If the MCU fails to transmit data to network after establishing the PPP connection, please check the PPP configuration and network status and restart the module.

4 PPP Connection Modes

4.1. Data Mode and Command Mode

The module communicates with application via USB or UART port (including AT commands and data). USB and UART ports have two working modes: data mode and command mode.

The two ports are in command mode before PPP is set, and the module can execute AT commands in this mode. When PPP negotiation is started, the two ports enter data mode, and remain in the mode when the PPP connection is set. If the PPP connection is not successfully established, the two ports will be in the command mode. In data mode, the module cannot execute AT commands.

EC200U and EG915U series modules provide convenient methods to switch between the two modes.

4.1.1. Switch from Data Mode to Command Mode

4.1.1.1. Change DTR Level to Switch from Data Mode to Command Mode

When the PPP connection has been established and USB/UART port is in data mode, change the DTR level from low to high to switch from data mode to command mode (**AT&D1** must be executed first). After the switch is successful, the module will return **OK**.

4.1.1.2. Use Sequence +++ to Switch from Data Mode to Command Mode

After the PPP connection is successfully established, use **+++** to switch the USB/UART port from data mode to command mode. To prevent the **+++** escape sequence from being misinterpreted as data, the following requirements should be followed:

1) Do not input any characters within 1 s or longer before inputting **+++**.
2) Input **+++** within 1 s, and no other characters can be inputted during this period.
3) Do not input any characters within 1 s after inputting **+++**.

When **+++** is received, the USB/UART port will switch from data mode to command mode, and the module will return **OK**.

NOTE

Please perform the above operations after completing the PPP negotiation, otherwise the above operations will terminate the PPP negotiation and the USB/UART port will exit the data mode. After completing the PPP negotiation, when the USB/UART port switches to the command mode, the input data will be treated as AT command, and the module maintains the PPP connection.

4.1.2. Switch from Command Mode to Data Mode

4.1.2.1. Use ATO to Switch from Command Mode to Data Mode

To switch USB/UART port from command mode to data mode when PPP connection maintains, you can execute **ATO**.

Example

```
//When PPP connection maintains, USB/UART port is in command mode.
ATO
CONNECT          //Indicates that TA has entered data mode, and all data inputted from USB/UART
                   port will be treated as PPP frames.
```

4.2. Handle URC in Data Mode

The URC for incoming calls and short messages in data mode will not be reported to the PPP dial-up port during PPP connection. But the level of module's RI pin will change from high to low for 120 ms as an indication of URC for incoming calls and short messages. The MCU can switch the port to command mode according to the RI pin status to process incoming calls or short message. After switching to command mode, the URC will be reported to the PPP dial-up port if there are still incoming calls or text messages.

4.3. Data Carrier Detection (DCD) Mode

DCD mode is determined by **AT&C**. If **AT&C0** is executed, the DCD pin will not be used to indicate the data carrier status. While executing **AT&C1**, the DCD pin will be used to indicate the data carrier status. The pin will remain at low level when there is data carrier or PPP negotiation begins, otherwise it will remain at high level.

NOTE

When switching module's USB/UART port from data mode to command mode (by using **+++**), the DCD state remains unchanged.

5 PPP Connection Termination

There are two methods to terminate the PPP dial-up connection:

1. Terminate the PPP connection through the LCP Terminate-Request message, and this method is recommended.

2. TA can also terminate the PPP connection by changing the DTR level. Set the DTR function by **AT&D2** first, change the DTR level from low to high, and the data connection will be automatically terminated. After the PPP connection is completely terminated, the USB/UART port will enter the command mode. Examples are as follows:

Example

```
//USB/UART port is still in command mode before PPP connection is established.
AT&D2
OK
```

NOTE

1. PPP connection termination procedures must be performed in data mode.
2. PPP connection termination procedures can be performed at any time during the PPP setting or connecting process.

6 PPP Dial-up Operations

This chapter introduces how to establish PPP dial-up in Windows 10. For detailed operations in Linux operating system, see ***document [3]***.

6.1. Preparation

It is necessary to finish the following steps before establishing a PPP dial-up connection in Windows.

1. Connect the module to PC and enter the PIN code if the (U)SIM card PIN is locked.
2. Make sure the (U)SIM card can successfully register on GPRS network.

6.2. PPP Dial-up in Windows 10

6.2.1. Modem Configuration

6.2.1.1. Add a New Modem

If the **Standard 19200 bps Modem** is not installed, you need to add a new standard modem to the modem section of the control panel.

1. Search for “**Phone**” in the main interface, and then click “**Phone and Modem**” as follows when it appears:

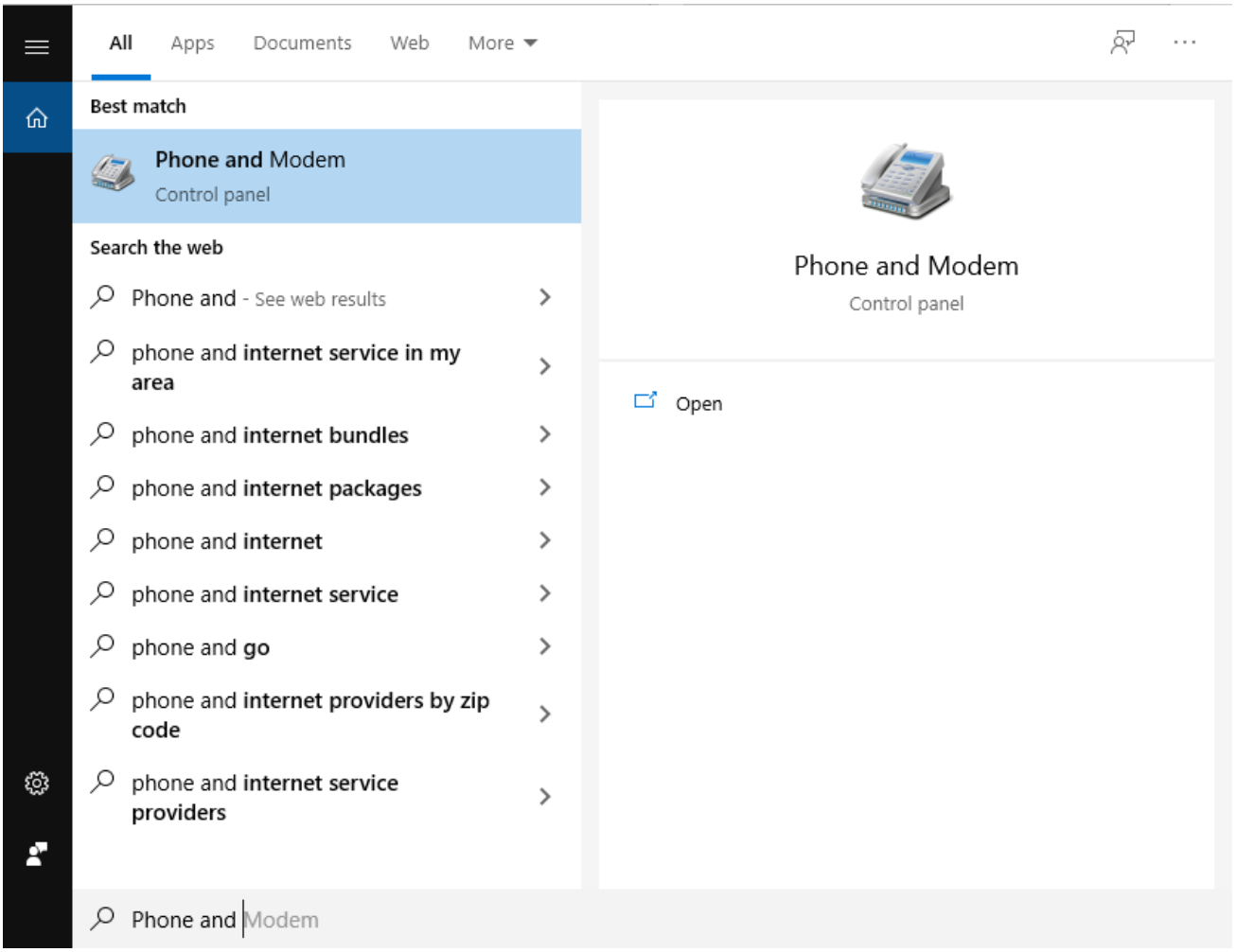

Figure 4: Search for “Phone and Modem” in Control Panel

2. Double-click the "**Phone and Modem**", and select "**Modems**" → "**Add…**" to add a new modem, as shown in the following figure.

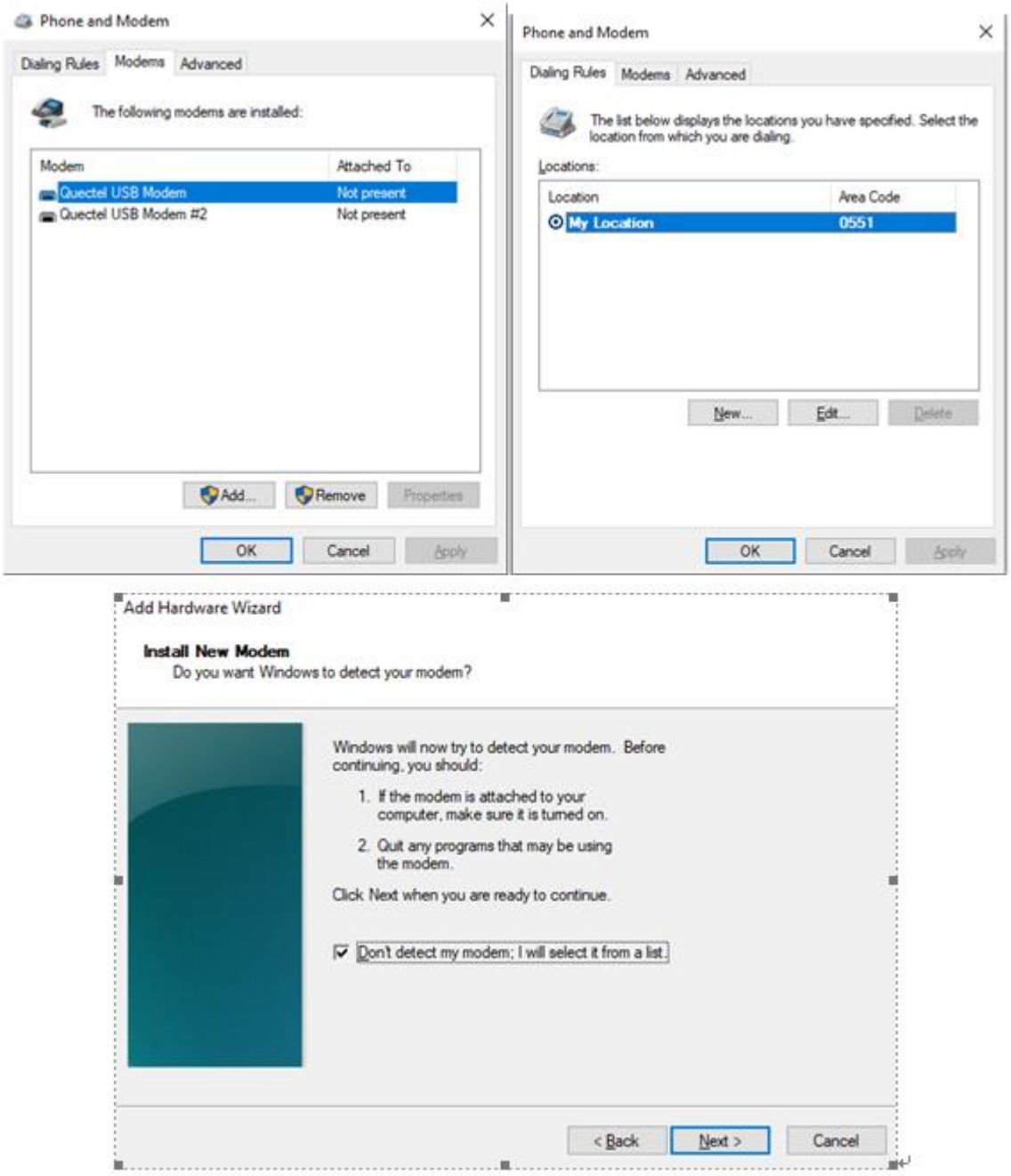

Figure 5: Add a New Modem

3. Follow the instructions on the screen to install the new modem: select "**Standard 19200 bps Modem**" and then the port (such as "**COM10**") to be installed; click "**Next**" button until the configuration is complete. For details, see the figure below.

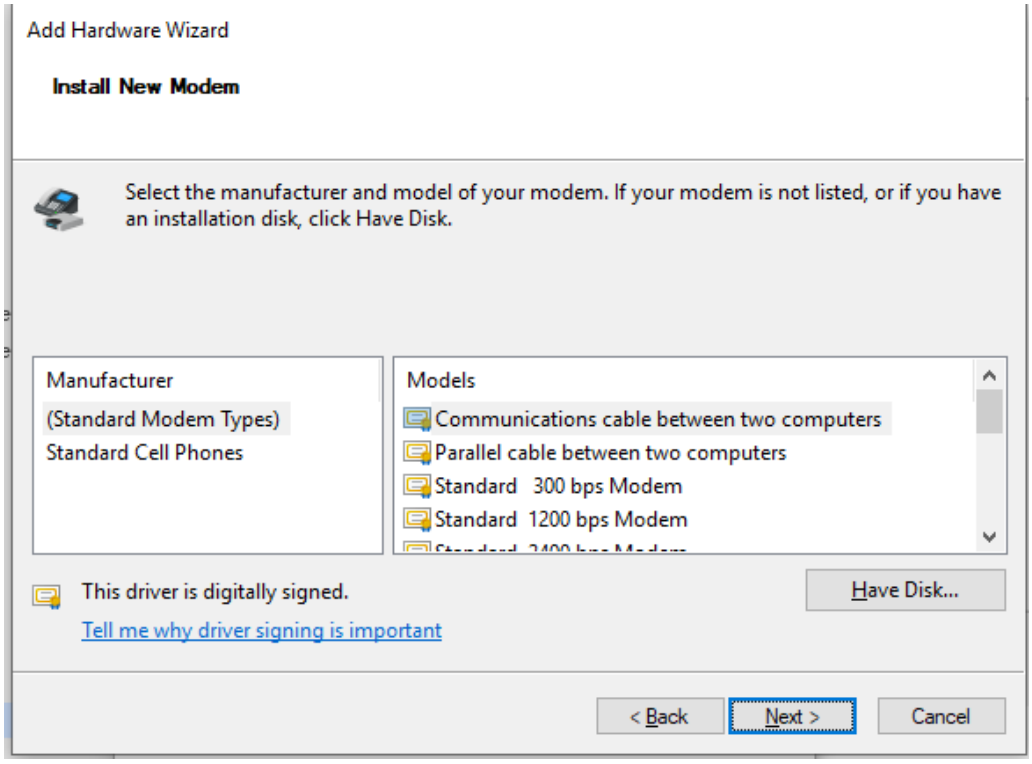

Figure 6: Select Model of the Modem

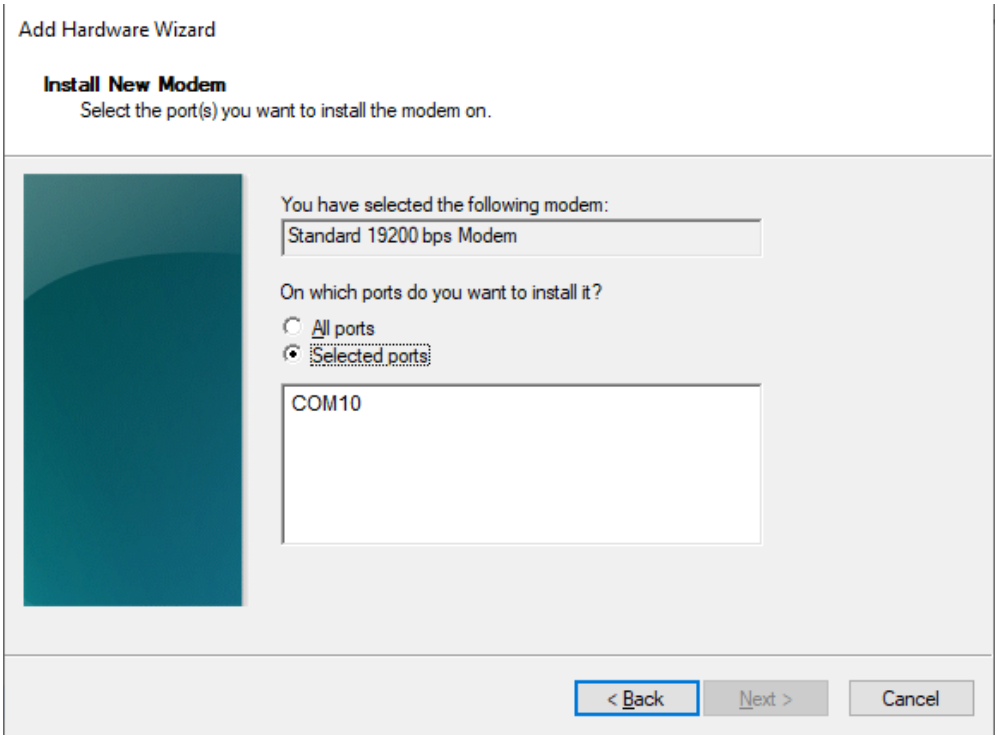

Figure 7: Select a Port

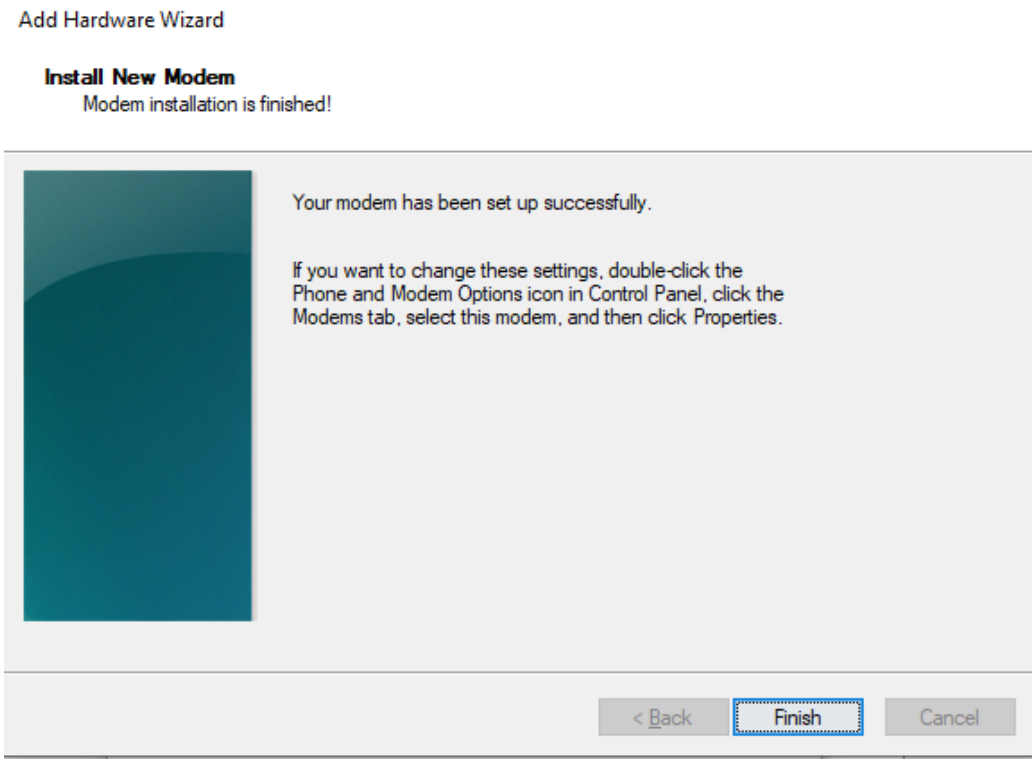

Figure 8: New Modem is Installed Successfully

6.2.1.2. Configure the Modem Driver

Select the installed "**Standard 19200 bps Modem**" and click the "**Properties**" button. After entering the interface, select the "**Modems**" option and modify the "**Maximum Port Speed**" to "115200" (default value). Click the "**Advanced**" option, configure "**Extra Settings**" and input **AT+CGDCONT=1,"IP","CMNET"** as shown below.

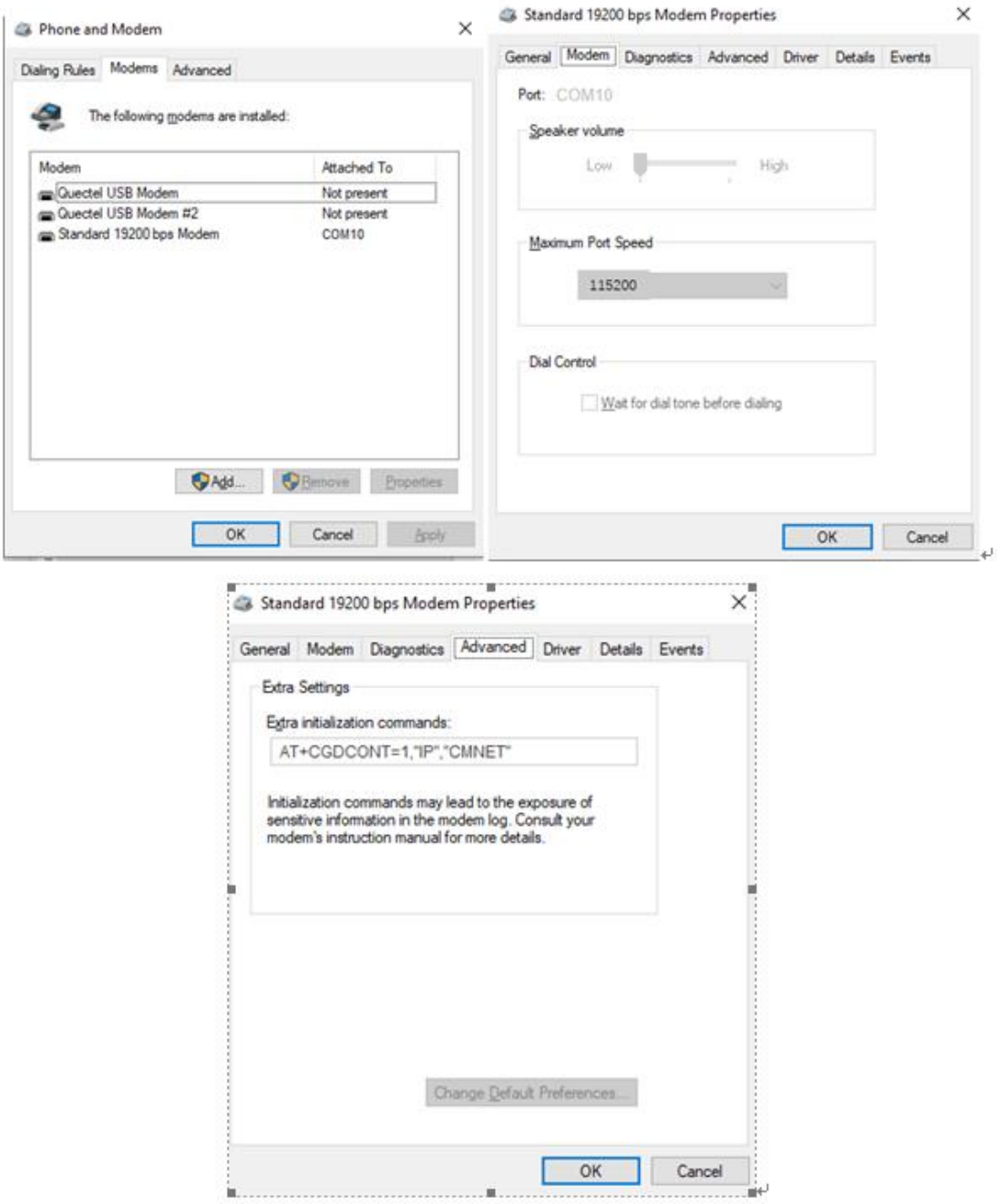

Figure 9: Configure the Modem Driver

NOTE

In the example above, the settings predefine a PDP context where CID=1, PDP type=IP and APN=CMNET. CMNET is the APN of the network operator China Mobile and it should be replaced with the value provided with the value defined by the network operator.

6.2.2. Dial-up Network Configuration

6.2.2.1. Create a New Connection

1. Open "**Control Panel**", click "**Network and Internet**", "**Network and Sharing Center**" and finally "**Set up a new connection or network**", as illustrated below.

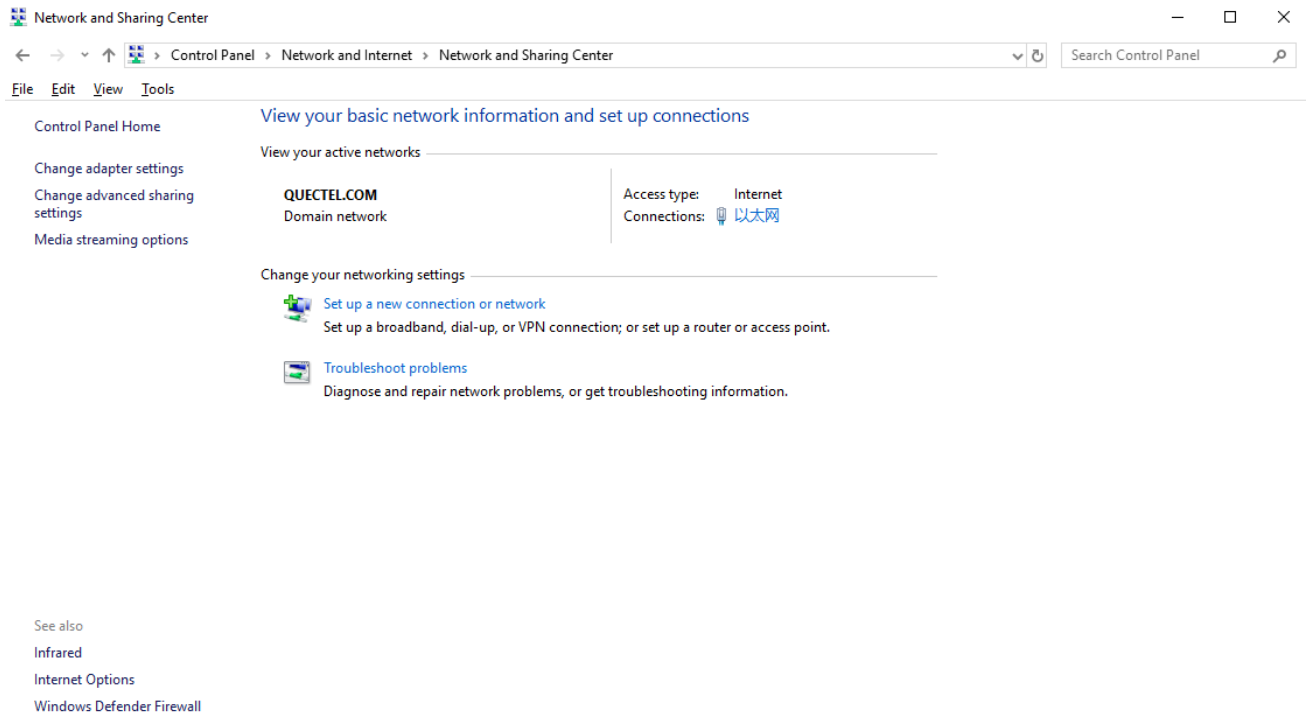

Figure 10: Create a New Connection

2. Select “**Connect to the Internet**”, click “**Next**”. Then click “**Set up a new connection anyway**” and “**Dial-up**” to connect as illustrated in the following figure.

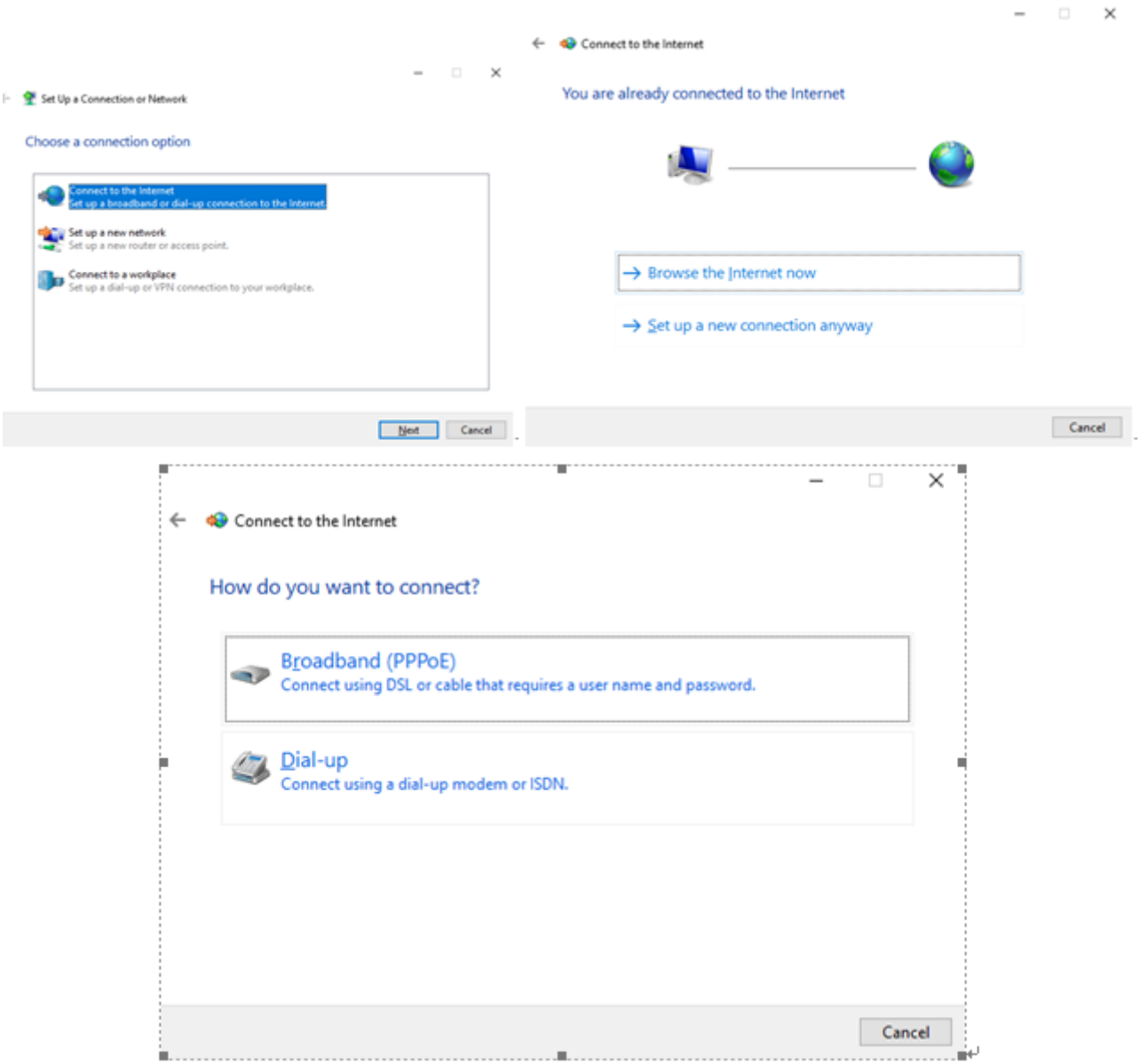

Figure 11: Set up the New Connection

6.2.2.2. Configure the Connection

Enter number (such as "***99#**") in "**Dial-up phone number**", and then click "**Connect**" button, as illustrated below.

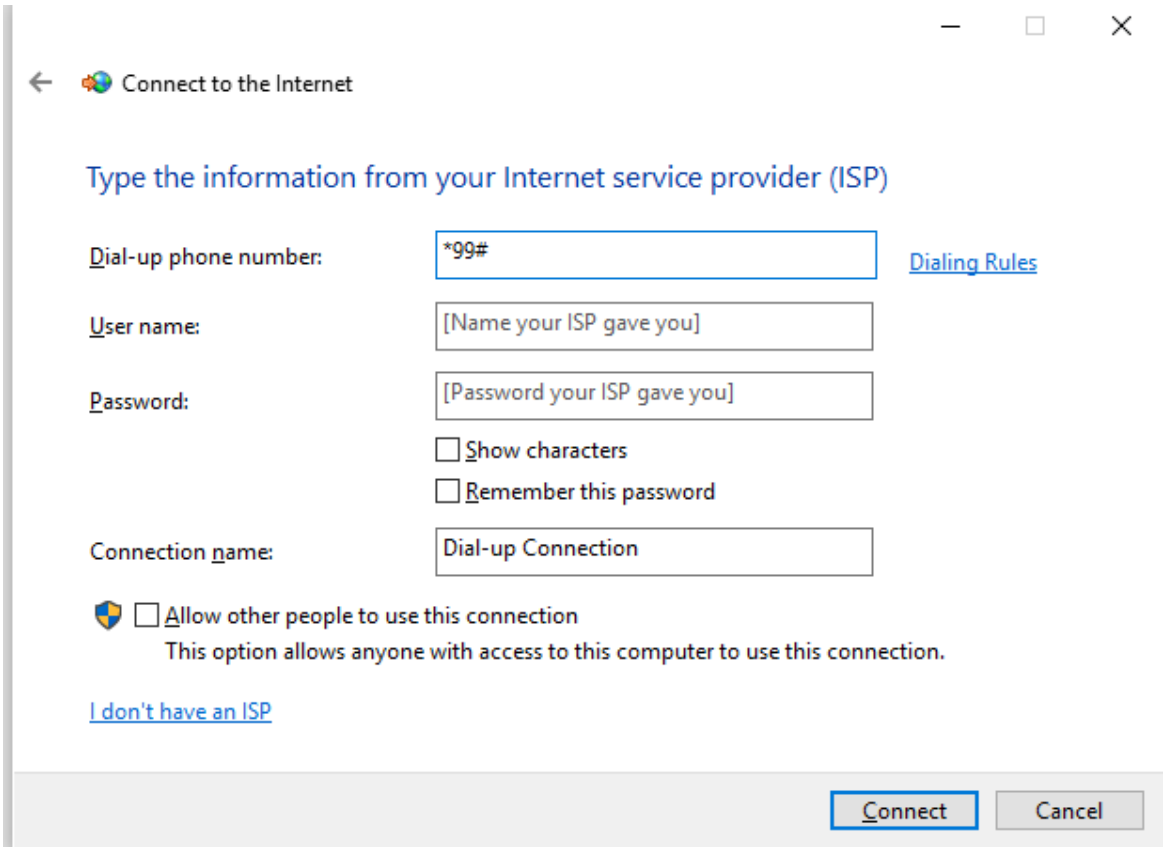

Figure 12: Configure the Connection

6.2.2.3. Configure the Dial-up Tool

Enter number (such as "***99#**") in "**Dial**" window, click "**Properties**" button, and configure the "**Standard 19200 bps Modem (COM10)**". Then select "**115200**" from the drop-down list of "**Maximum speed**". Click "**OK**" button to finish the configuration. See the following figure for details.

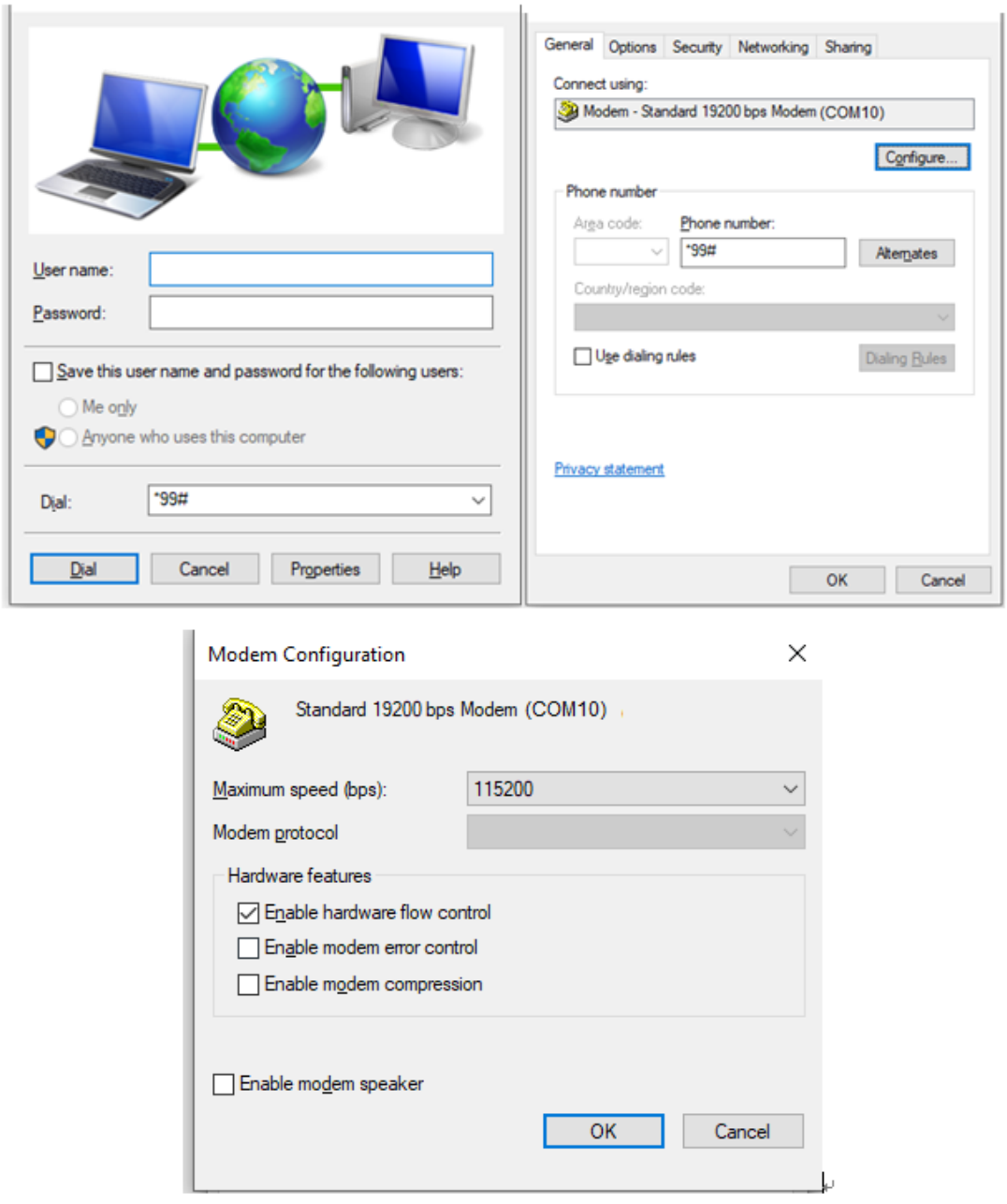

Figure 13: Configure the Dial-up Tool

6.2.2.4. Establish the Dial-up Connection

After the above operations, click the "**Dial**" button, the interface will pop up a prompt box "**Verifying username and password**", and the pop-up box quickly pops up "**Connected**" to indicate a dial-up connection. See following figures for details.

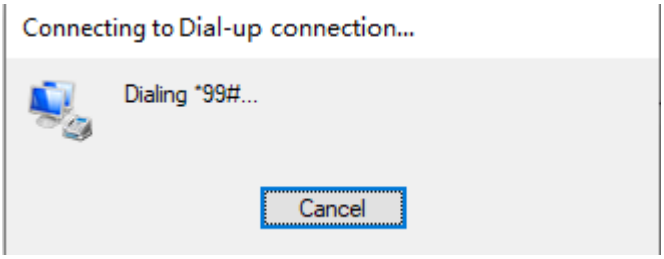

Figure 14: Connecting to Dial-up Connection

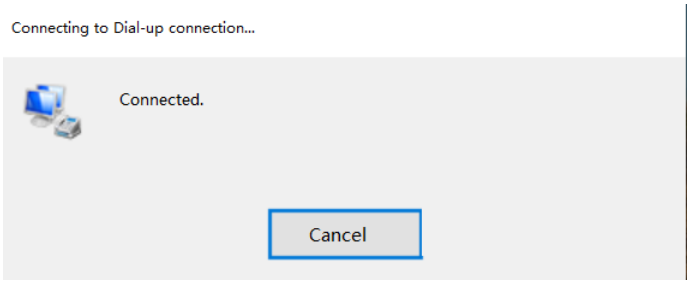

Figure 15: Establish the Dial-up Connection Successfully

7 Appendix References

Table 1: Related Documents

Document Name
[1] Quectel_EC200U_Series_Hardware_Design
[2] Quectel_EG915U_Series_Hardware_Design
[3] Quectel_LTE&5G_Linux_USB_Driver_User_Guide

Table 2: Terms and Abbreviations

Abbreviation	Description
APN	Access Point Name
CHAP	Challenge Handshake Authentication Protocol
DCD	Data Carrier Detection
DNS	Domain Name Server
DTR	Data Terminal Ready
GPRS	General Packet Radio Service
GSM	Global System of Mobile Communication
IP	Internet Protocol
IPCP	IP Control Protocol
LCP	Link Control Protocol
MCU	Micro Control Unit
MS	Mobile Station

PAP	Password Authentication Protocol
PC	Personal Computer
PDP	Packet Data Protocol
PIN	Personal Identification Number
PPP	Point-to-Point Protocol
RI	Ring Indicator
TA	Terminal Adapter
TE	Terminal Equipment
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus
(U)SIM	(Universal) Subscriber Identity Module