

IQRF[®] - Basic steps in practice

IQRF Workshops – Wrocław 2017



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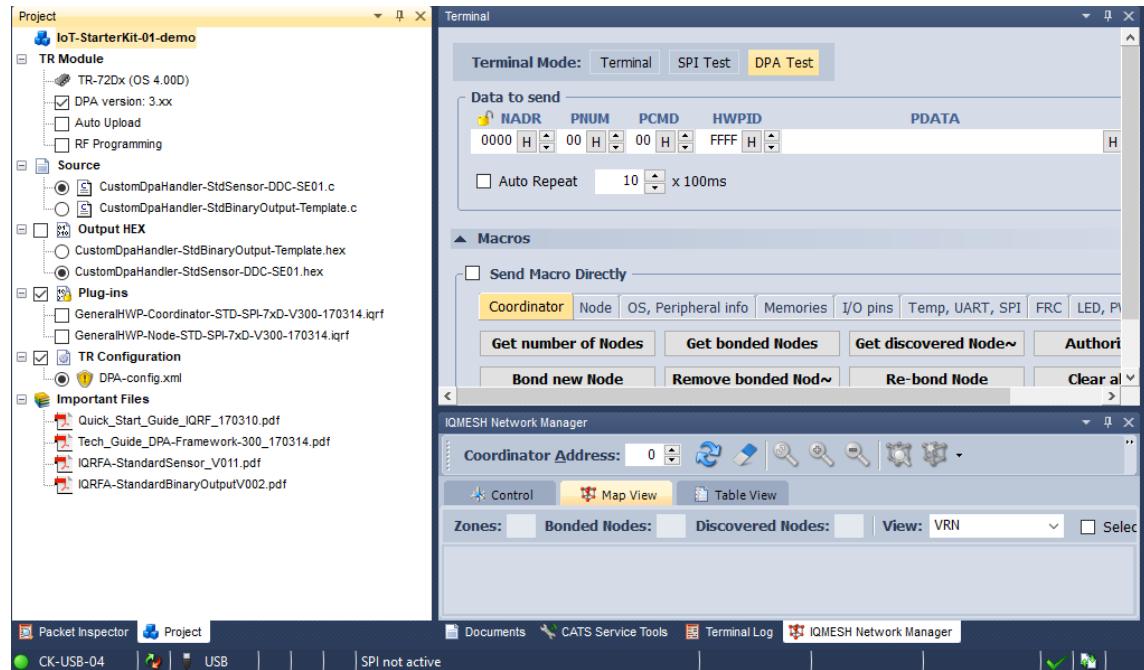
29.11.2017

How to start

1. Please go to www.IQRF.org webpage and download the IQRF startup package.
<https://www.iqrf.org/support/download>
2. In the main folder (IQRF_OS400_7xD) you see four subfolders (Development, Documentation, Examples, IQRF_IDE)
3. Go to subfolder IQRF_IDE and instal IQRF IDE 4.xx application on your workstation.

How to start

1. Please find folder
IQRF_OS400_7xD
2. From main folder
IQRF_OS400_7xD - go to folder
Examples / DPA / StartUp and run
file IoT-StarterKit-01-demo.
3. You see the main view of IQRF
IDE application with IoT-
StarterKit-01-demo project.



How to start

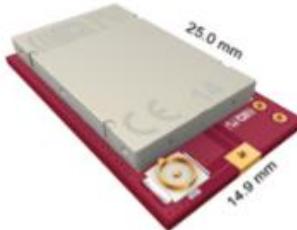
On the table you see DS - IOT - 01.



How to start

In the DS-IOT- 01 you see:

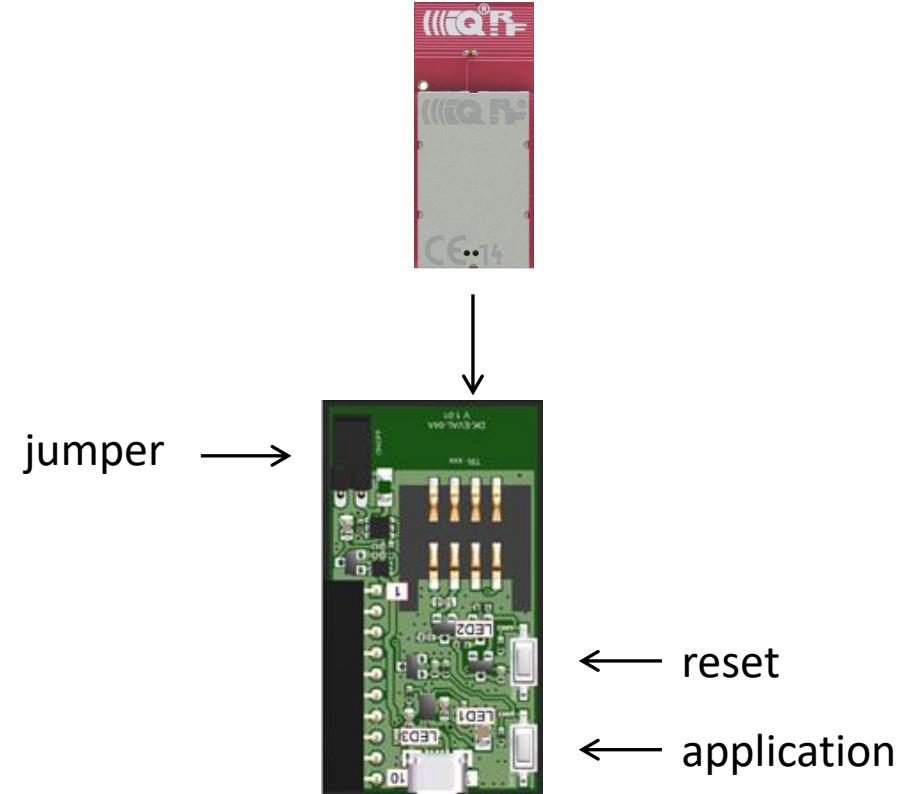
1. DK-EVAL- 3 pcs (black box)
2. CK-USB - 1 pc (grey box)
3. DCTR 72 DAT - 4 pcs
4. DDC-SE-01
5. DDC-RE-01
6. Micro USB cable 18.5 cm
7. USB flash drive



How to start

Put IQRF module to DK –EVAL
(black box) as on the picture but
remember:

- First set the jumper in this position.
- When you do it, press and keep button SW1 (reset button)



If everything is ok, the red led on the module should blink once!

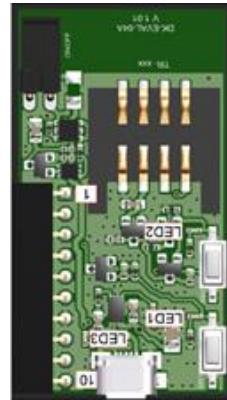
How to start

1. At this moment you have to prepare module to work. You have to:

- push and keep application button
- push (not keep) reset button. Green led will start switching at this moment. It takes about 2 seconds. When green led switches off – release the other button immediately.

2. The red led on the module is starting blinking automatically. It means you have done unbonding process successfully.

3. Please repeat process for each modules.



← 2. push and come off

← 1. push and keep

Basic settings

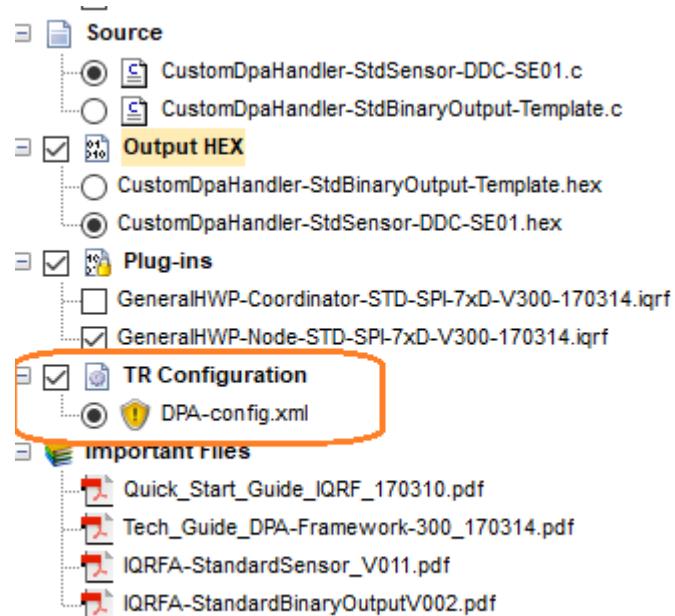
1. Connect the CK-USB (grey box) by USB cable for your workstation as you see in the picture.

2. In the next step, put the module to CK-USB (programmer) and go to IQRF IDE application.



Basic settings

In the project section, please double click DPA – config (in TR Configuration part) and open the table.

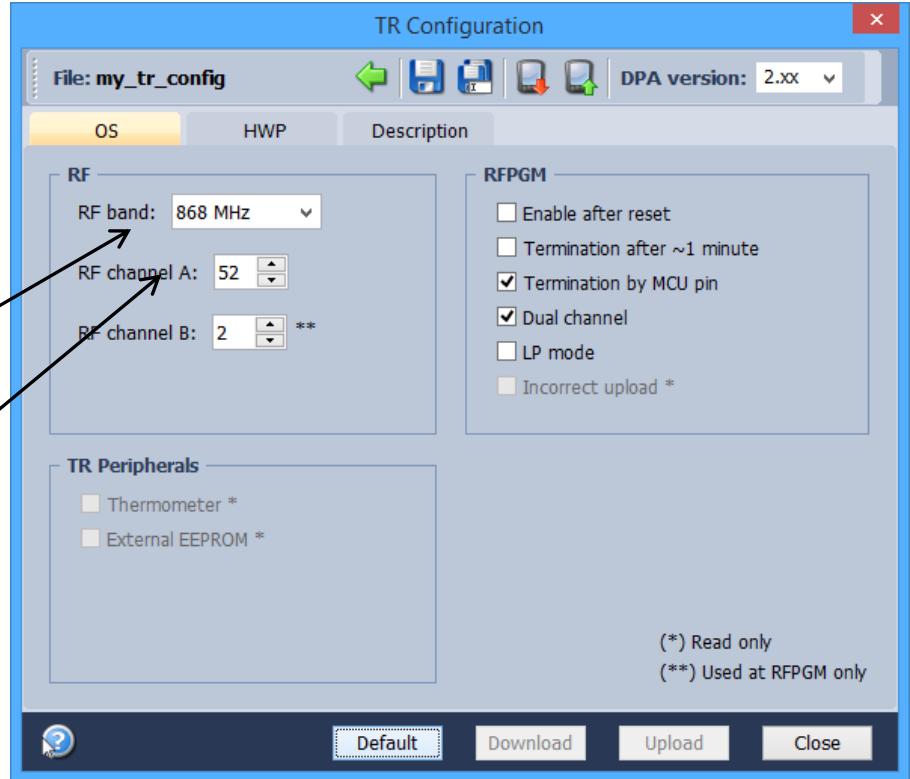


Basic settings

Set the channel and frequency you want to use

Set the frequency

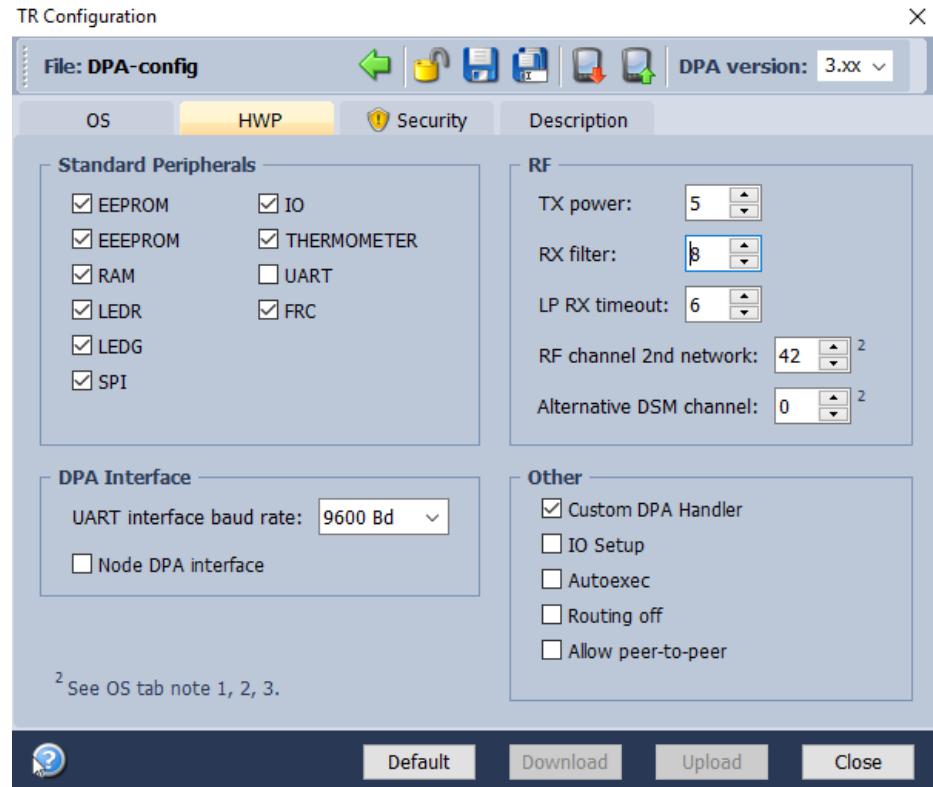
Set the channel



Basic settings

- Set the all standard peripherals as you see on the picture.
- Set Tx power and Rx filter
- Enable Custom DPA Handler

If you finish settings parameters, press close button and **confirm changes – click save.**

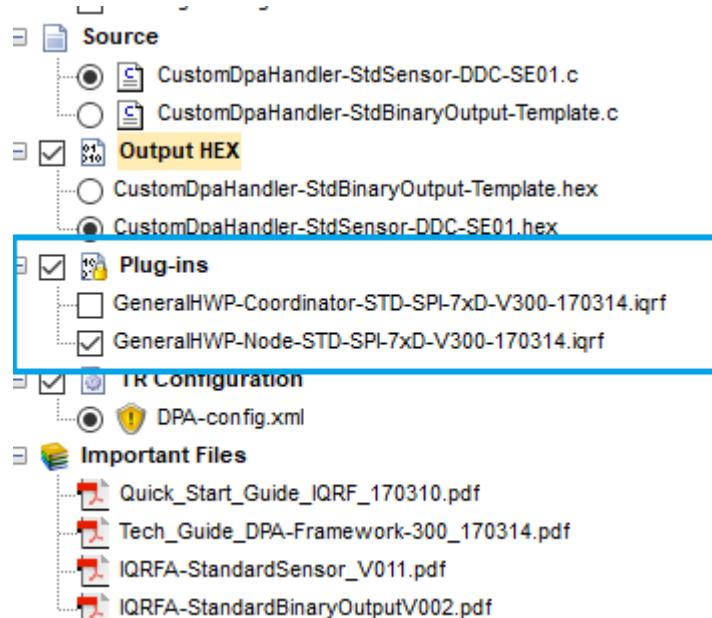


Hardware profile implementation

In the project section, please go to plug-ins and choose the correct hardware profile.

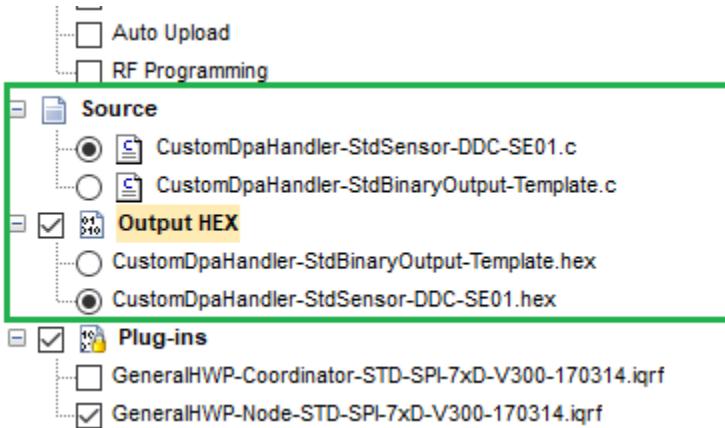
You can choose communications by SPI, UART with standard or low power mode. You have a few options.

-  GeneralHWP-Coordinator-LP-SPI-7xD-V300-170314
-  GeneralHWP-Coordinator-LP-UART-7xD-V300-170314
-  GeneralHWP-Coordinator-STD-SPI-7xD-V300-170314
-  GeneralHWP-Coordinator-STD-UART-7xD-V300-170314
-  GeneralHWP-Node-LP-7xD-V300-170314
-  GeneralHWP-Node-STD-SPI-7xD-V300-170314
-  GeneralHWP-Node-STD-UART-7xD-V300-170314



Custom DPA handler implementation

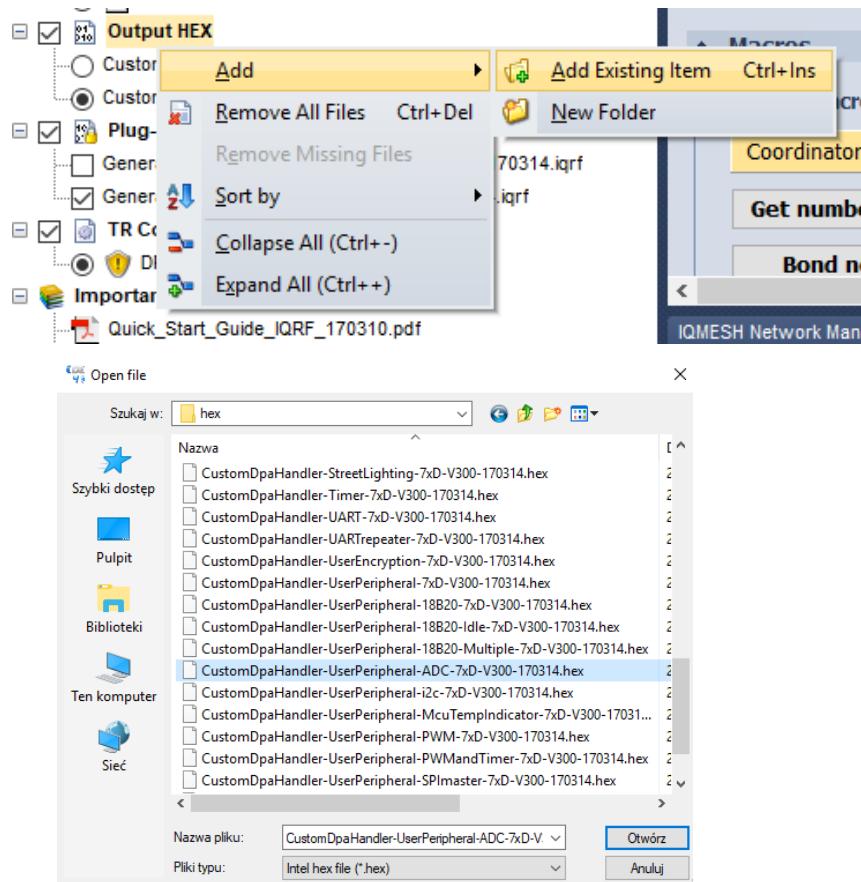
If you want to upload output .hex file,
You can do it in two ways.



Custom DPA handler implementation

First:

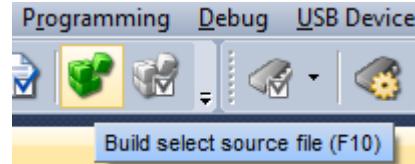
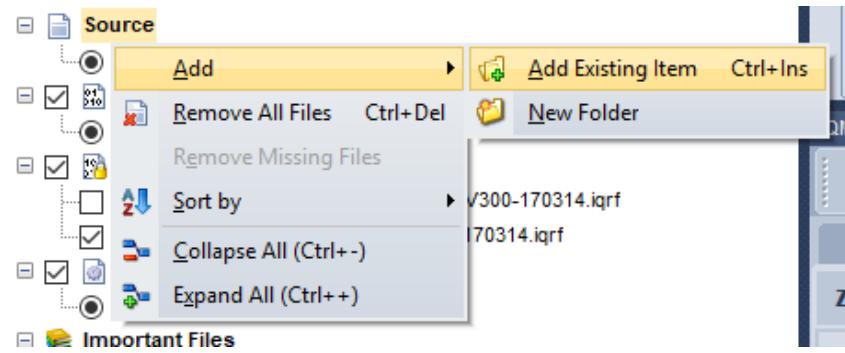
- click right button / add existing items on output HEX part.
- from the path
`IQRF_OS400_7xD\Examples\DPA\CustomDpaHandlerExamples\hex` - please choose the right handler and open it.
- If everything is ok, you will see your handler in output HEX section.



Custom DPA handler implementation

Second:

- click right button / add existing item source part.
- from the path
IQRF_OS400_7xD\Examples\DPA\CustomDpaHandlerExamples - please choose the right handler and open it in C code.
- If everything is ok, you will see your handler in source section.
- You have to compile you code now - press F10 or click the button



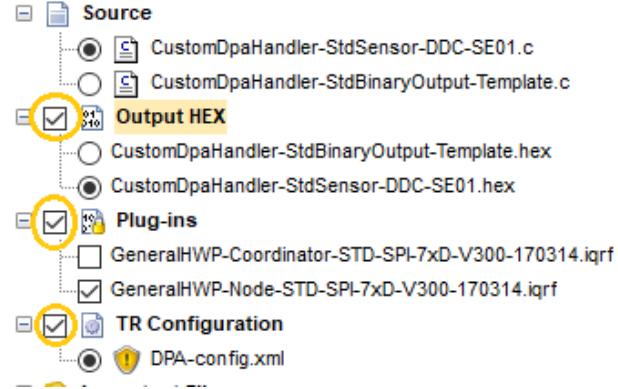
Upload settings

Now you can upload the setting. You can choose what you want to upload. In this case, please check if all checkboxes are selected.

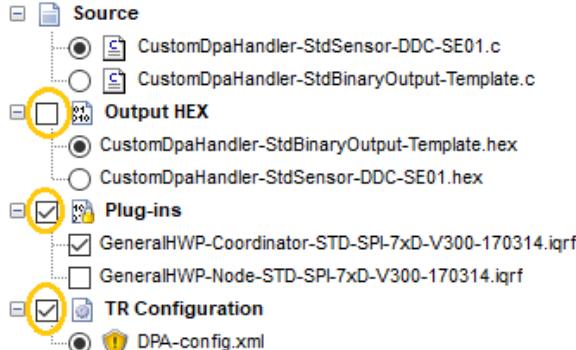
Remember!!!

You have to upload „node plugin” to each module, which have node function in your network and only one coordinator plugin for your mesh network!

Node configuration

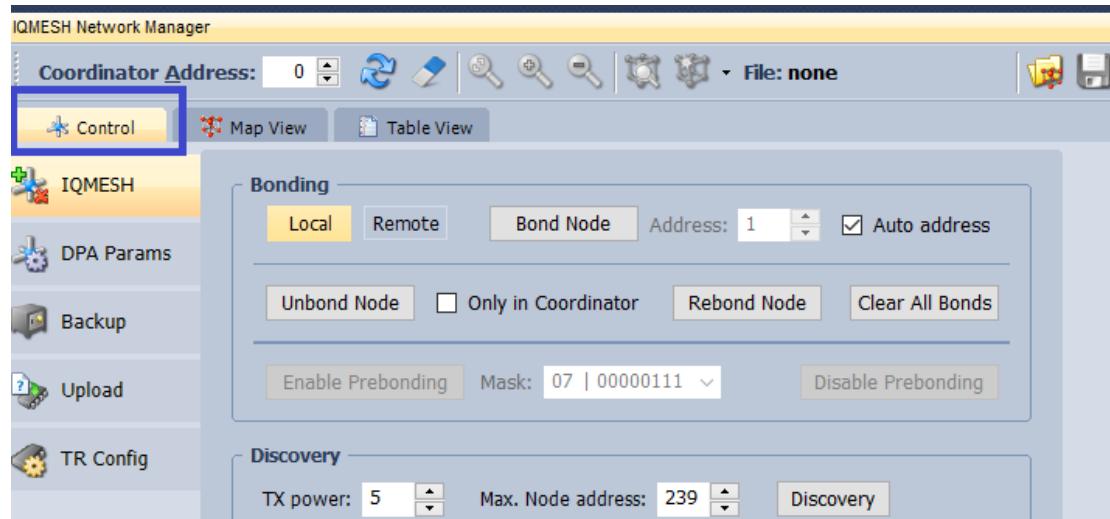


Coordinator configuration



Creating mesh network

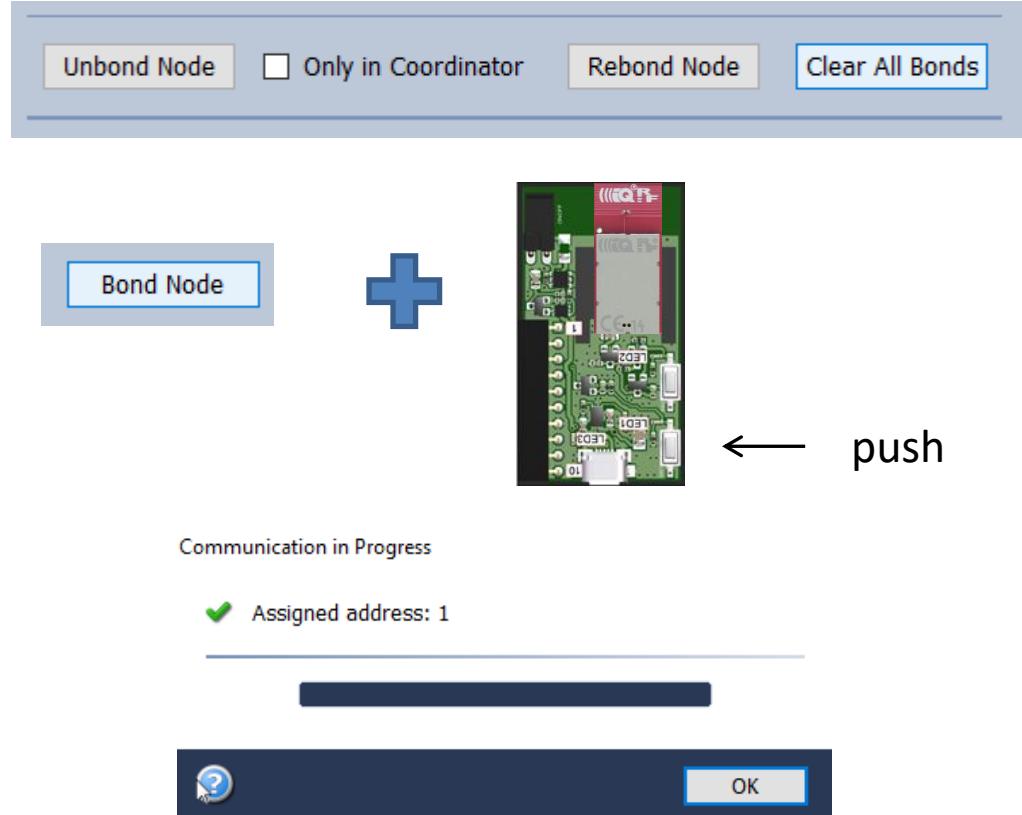
When you finish upload, put the transceiver - node to DK Eval (black box) and transceiver -coordinator to CK-USB (grey box). After that in IQRF IDE application open the mesh network manager / control part.



Creating mesh network

Before you start creating your network, the memory in the module should be flushed. Click the button „Clear all bonds”. After that you can start bonding process - it means, assigning devices to your network.

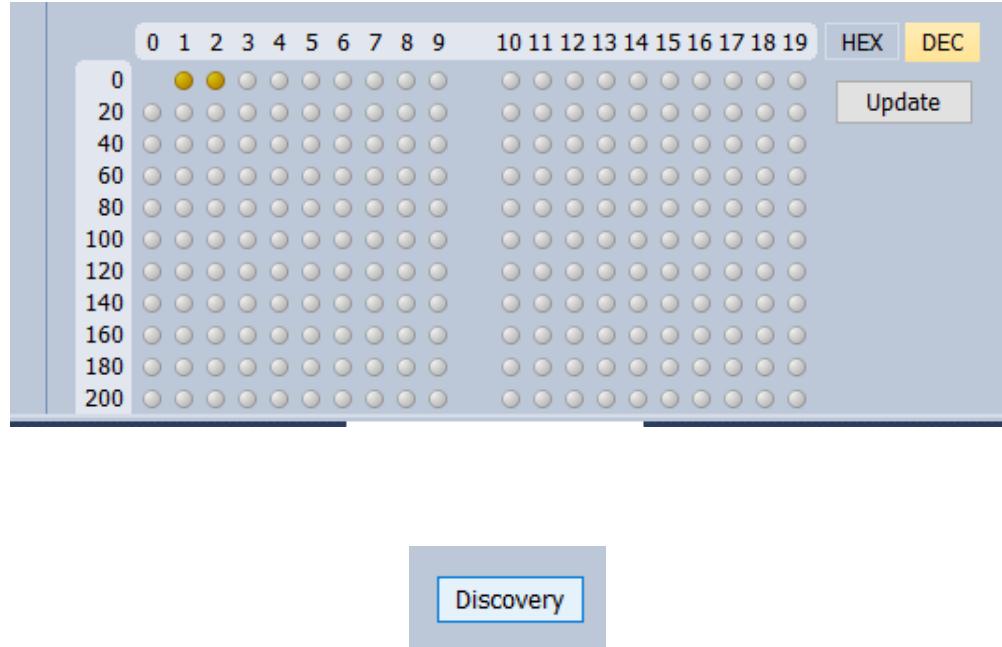
Please click the „bond node” button in application and push the application button on DK Eval. In this way, you assign all devices to your network. Please repeat this process for all of them.



Creating mesh network

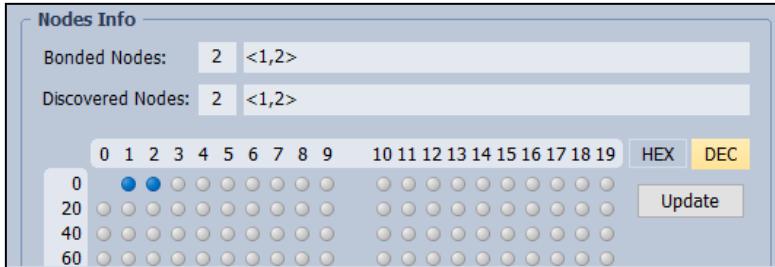
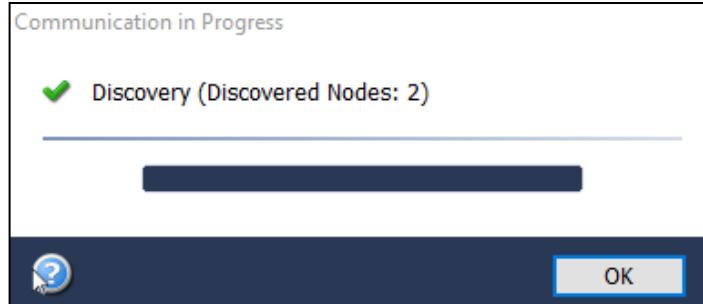
When you do it, you should see below in the screen yellow dots which fill the table automatically.

It is information for you, which addresses are occupied (assigned) already. When finish assigning process, press the „discovery” button.



Creating mesh network

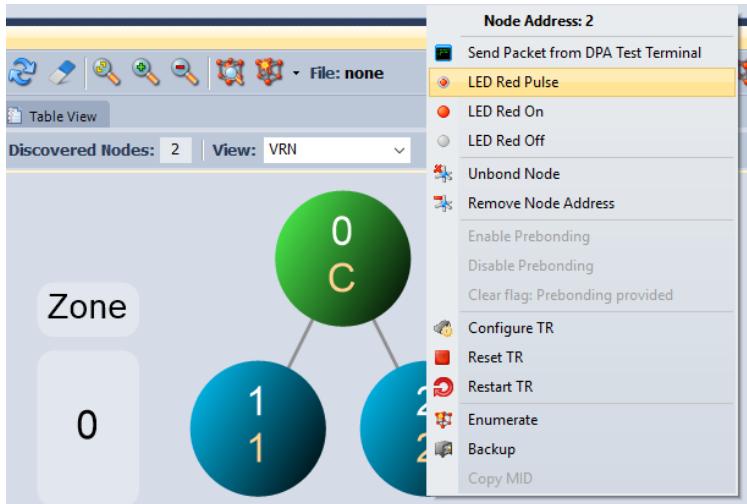
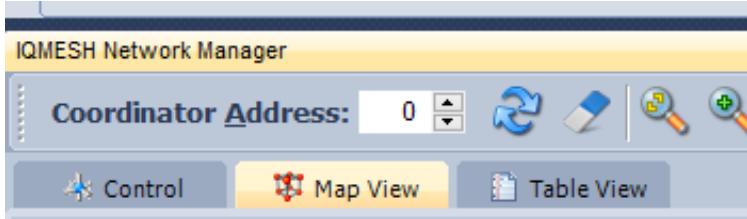
If process is done successfully, you will see information how many nodes are in your network. The yellow dots in the node info section are changed into blue dots.



Informations about network

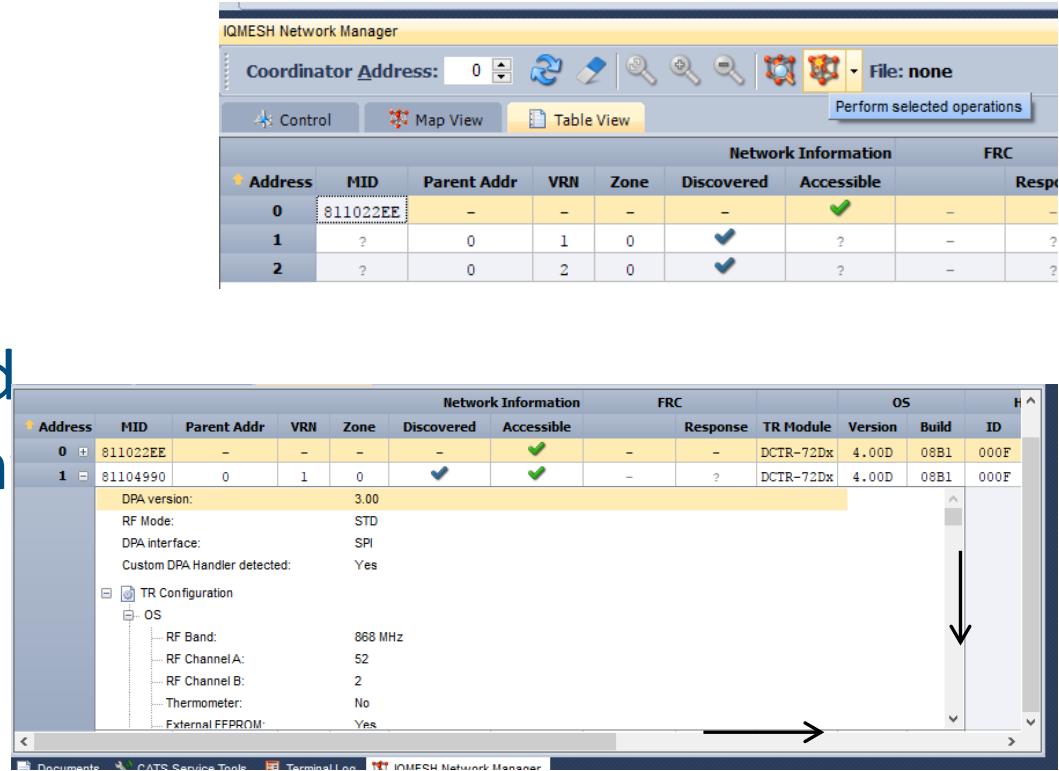
You can see your network in the picture. Go to map view section and see your network.

If you don't remember numbers of your node, you can check it extremely fast! Please click the right button of you mouse and choose led red pulse. Check which of the modules blinks the red led.



Informations about network

Please go to „table view” section and click the enumeration button. In this moment the application will download information about current status of the network.



The screenshot shows the IQMESH Network Manager interface. At the top, it displays the Coordinator Address as 0. Below this, there are three tabs: Control, Map View, and Table View, with Table View selected. The main area is divided into two sections: Network Information and FRC (Frequency Response Characteristics). The Network Information table lists three devices:

Address	MID	Parent Addr	VRN	Zone	Discovered	Accessible	FRC	Response
0	811022EE	-	-	-	-	<input checked="" type="checkbox"/>	-	-
1	?	0	1	0	<input checked="" type="checkbox"/>	?	-	?
2	?	0	2	0	<input checked="" type="checkbox"/>	?	-	?

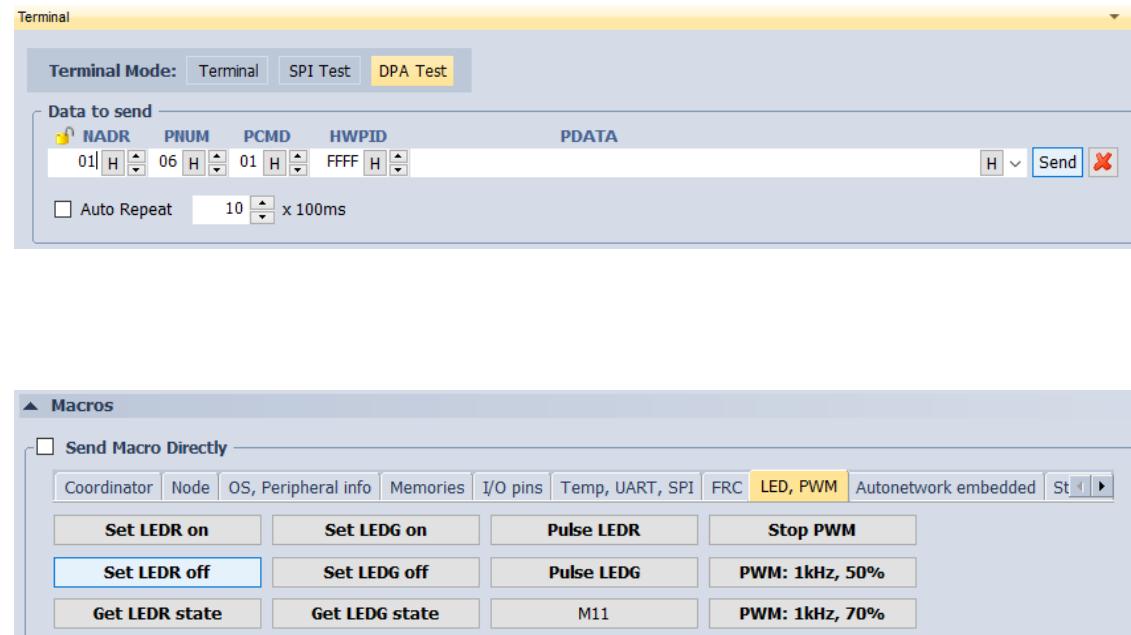
Below this, a detailed view for device address 0 is shown, including DPA version (3.00), RF Mode (STD), DPA interface (SPI), and Custom DPA Handler detected (Yes). It also shows TR Configuration and OS details:

- TR Configuration:** RF Band: 868 MHz, RF Channel A: 52, RF Channel B: 2, Thermometer: No, External EEPROM: Yes.
- OS:** Version: 4.00D, Build: 08B1, ID: 000F.

Sending informations

Go to „Terminal” section and send your first DPA command. Please set the command as you see in the picture. When you send this command, the red led on the module one should switch on.

In the next step, please try to switch off the same red led. You can use the macros as in the picture.



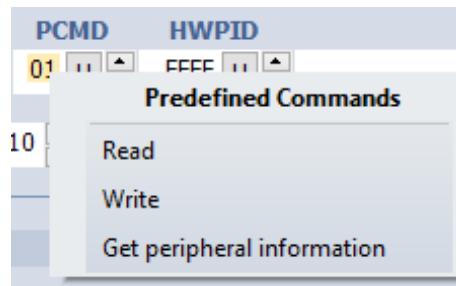
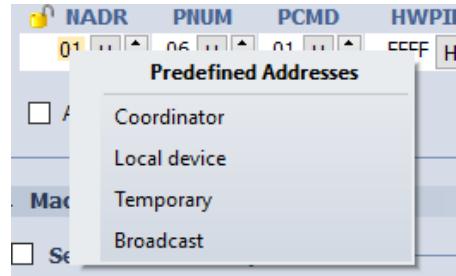
The screenshot shows two main windows of the IQRF software:

- Terminal Window:** The title bar says "Terminal". The "Terminal Mode" tab is selected, showing "DPA Test" as the active mode. The "Data to send" section contains fields for NADR (01), PNUM (06), PCMD (01), HWPIID (FFFF), and PDATA. There is a checkbox for "Auto Repeat" and a spin box for "10 x 100ms". A "Send" button is visible on the right.
- Macros Window:** The title bar says "Macros". A checkbox labeled "Send Macro Directly" is checked. Below it is a grid of buttons categorized by tabs: Coordinator, Node, OS, Peripheral info, Memories, I/O pins, Temp, UART, SPI, FRC, LED, PWM, Autonetwork embedded, and St. The "LED, PWM" tab is selected. The buttons in the grid include: Set LEDR on, Set LEDG on, Pulse LEDR, Stop PWM, Set LEDR off, Set LEDG off, Pulse LEDG, PWM: 1kHz, 50%, Get LEDR state, Get LEDG state, M11, and PWM: 1kHz, 70%.

Sending informations

You can use also predefined addresses, peripherals or commands.

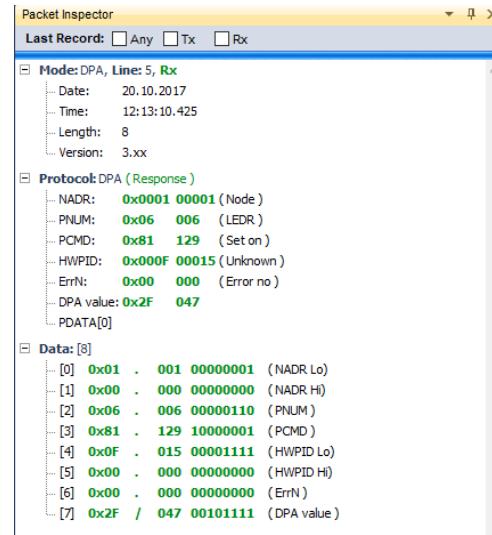
Remember!!!
 Predefined commands are variables based on predefined peripherals.



PNUM	PCMD	HWPID
Predefined Peripherals		
pea		COORDINATOR
pea		NODE
OS		EEPROM
EEPROM		EEEEPROM
RAM		RAM
LEI		LEDR
LEI		LEDG
EDI		SPI
EDI		IO
ana		Thermometer
AC		PWM
AC		UART
AC		FRC
User Peripheral 0x20		
Peripheral enumeration		

Check informations

Please open the „Terminal log” section and go to „Packet Inspector” section. You see detailed information for each step that were done(request / confirmation/ response).



Terminal Log								
	Line	Time	Rx/Tx	Length	Data HEX	DPA Me...	Error	
1	1	10:47:09.612	Rx	21	00.00.FF.3F.0F.00.80.00.00.03.02.FD.27.00.00.0F.00.CD.AB.01.03.	Asynchronous		
2	2	11:35:04.392	Rx	21	00.00.FF.3F.0F.00.80.00.00.03.02.FD.27.00.00.0F.00.CD.AB.01.03.	Asynchronous		
3	3	12:13:10.279	Tx	6	01.00.06.01.FF.FF.	Request		
4	4	12:13:10.295	Rx	11	01.00.06.01.FF.FF.FF.46.01.04.01.	Confirmation		
5	5	12:13:10.425	Rx	8	01.00.06.81.0F.00.00.2F.	Response		

Error detection

„Terminal Log“ is very useful feature during error detection process. You are able to easily find where problem exists (error on communication level, device not answering or your mistake). See the picture below.

ne	Time	Rx/Tx	Length	Data HEX	DPA Me...	Error
3	12:13:10.279	Tx	6	01.00.06.01.FF.FF.	Request	
4	12:13:10.295	Rx	11	01.00.06.01.FF.FF.FF.46.01.04.01.	Confirmation	
5	12:13:10.425	Rx	8	01.00.06.81.0F.00.00.2F.	Response	
6	12:25:25.558	Tx	6	03.00.06.01.FF.FF.	Request	
7	12:25:25.572	Rx	8	03.00.06.81.FF.FF.08.2F.	Response	NADR
8	12:26:33.508	Tx	6	14.00.06.01.FF.FF.	Request	
9	12:26:33.522	Rx	8	14.00.06.81.FF.FF.08.2F.	Response	NADR

Please connect DK-EVAL-04a with DDC-RE-01 and DK-EVAL-04a with DDC-SE-01. Then use macros:

FRC-temperature 2B

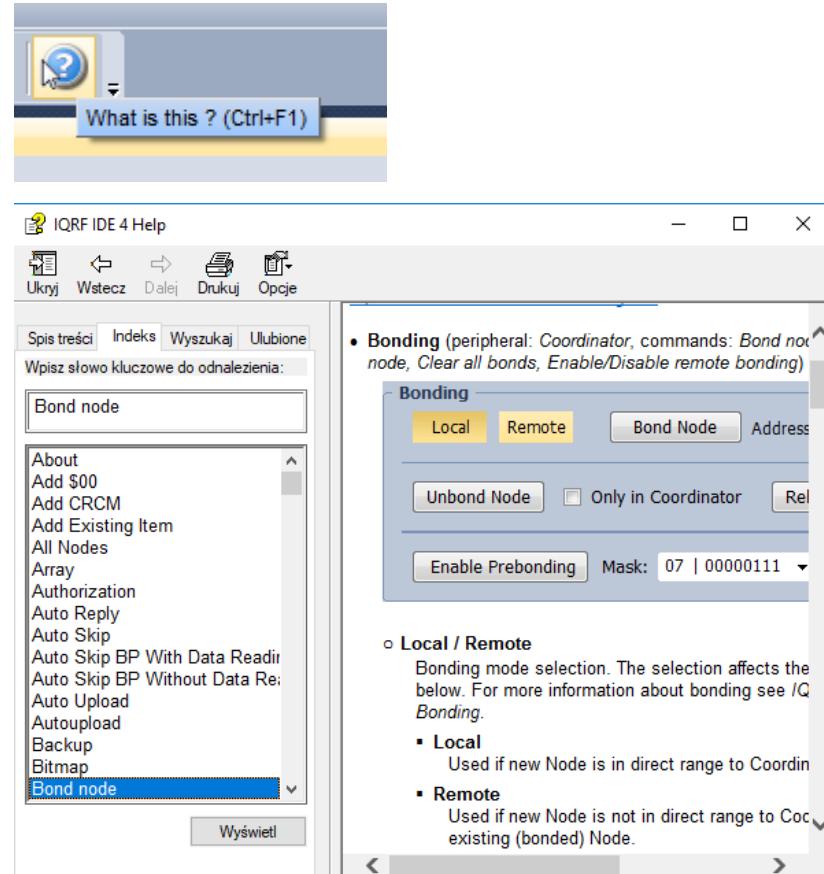
FRC-photoresistor

FRC-potentiometer

and send the command. Next go to the packet inspector. What do you see? Are you able to explain the results?

Help

If you want to know, what some functions are, please click the help button. You will get detailed information in IQRF IDE 4 help.



Let's play!

Exercise in practice

1. What NADR error type means? Are you able to induce other type than NADR error in. ex. PCMD, PNUM?
2. Try to set constant green led pulsation with frequency 2,5 seconds. Do you have ideas how to do it?
3. Try to measure the range? Do you have ideas, how you can do it? What result did you get? Which parameters in application IQRF IDE are responsible for the range.
4. Use commands „Get number of nodes”. What do you see. Why didn't you get the „confirmation” in terminal log section? Any ideas?

5. Please change the potentiometer positions. Try to measure 5 positions for example. If everything works, go to the next exercise.
6. Please try to measure light intensity. Use the natural lights, flashlight and try out the device in the darker place. Do you see the difference?
7. Please try to turn on the relay. Can you do it?
8. Please try to measure the temperature in the by FRC command. Try to measure the temperature on the module. Do you see the difference? Could you explain why?

Exercise in practice

9. Do you know, where is information about RSSI level? Read the RSSI level when you are at different distances from the coordinator. Do you see the difference.

10. Try to do unbond module and assign it one more time but:

- don't use function „clear all bonds” in IQRF IDE application
- use other address than you had previously.

What do you see in control section (nodes info part) and map view?

11. Try to set control with external LED by PWM. Do you know how to do it?

12. Please click checkbox „Send macro directly”. Do you see the difference when checkbox is on / off. Could you explain it.

