

User Guide to the PicoCell Gateway V1.0 Graphical User Interface

Table of Contents

1	PicoGW Tools Overview.....	4
1.1	Packet Forwarder.....	4
1.2	HAL Util Tx Continuous	4
1.3	HAL Util Tx Test	4
1.4	Packet Util Tx Test.....	4
1.5	Properties and Options Menus.....	4
2	Quick Start	5
2.1	PicoGW User Interface	5
2.1.1	Step 1: Startup.....	5
2.1.2	Step 2: Open Packet Forwarder Utility	5
2.1.3	Step 3: Open “Global Conf” Options	6
2.1.4	Step 4: Global Configuration.....	6
2.1.5	Step 5: Open Options	7
2.1.6	Step 6: Options.....	7
2.1.7	Step 7: Start the Packet Forwarder	8
2.2	Integration into Semtech’s Network Server.....	9
2.2.1	Step 1: Create an Account.....	9
2.2.2	Step 2: Register the Gateway	9
2.2.3	Step 3: Add the Gateway	9
2.2.4	Step 4: Enter Gateway Data.....	10
2.2.5	Step 5: Verification.....	10
3	Packet Forwarder	11
3.1	Packet Forwarder Controls.....	11
3.2	Filtering Options	12
3.3	Filtered Results	12
3.4	Gateway Statistics	12
3.5	Console Output: Log all Received Packets	13
4	HAL Util Tx Continuous.....	13
5	HAL Util Tx Test.....	14
6	Packet Util Tx Test.....	14
7	Properties: Options Menus.....	15
7.1	Global Conf	15
7.1.1	Cloud Network.....	16

7.1.2	Gateway Properties	16
7.1.3	SX1301 Properties.....	16
7.2	Options.....	17
8	PicoCell Gateway Firmware Update.....	18
8.1.1	Step 1: Set the PicoCell Gateway in DFU Mode.....	18
8.1.2	Step 2: Open Dfuse Software	18
8.1.3	Step 3: Flash the Gateway.....	19
9	Revision History	20

List of Figures

Figure 1:	PicoGW Main Menu.....	4
Figure 2:	Quick Start Step 1	5
Figure 3:	Quick Start Step 2	5
Figure 4:	Quick Start Step 3	6
Figure 5:	Quick Start Step 4	6
Figure 6:	Quick Start Step 5	7
Figure 7:	Quick Start Step 6	7
Figure 8:	Quick Start Step 7	8
Figure 9:	Quick Start Integration Step 2.....	9
Figure 10:	Quick Start Integration Step 3	9
Figure 11:	Quick Start Integration Step 4	10
Figure 12:	Quick Start Integration Step 5	10
Figure 13:	Packet Forwarder Main Menu.....	11
Figure 14:	Packet Forwarder Controls	11
Figure 15:	Filtering Options.....	12
Figure 16:	Filtered Results	12
Figure 17:	Gateway Statistics	12
Figure 18:	Console Output.....	13
Figure 19:	HAL Util Tx Continuous	13
Figure 20:	HAL Util Tx Test	14
Figure 21:	Packet Util Tx Test	14
Figure 22:	Properties.....	15
Figure 23:	Options.....	17
Figure 24:	Gateway Upgrade Step 1.....	18
Figure 25:	Gateway Upgrade Step 2.....	18
Figure 26:	Gateway Upgrade Step 3.....	19

1 PicoGW Tools Overview

PicoGW Tools is a software set allowing easy command & control of Semtech's PicoCell Gateway.

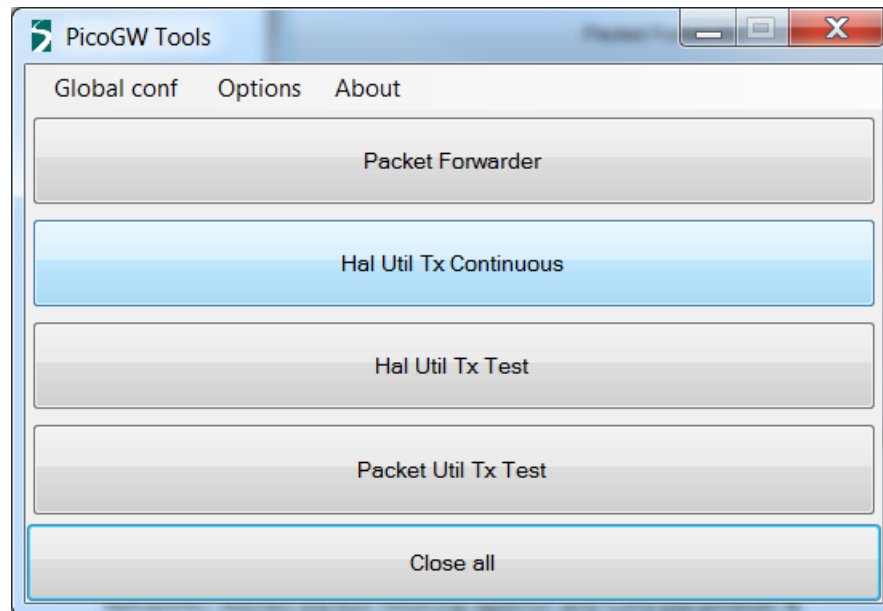


Figure 1: PicoGW Main Menu

1.1 Packet Forwarder

Real-time display of received packets, also able forward them to a network server. This function allows packet filtering against any LoRa® parameter.

1.2 HAL Util Tx Continuous

Continuous sending of a LoRa® preamble or FSK sync word.

1.3 HAL Util Tx Test

Send packets at HAL level.

1.4 Packet Util Tx Test

Send a packet at packet forwarder level. This can be used to simulate a downlink.

1.5 Properties and Options Menus

Customize the packet forwarder behavior.

2 Quick Start

This section shows the main steps to have a functional packet forwarder connected to any network server compatible with Semtech's packet forwarder. This section will use Semtech's network server.

2.1 PicoGW User Interface

2.1.1 Step 1: Startup

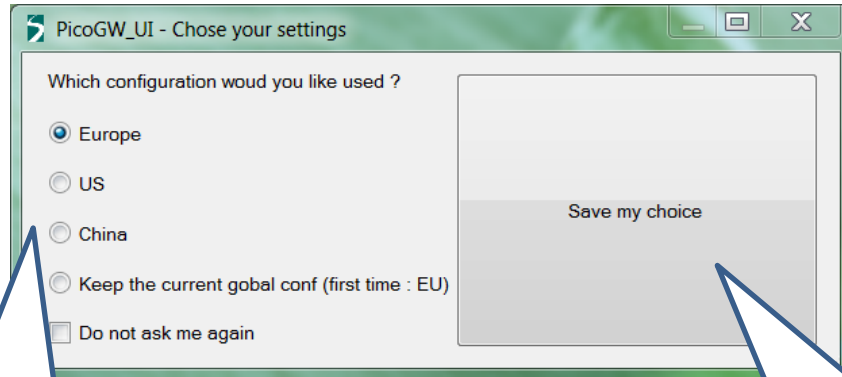


Figure 2: Quick Start Step 1

1. Select your region

2. Click on "Save my choice"

2.1.2 Step 2: Open Packet Forwarder Utility

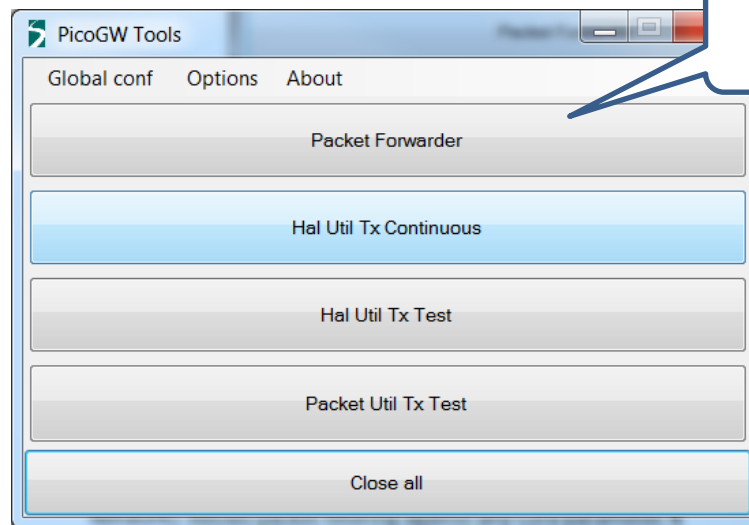


Figure 3: Quick Start Step 2

Click on
"Packet Forwarder"

2.1.3 Step 3: Open “Global Conf” Options

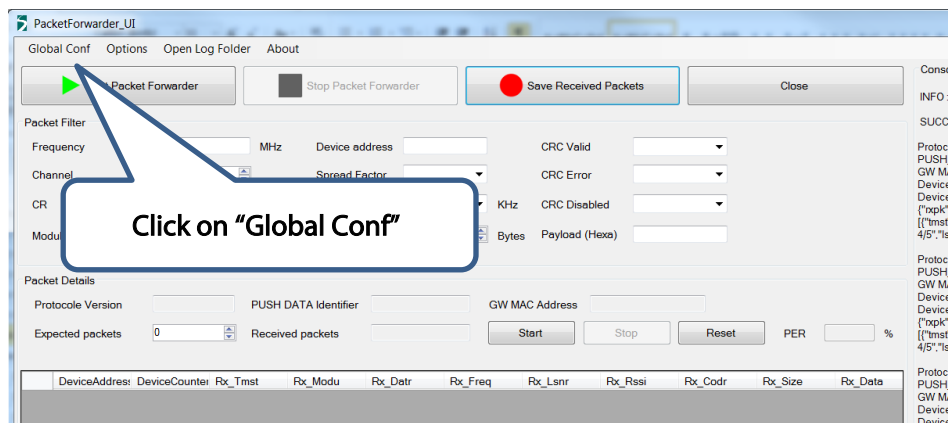


Figure 4: Quick Start Step 3

2.1.4 Step 4: Global Configuration

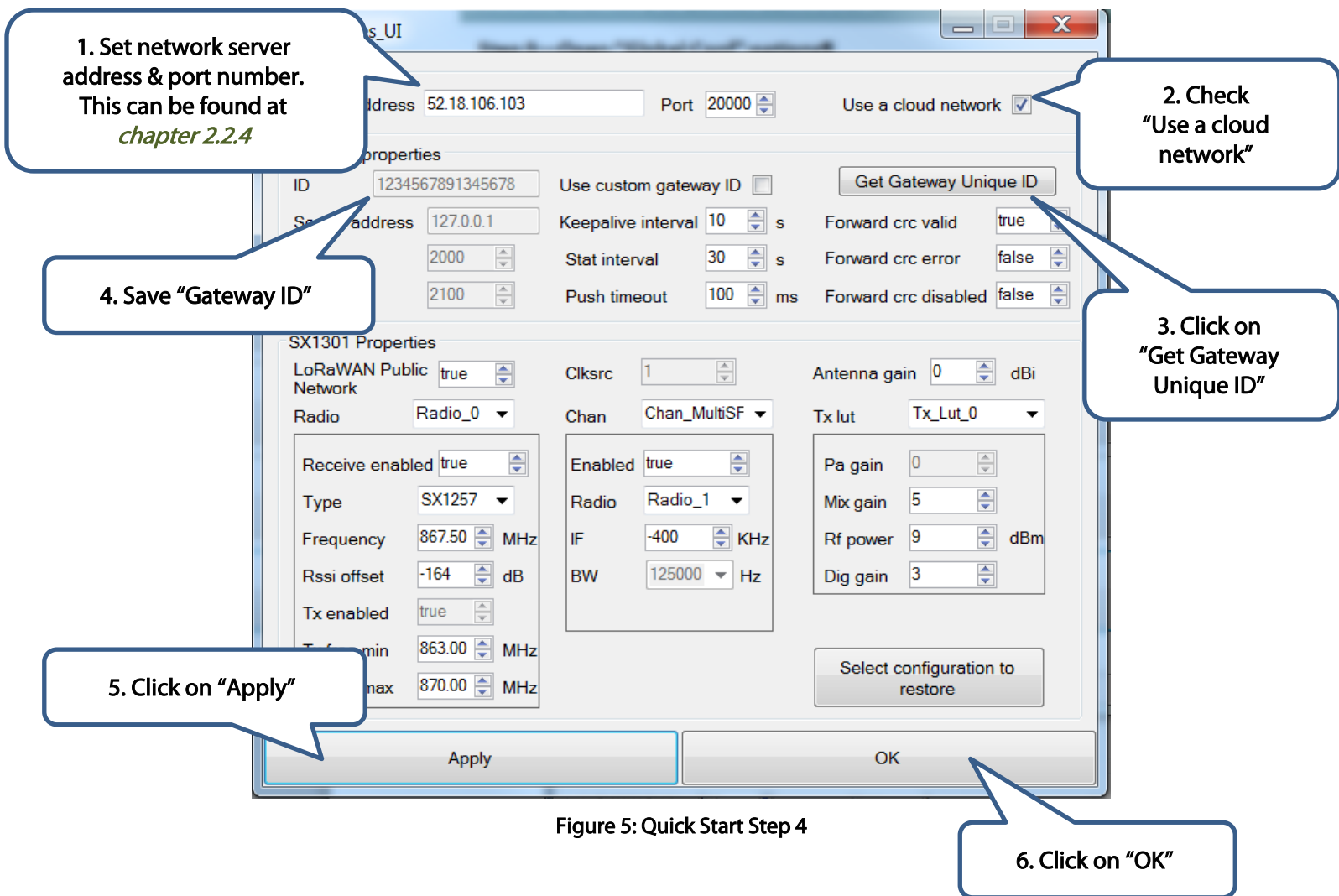


Figure 5: Quick Start Step 4

2.1.5 Step 5: Open Options

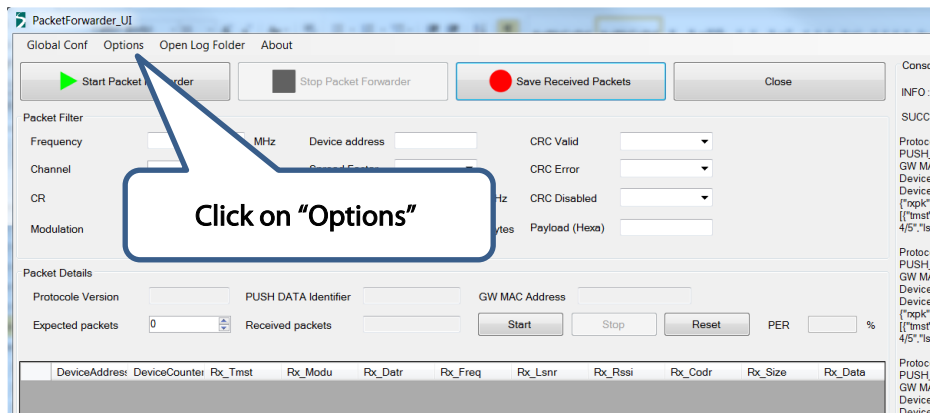


Figure 6: Quick Start Step 5

2.1.6 Step 6: Options

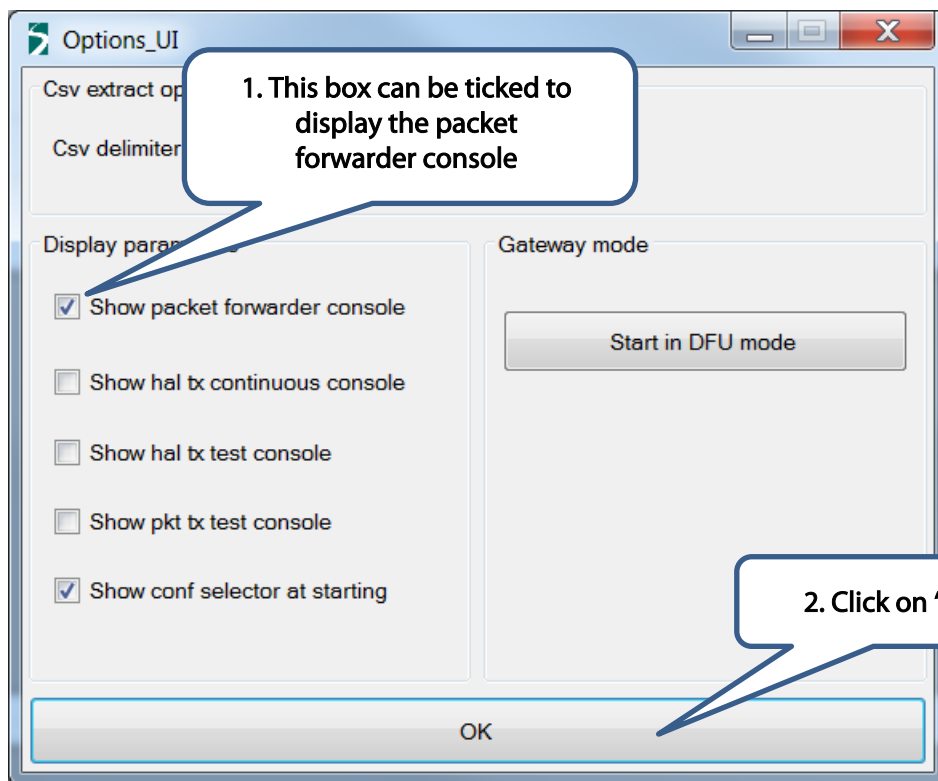


Figure 7: Quick Start Step 6

2.1.7 Step 7: Start the Packet Forwarder

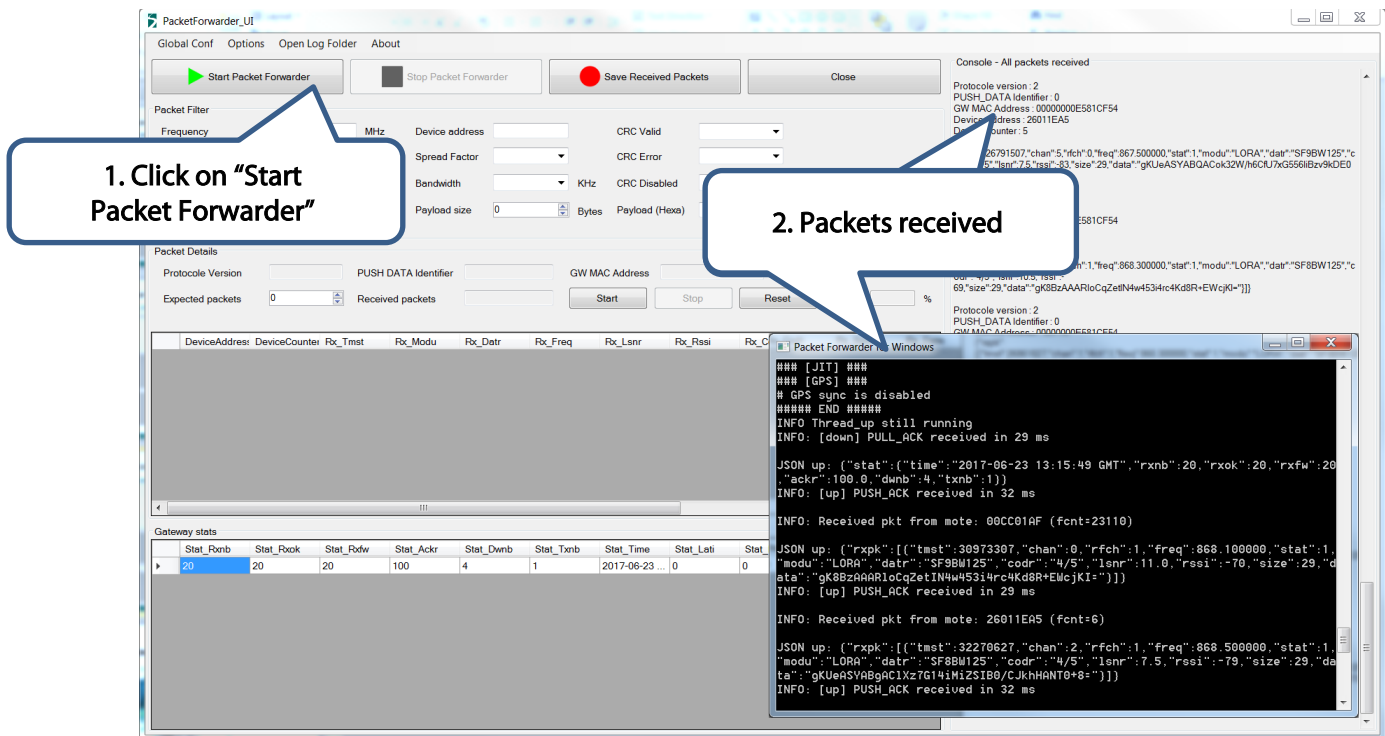


Figure 8: Quick Start Step 7

The packet forwarder is now sending all the received packets to the network server.

2.2 Integration into Semtech's Network Server

2.2.1 Step 1: Create an Account

Create an account according to your localization:

- <https://eu.iot.semtech.cloud>
- <https://na.iot.semtech.cloud>
- <https://cn.iot.semtech.cloud>
- <https://apac.iot.semtech.cloud>

2.2.2 Step 2: Register the Gateway

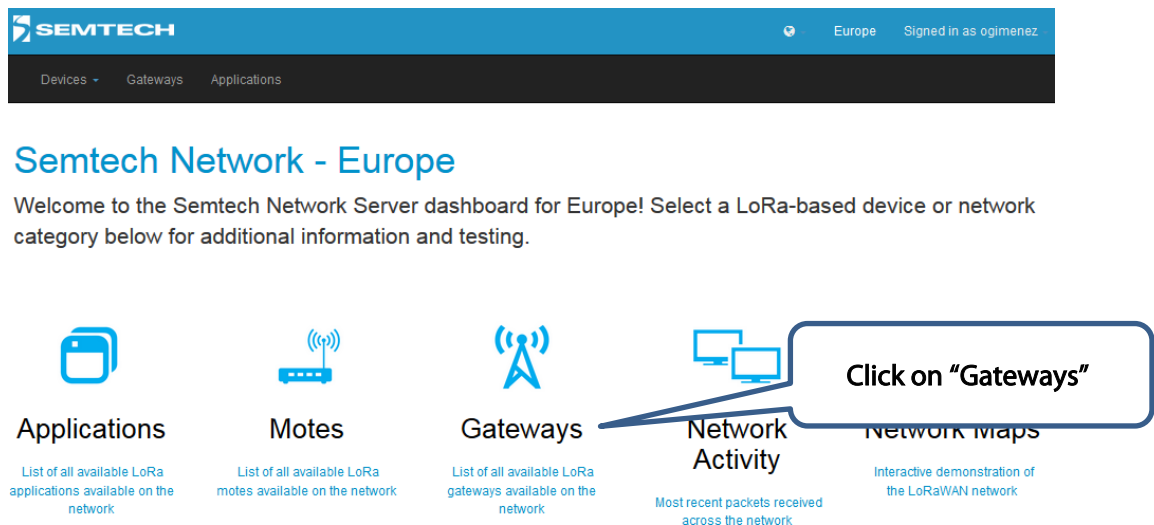


Figure 9: Quick Start Integration Step 2

2.2.3 Step 3: Add the Gateway

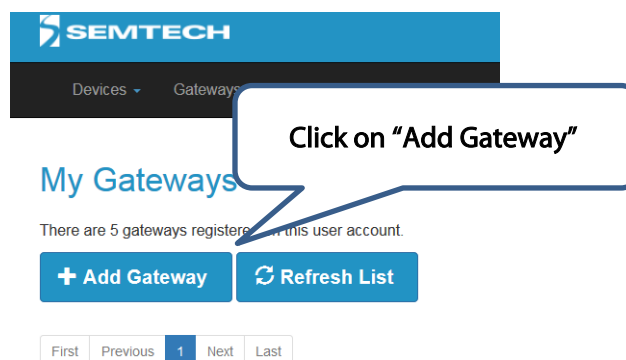


Figure 10: Quick Start Integration Step 3

2.2.4 Step 4: Enter Gateway Data

Add Gateway

1. Gateway name

Gateway Name: User guide gateway

Gateway ID: 1234567891345678

Enter Gateway ID in hex format. The identifier must be 16 hex characters (e.g., 1234567891345678).

Note: You can use this dialog to create a new gateway.

The Gateway ID above must match the value set in the packet forwarder configuration file. Please set a valid ID, e.g. based on the MAC address of the gateway. Then set the following values in the packet forwarder configuration file to point it to this network:

```
"server_address": "52.18.106.103",  
"serv_port_up": 20000,  
"serv_port_down": 20000,
```

3. Configure the gateway with these parameters

Finally, the packet packet forwarder must be configured to use the following channels:

867.1, 867.3, 867.5, 867.7, 867.9, 868.1, 868.3 and 868.5 MHz with SF range 7-12 and 125kHz BW.
SF7BW250 and FSK disabled

4. Click on "Add Gateway"

Once the gateway have been added and the packet forwarder or gateway started, you should the status "OK" in the gateway list. Please allow some time for the status to change. Once you see OK you are ready to go!

Add Gateway Cancel

Figure 11: Quick Start Integration Step 4

2.2.5 Step 5: Verification

SEMTECH Europe

Devices - Gateways Users - Applications

My Gateways

There are 13 gateways registered on this user account.

+ Add Gateway Refresh List

Gateway ID	Gateway Name	Status
7: 23	o o 1	OK

Gateways status is "OK"

Figure 12: Quick Start Integration Step 5

You should now have a fully functional gateway redirecting packets to the network server.

3 Packet Forwarder

This is real-time display of received packets. You can forward them to a network server. This function allows packet filtering against any LoRa® parameter.

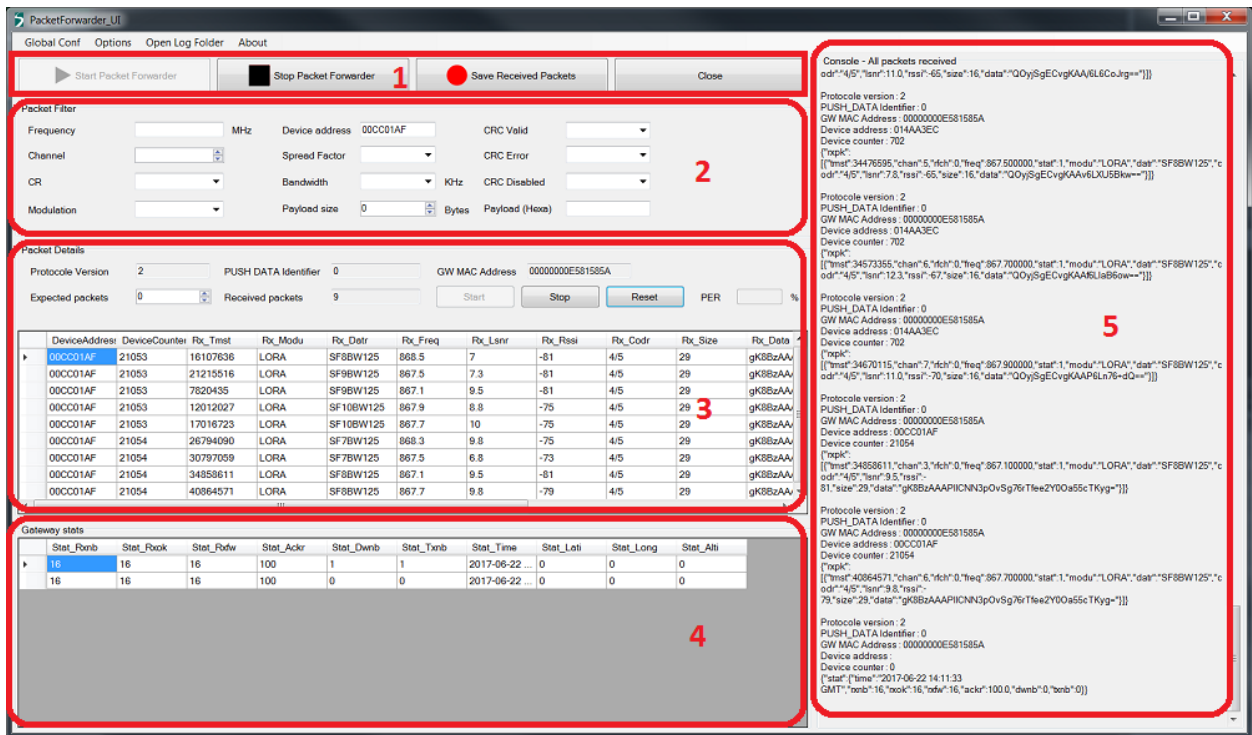


Figure 13: Packet Forwarder Main Menu

1. Packet Forwarder Controls
2. Filtering Options
3. Filtered Results
4. Gateway Statistics
5. Console Output – Log all received packets

3.1 Packet Forwarder Controls



Figure 14: Packet Forwarder Controls

Controls can be used to start and stop the packet forwarder. The *Save Received Packets* button saves all the received packets in a CSV file. Use the *Open Log Folder* menu to open them. *Close* will stop the packet forwarder and close the UI.

3.2 Filtering Options

The Packet Filter interface includes the following fields:

- Frequency: MHz
- Channel:
- CR:
- Modulation:
- Device address:
- Spread Factor:
- Bandwidth: KHz
- Payload size: Bytes
- CRC Valid:
- CRC Error:
- CRC Disabled:
- Payload (Hexa):

Figure 15: Filtering Options

Filters can be applied on received packets in order to help data analysis.

3.3 Filtered Results

Packet Details

Protocol Version: 2, PUSH DATA Identifier: 0, GW MAC Address: 00000000E581585A

Expected packets: 0, Received packets: 201, Start, Stop, Reset, PER: %

	DeviceAddress	DeviceCounter	Rx_Tmst	Rx_Modu	Rx_Datr	Rx_Freq	Rx_Lsnr	Rx_Rssi	Rx_Codr	Rx_Size	Rx_Data
▶	00CC01AF	21053	16107636	LORA	SF8BW125	868.5	7	-81	4/5	29	gK8BzAAV
	00CC01AF	21053	21215516	LORA	SF9BW125	867.5	7.3	-81	4/5	29	gK8BzAAV
	00CC01AF	21053	7820435	LORA	SF9BW125	867.1	9.5	-81	4/5	29	gK8BzAAV
	00CC01AF	21053	12012027	LORA	SF10BW125	867.9	8.8	-75	4/5	29	gK8BzAAV
	00CC01AF	21053	17016723	LORA	SF10BW125	867.7	10	-75	4/5	29	gK8BzAAV
	00CC01AF	21054	26794090	LORA	SF7BW125	868.3	9.8	-75	4/5	29	gK8BzAAV
	00CC01AF	21054	30797059	LORA	SF7BW125	867.5	6.8	-73	4/5	29	gK8BzAAV
	00CC01AF	21054	34858611	LORA	SF8BW125	867.1	9.5	-81	4/5	29	gK8BzAAV
	00CC01AF	21054	40864571	LORA	SF8BW125	867.7	9.8	-79	4/5	29	gK8BzAAV

Figure 16: Filtered Results

Results matching the filter are displayed here. Start and stop statistics (Received packets, PER).

3.4 Gateway Statistics

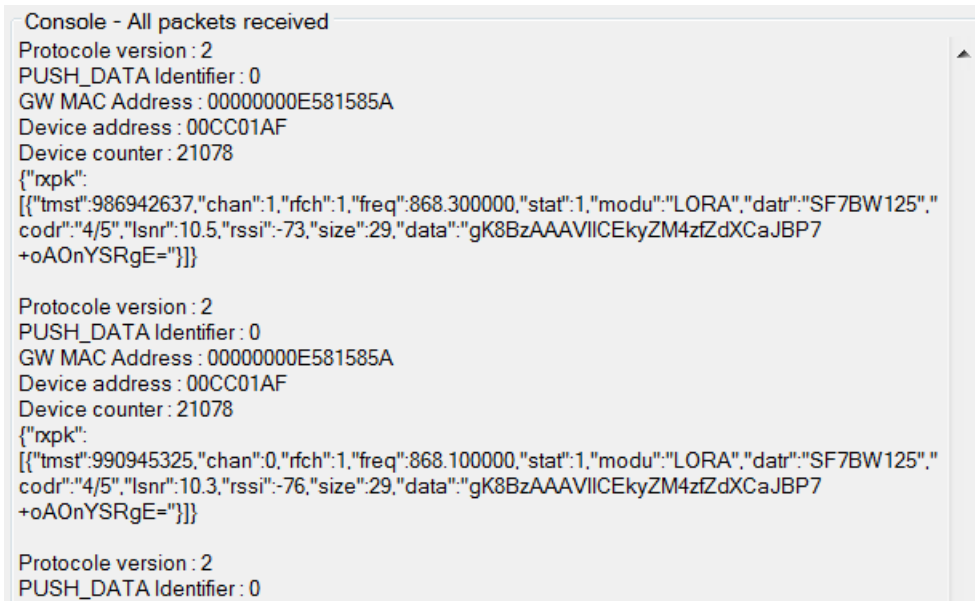
Gateway stats

	Stat_Rxnb	Stat_Rxok	Stat_Rxfw	Stat_Ackr	Stat_Dwnb	Stat_Txnb	Stat_Time	Stat_Lati	Stat_Long	Stat_Alti
▶	16	16	16	100	1	1	2017-06-22 ...	0	0	0
	16	16	16	100	0	0	2017-06-22 ...	0	0	0
	18	16	16	53.3	0	0	2017-06-22 ...	0	0	0
	18	17	17	77.8	0	0	2017-06-22 ...	0	0	0
	18	18	18	88.9	0	0	2017-06-22 ...	0	0	0
	14	13	13	100	0	0	2017-06-22 ...	0	0	0
	17	17	17	100	0	0	2017-06-22 ...	0	0	0
	15	15	15	100	0	0	2017-06-22 ...	0	0	0
	18	17	17	100	0	0	2017-06-22 ...	0	0	0
	18	18	18	94.7	0	0	2017-06-22 ...	0	0	0

Figure 17: Gateway Statistics

Statistics sent by the gateway are displayed here.

3.5 Console Output: Log all Received Packets



```
Console - All packets received
Protocole version : 2
PUSH_DATA Identifier : 0
GW MAC Address : 00000000E581585A
Device address : 00CC01AF
Device counter : 21078
{"rxpk":
[{"tmst":986942637,"chan":1,"rfch":1,"freq":868.300000,"stat":1,"modu":"LORA","datr":"SF7BW125","
codr":"4/5","lsnr":10.5,"rssi":-73,"size":29,"data":"gK8BzAAAVIICEkyZM4zfZdXCajBP7
+oAOnYSRgE="}]}

Protocole version : 2
PUSH_DATA Identifier : 0
GW MAC Address : 00000000E581585A
Device address : 00CC01AF
Device counter : 21078
{"rxpk":
[{"tmst":990945325,"chan":0,"rfch":1,"freq":868.100000,"stat":1,"modu":"LORA","datr":"SF7BW125","
codr":"4/5","lsnr":10.3,"rssi":-76,"size":29,"data":"gK8BzAAAVIICEkyZM4zfZdXCajBP7
+oAOnYSRgE="}]}

Protocole version : 2
PUSH_DATA Identifier : 0
```

Figure 18: Console Output

All received packets are displayed in this frame without any filtering.

4 HAL Util Tx Continuous

Send continuously a LoRa® preamble or a FSK Sync Word.

All radio parameters can be selected and the packet type can be changed with the “modulation” option.

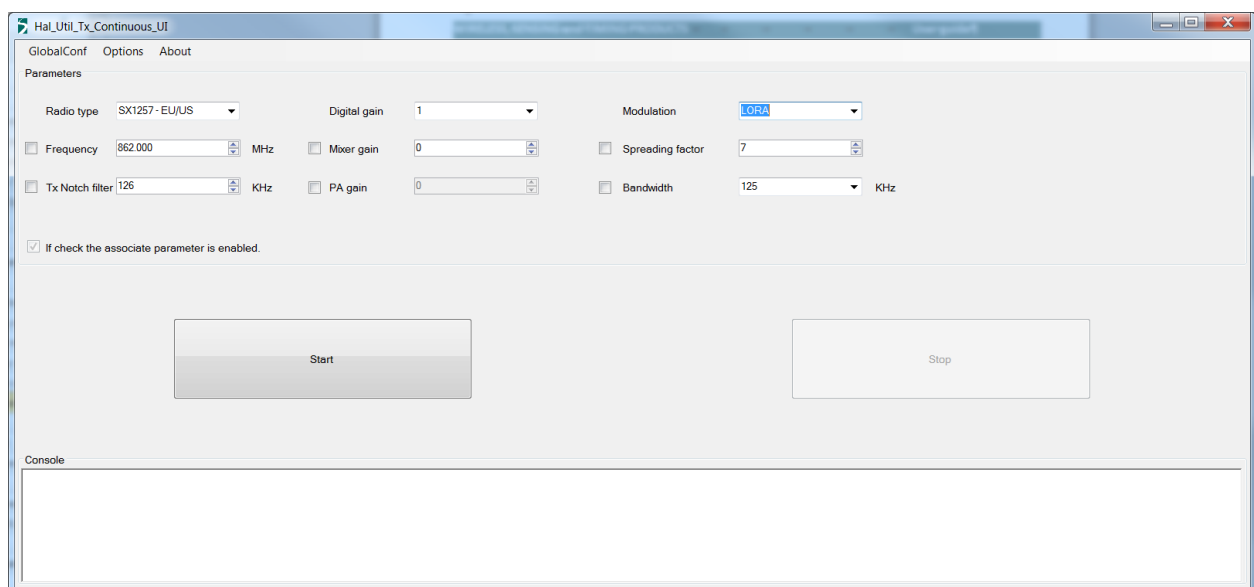


Figure 19: HAL Util Tx Continuous

5 HAL Util Tx Test

Send packets at HAL level, i.e. complete LoRa® or FSK packets.
Each parameter can be set to match the requested configuration. The packet type can be changed with the “modulation” option.

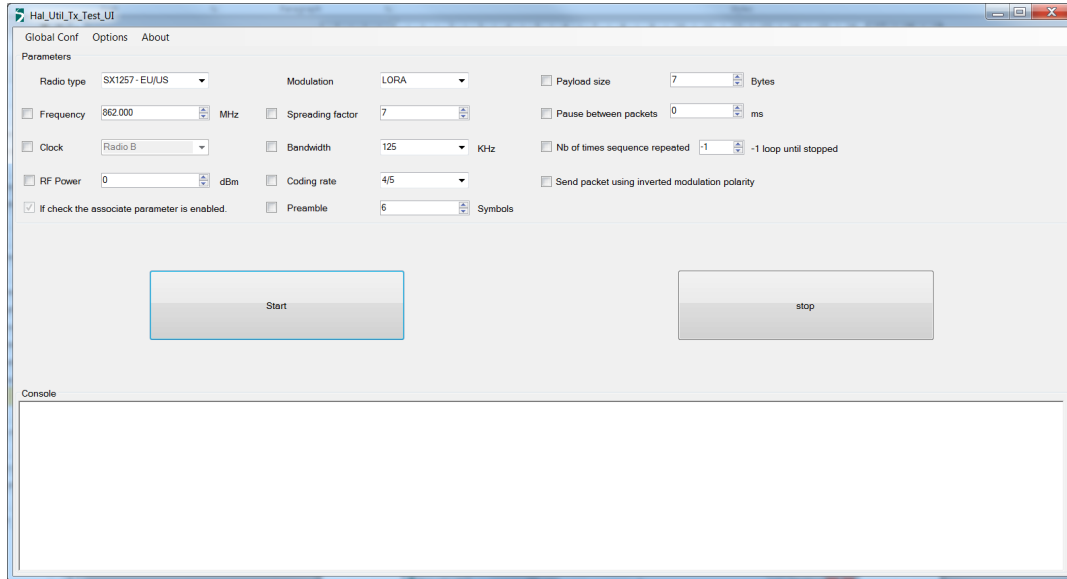


Figure 20: HAL Util Tx Test

6 Packet Util Tx Test

Inject a packet at a packet forwarder level. This can be used to simulate a downlink.

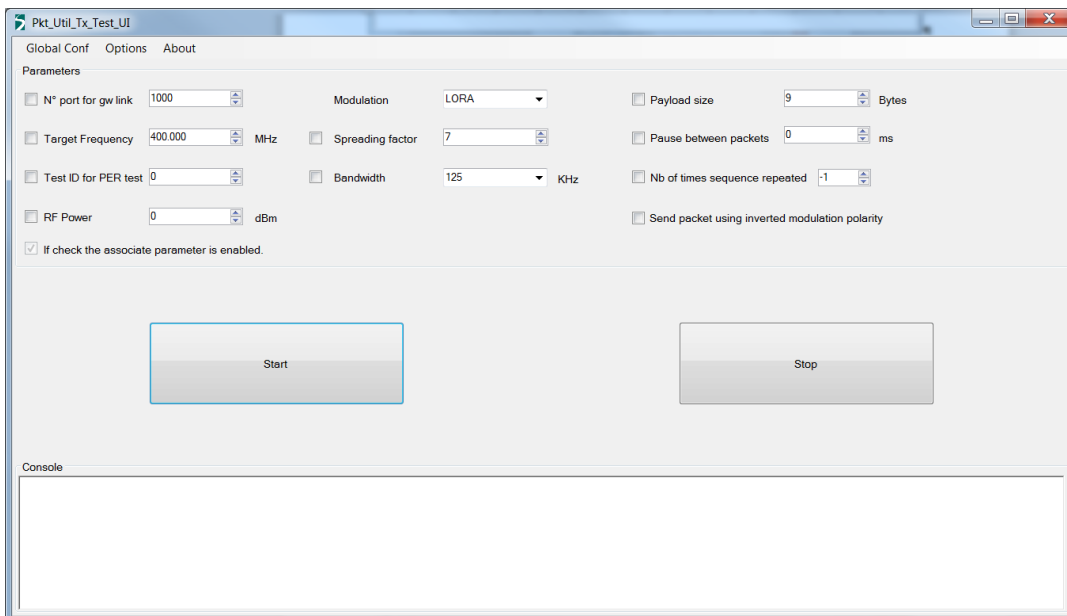


Figure 21: Packet Util Tx Test

7 Properties: Options Menus

7.1 Global Conf

This menu opens the configuration window.

The screenshot shows the 'Properties_UI' configuration window. It is divided into three main sections, each highlighted with a red box and a red number:

- Section 1 (Cloud network):** Contains 'Server Address' (text field), 'Port' (spin box set to 1700), and a checked 'Use a cloud network' checkbox.
- Section 2 (Gateway properties):** Contains 'ID' (text field), 'Server address' (text field set to 127.0.0.1), 'Port up' (spin box set to 2000), 'Port down' (spin box set to 2100), 'Use custom gateway ID' (checkbox), 'Keepalive interval' (spin box set to 10 s), 'Stat interval' (spin box set to 30 s), 'Push timeout' (spin box set to 100 ms), 'Forward crc valid' (checkbox set to true), 'Forward crc error' (checkbox set to false), and 'Forward crc disabled' (checkbox set to false). There is a 'Get Gateway Unique ID' button.
- Section 3 (SX1301 Properties):** Contains 'LoRaWAN Public Network' (checkbox set to true), 'Radio' (dropdown set to Radio_0), 'Chan' (dropdown set to Chan_MultiSF_0), 'Tx lut' (dropdown set to Tx_Lut_0), 'Receive enabled' (checkbox set to true), 'Type' (dropdown set to SX1257), 'Frequency' (spin box set to 867.50 MHz), 'Rssi offset' (spin box set to -164 dB), 'Tx enabled' (checkbox set to true), 'Tx freq min' (spin box set to 863.00 MHz), 'Tx freq max' (spin box set to 870.00 MHz), 'Cksrc' (spin box set to 1), 'Antenna gain' (spin box set to 0 dBi), 'Pa gain' (spin box set to 0), 'Mix gain' (spin box set to 5), 'Rf power' (spin box set to 9 dBm), 'Dig gain' (spin box set to 3), and a 'Select configuration to restore' button.

At the bottom of the window, there are 'Apply' and 'OK' buttons for each section, and a larger 'Apply' and 'OK' button at the very bottom. A 'Select configuration to restore' button is also present at the bottom right.

Figure 22: Properties

7.1.1 Cloud Network

Allow packet forwarding to a public network if “Use a cloud network” box is checked.

- **Use a cloud network:** send data to a server defined in the “options” menu, in addition to the server defined in “server address”
- **Server Address:** enter the network server address
- **Port:** enter the port number of the network server

7.1.2 Gateway Properties

All gateway parameters can be set:

- **ID:** Gateway unique identifier (EUI-64). You can use the PicoCell Gateway’s embedded micro-controller ID by using the button “get gateway unique ID” or set a custom ID by checking “use custom gateway ID” and entering an 8-byte ID.
- **Keep alive interval:** send a “keep alive” frame if required every X seconds
- **Stat interval:** send statistics every given time in seconds
- **Push time-out:** time-out in milliseconds
- **Forward crc valid/error/disabled:** allow forwarding packet according to their CRC status

7.1.3 SX1301 Properties

All radio properties can be changed. A set of predefined values can be applied with the button “Select configuration to restore”. This is also useful to select another region.

7.2 Options

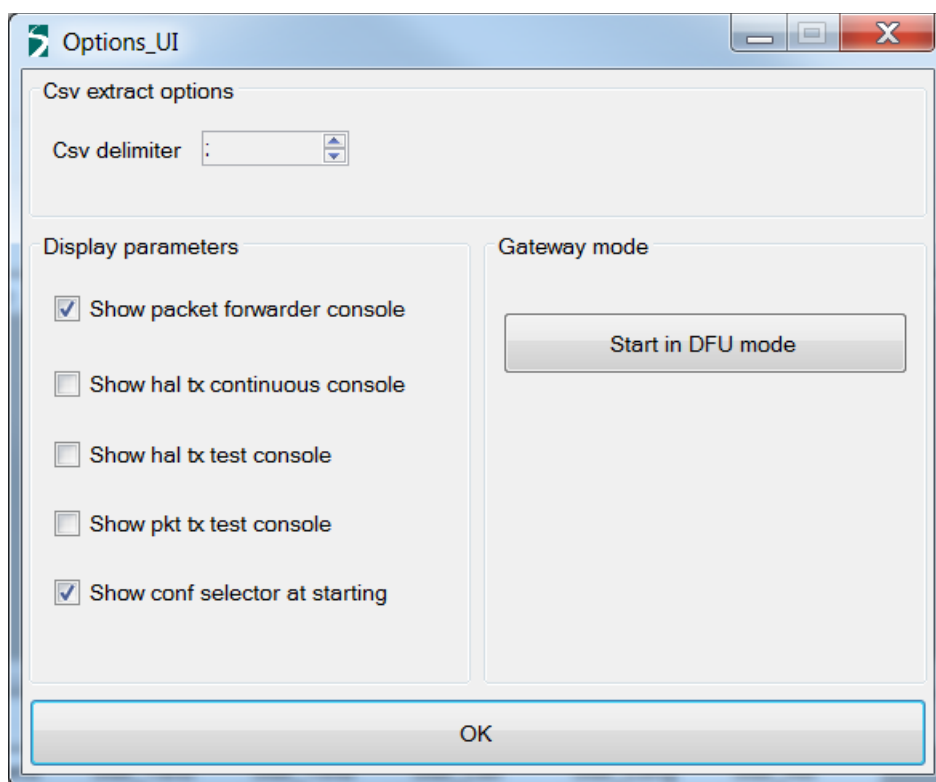


Figure 23: Options

The CSV delimiter and display parameters can be customized.

The packet forwarder can be displayed in any mode by checking the corresponding box.

"Show conf selector at starting" allows displaying the regional parameter windows at startup.

Use the button "Start in DFU mode" to update the PicoCell Gateway as in [section 8](#).

8 PicoCell Gateway Firmware Update

The PicoCell Gateway can be updated with the “Dfuse” utility installed with the PicoCell GUI.

8.1.1 Step 1: Set the PicoCell Gateway in DFU Mode

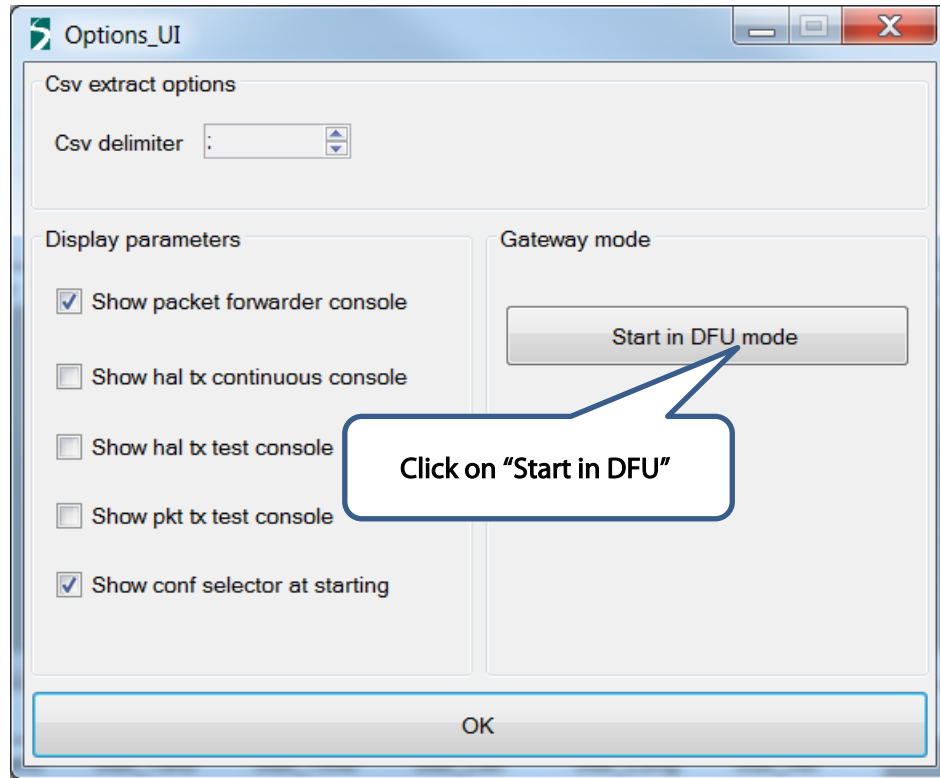


Figure 24: Gateway Upgrade Step 1

The gateway must be set in DFU (Device Firmware Upgrade) mode in order to be updated.

8.1.2 Step 2: Open Dfuse Software

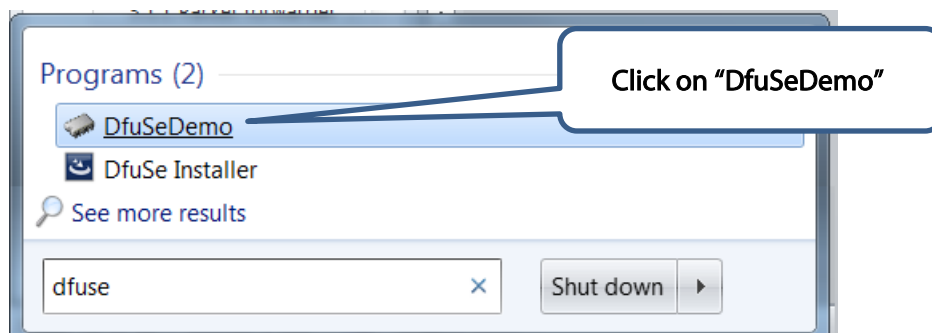


Figure 25: Gateway Upgrade Step 2

8.1.3 Step 3: Flash the Gateway

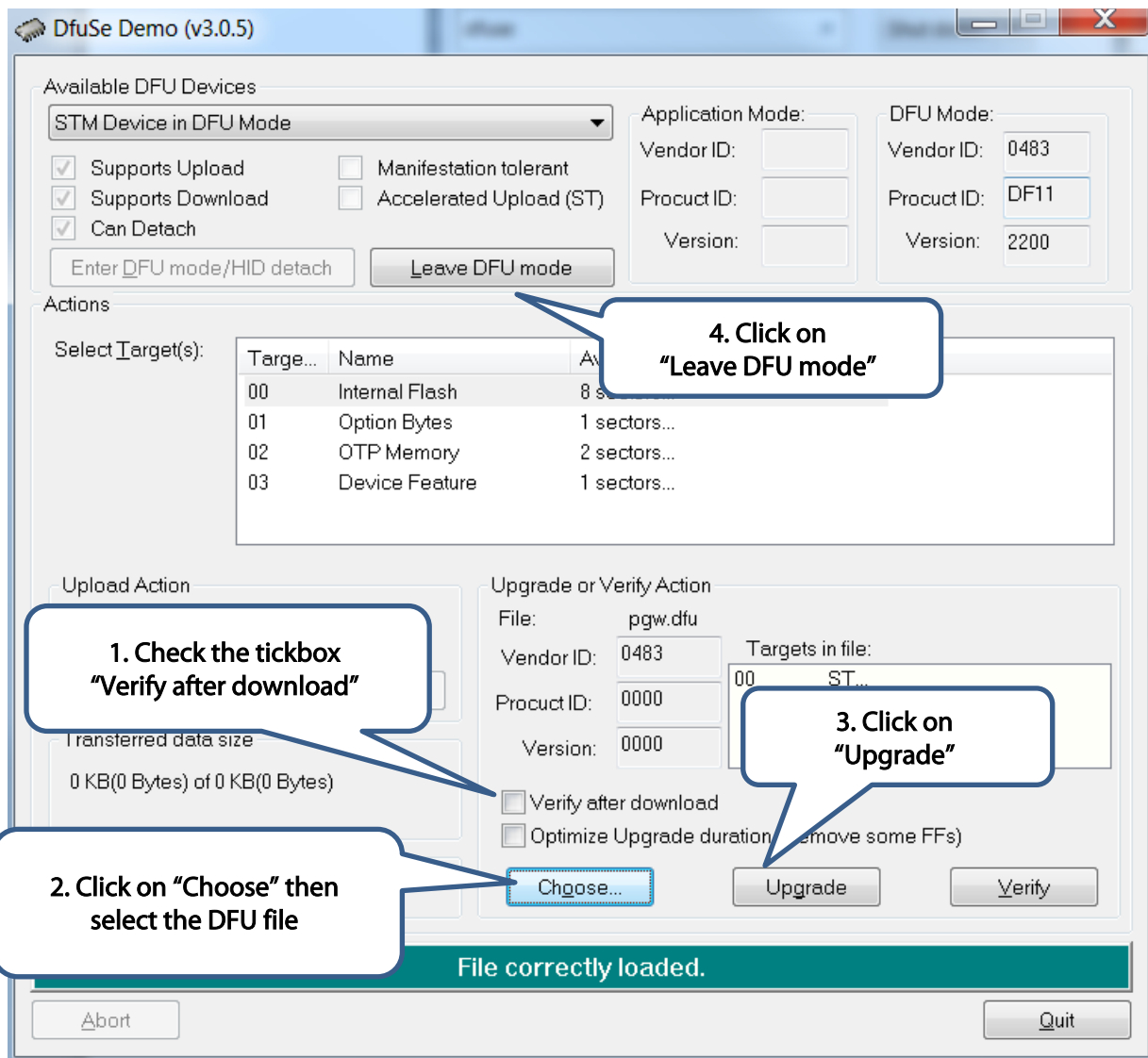


Figure 26: Gateway Upgrade Step 3

Note:

The firmware can be found in the directory `%appdata%\Semtech\PicoGW_UI\DFU`.

9 Revision History

Version	Date	Modifications
1.0	August 2017	First Release
1.1	March 2017	Update with details of Semtech's network server



Important Notice

Information relating to this product and the application or design described herein is believed to be reliable, however such information is provided as a guide only and Semtech assumes no liability for any errors in this document, or for the application or design described herein. Semtech reserves the right to make changes to the product or this document at any time without notice. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. Semtech warrants performance of its products to the specifications applicable at the time of sale, and all sales are made in accordance with Semtech's standard terms and conditions of sale.

SEMTECH PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS, OR IN NUCLEAR APPLICATIONS IN WHICH THE FAILURE COULD BE REASONABLY EXPECTED TO RESULT IN PERSONAL INJURY, LOSS OF LIFE OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. INCLUSION OF SEMTECH PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE UNDERTAKEN SOLELY AT THE CUSTOMER'S OWN RISK. Should a customer purchase or use Semtech products for any such unauthorized application, the customer shall indemnify and hold Semtech and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs damages and attorney fees which could arise.

The Semtech name and logo are registered trademarks of the Semtech Corporation. All other trademarks and trade names mentioned may be marks and names of Semtech or their respective companies. Semtech reserves the right to make changes to, or discontinue any products described in this document without further notice. Semtech makes no warranty, representation or guarantee, express or implied, regarding the suitability of its products for any particular purpose. All rights reserved.

© Semtech 2018

Contact Information

Semtech Corporation
Wireless & Sensing Products
200 Flynn Road, Camarillo, CA 93012
E-mail: sales@semtech.com
Phone: (805) 498-2111, Fax: (805) 498-3804
www.semtech.com