DT0128
Design tip

How to enable Unicast/Broadcast communication on S2-LP

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Main components	
S2-LP	Ultra-low power, high performance, sub-1GHz transceiver

Purpose and benefits

The S2-LP is a high performance ultra-low power RF transceiver, intended for RF wireless applications in the sub-1 GHz band. It is designed to operate in both the license-free ISM and SRD frequency bands at 433, 512, 868 and 920 MHz, but can also be programmed to operate at other additional frequencies in the 413-479 MHz, 452-527 MHz, 826-958 MHz, 904-1055 MHz bands. The S2-LP supports different modulation schemes: 2(G)FSK, 4(G)FSK, OOK and ASK. The air data rate is programmable from 0.1 to 500 kbps.

The S2-LP shows an RF link budget higher than 140 dB for long communication ranges and meets the regulatory requirements applicable in territories worldwide, including Europe, Japan, China and the USA.

The scope of this document is to provide the customer with a reference on how to setup a Unicast/Broadcast communication on S2-LP by enabling the destination address filtering feature offered by the embedded packet handler of the S2-LP, in a scenario One-To-Many or Many-To-One.

Description

Different scenarios apply to this document:

1) One-to-Many: When there are several receivers and one transmitter, and you may want to send a packet to multiple nodes or just one node;

2) Many-to-One: When there are several nodes that want to send packets to a single node (e.g. a Concentrator/Collector);

For these purposes it is needed to enable the destination address filtering and the Unicast/Broadcast addresses on the S2-LP.

A possible practical example can be thought as when using five STEVAL-FKI915V1 boards where:

- One board represents the main application HUB and is assigned the address 0x88

- The remaining four boards represent four nodes and are assigned respectively the addresses 0xAA, 0xBB, 0xCC, and 0xDD

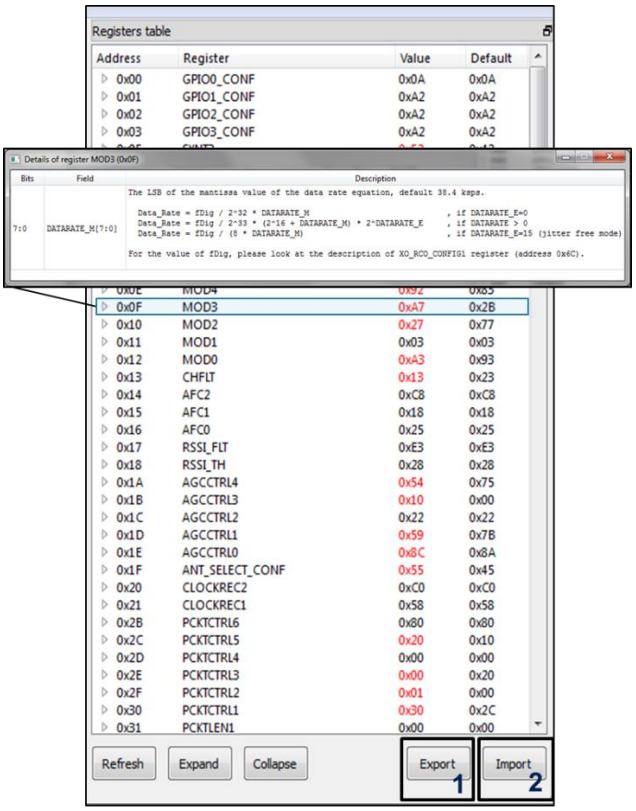
With this setup and the destination address filtering enabled, the reception of packets is successfully completed when the destination address matches (on the node and the destination address field embedded in the packet). If using a different destination address on the transmitter to be embedded in the packet, the receiver will report the error: "Packet lost. Destination Addr. does not match" as expected.

In this document you will see how to configure the registers of the S2-LP for the address filtering scope.

The demonstration makes use of the PC application contained into the STSW-S2LP-DK, the evaluation SW package based on S2-LP. With the GUI, it is possible to change the registers settings by clicking on a specific register (value column) and writing the new value. When a register has changed, its value is highlighted in red. By double clicking on a register, a detailed description of its fields is provided.

It is important to note that the PC application mentioned above allows importing and exporting of the register configuration of the S2-LP. As a matter of fact, the GUI can export the current register configuration. This will save all the registers to a .xml file. A configuration that has been exported can be imported using the Import button. As shown in the Fig.1 below.

Figure 1. Register map



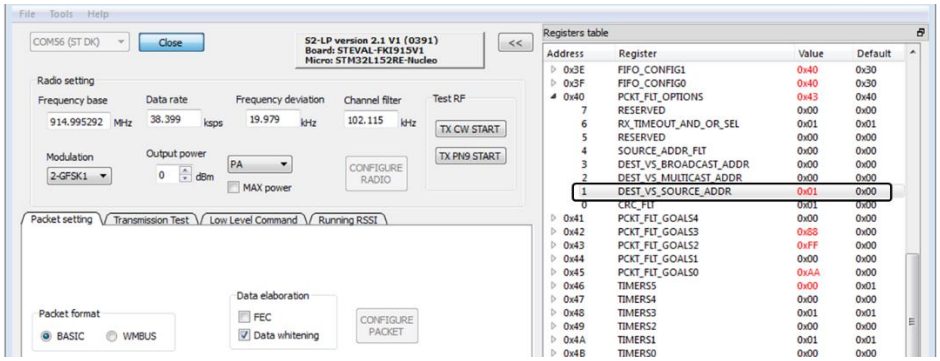
Registers configuration on the HUB

Follow the five steps below to setup the HUB (i.e. Coordinator/Collector):

1) Write the register PCKT_FLT_OPTIONS:DEST_VS_SOURCE_ADDR = 0x01

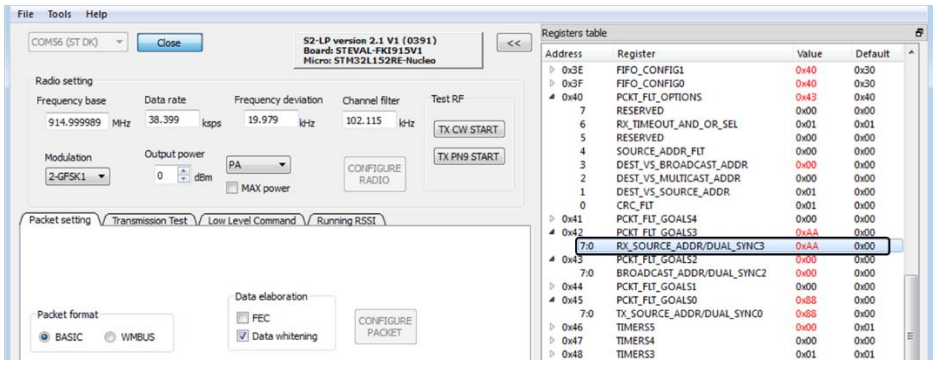
   This is needed in order to filter out the packet received if the destination address field embedded in the packet does not match the node address. See the Fig.2 below for a simpler/practical explanation:

Figure 2. Enable Destination Address Filtering on the HUB



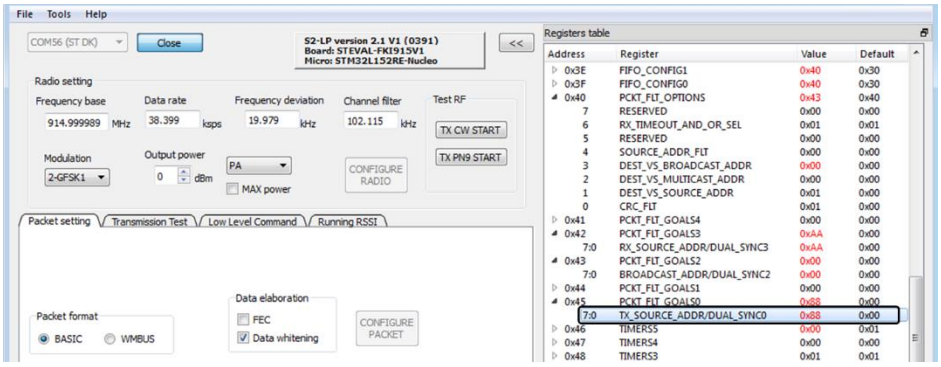
2) Write the register PCKT_FLT_GOALS3 = 0xFF or the destination node address (ex. 0xAA), this corresponds to the destination node's address to which the packet is meant to be sent. See the Fig. 3 below for a simpler/practical explanation:

Figure 3. Set the destination address to embed in the packets from the HUB



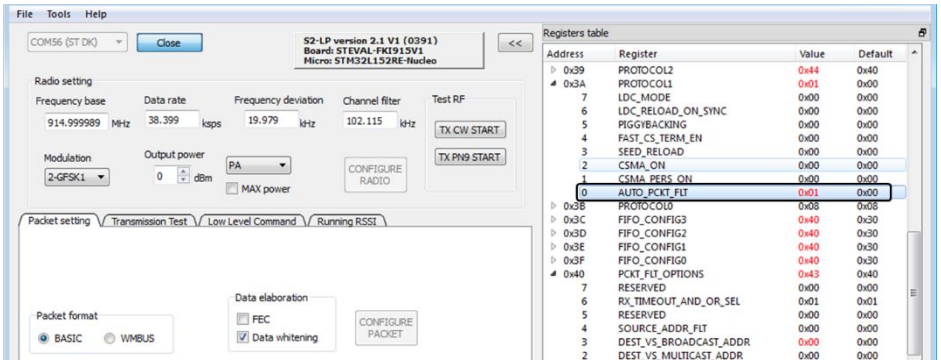
3) Write the register PCKT_FLT_GOALS0 = 0x88, this is the address of the HUB that the nodes have to embed as destination address for the packets meant to be sent to the HUB. See the Fig.4 below for a simpler/practical explanation:

Figure 4. Set the Hub address



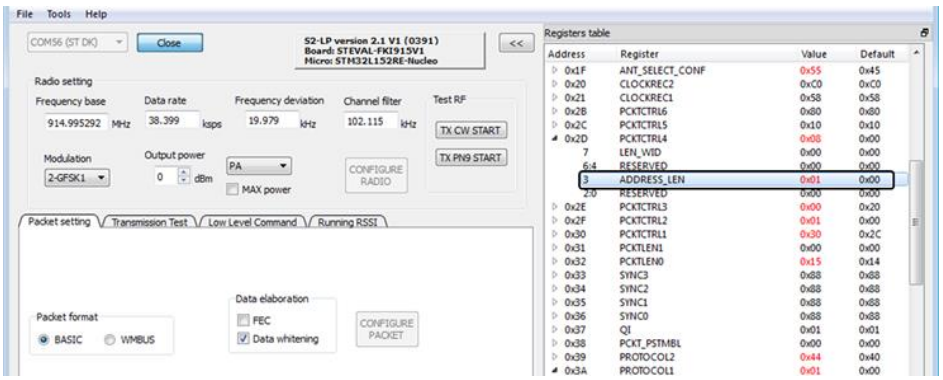
4) Write the register PROTOCOL1:AUTO_PCKT_FLT = 0x01 in order to enable automatic packet filtering. See the Fig.5 below for a simpler/practical explanation:

Figure 5. Enable automatic packet filtering



5) Write the register PCKTCTRL4:ADDRESS_LEN = 0x01 in order to enable automatic filtering based on destination address. See the Fig.6 below for a simpler/practical explanation:

Figure 6. Enable automatic filtering based on destination address

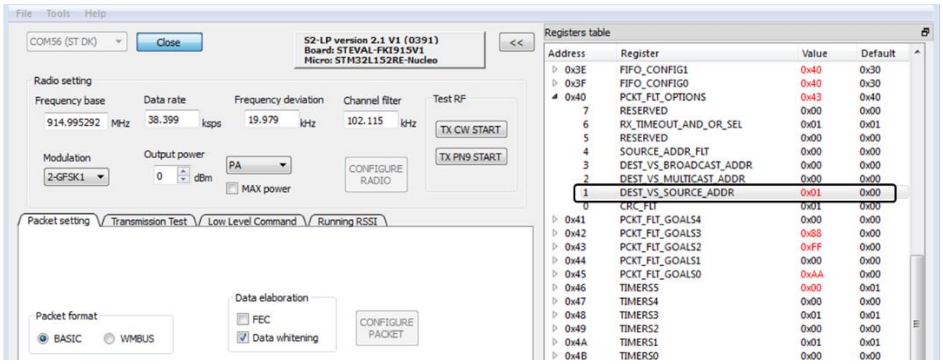


Registers configuration for a Node

Follow the seven steps below to setup the nodes:

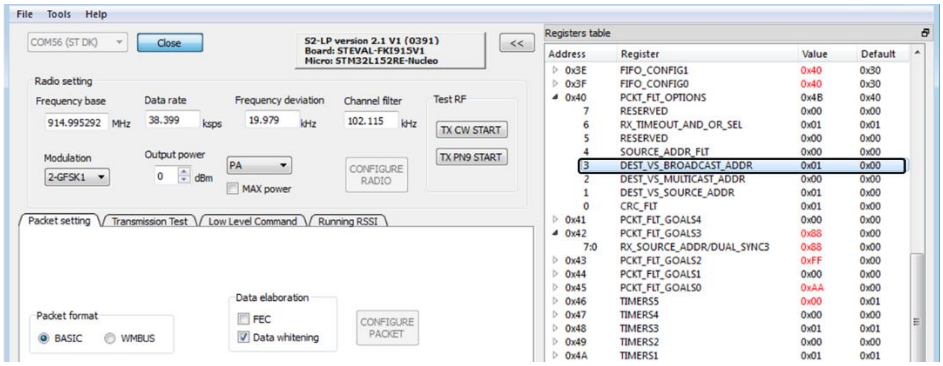
6) Write the register PCKT_FLT_OPTIONS:DEST_VS_SOURCE_ADDR = 0x01. This is needed in order to filter out the packet received if the destination address field embedded in the packet does not match the node address. See the Fig.7 below for a simpler/practical explanation:

Figure 7. Enable Destination Address Filtering on the Nodes based on Unicast Address



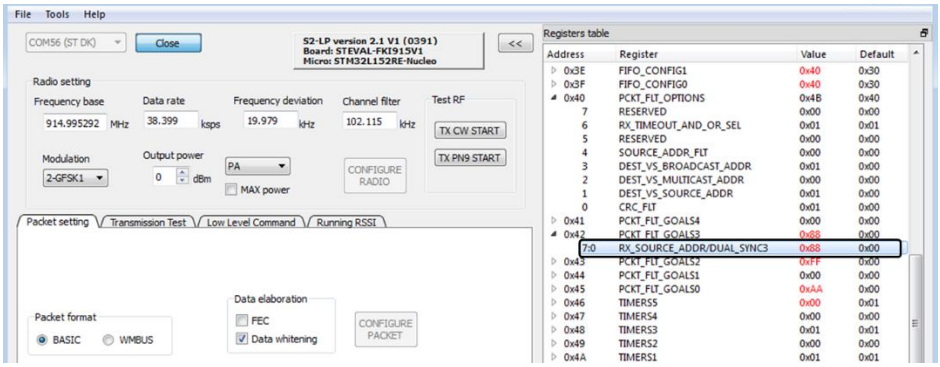
7) Write the register PCKT_FLT_OPTIONS:DEST_VS_BROADCAST_ADDR = 0x01. This is needed in order to filter out the packet received if the destination address field embedded in the packet does not match the node's broadcast address. See the Fig.8 below for a simpler/practical explanation:

Figure 8. Enable destination address filtering on the nodes based on broadcast address



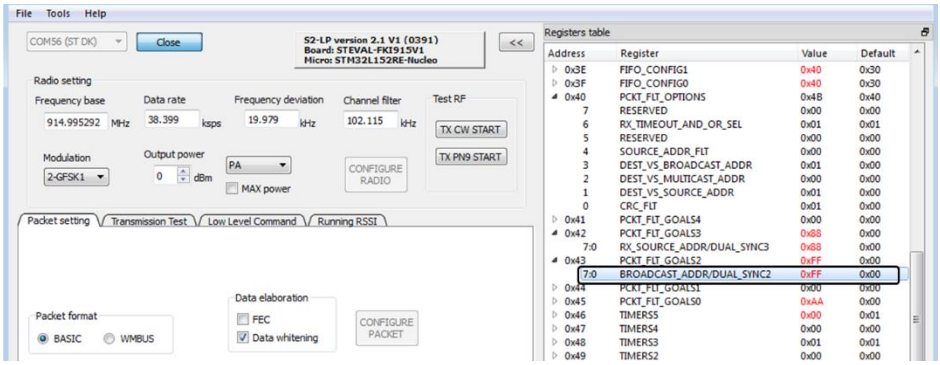
8) Write the register PCKT_FLT_GOALS3 = 0x88, this corresponds to the HUB address. See the Fig.9 below for a simpler/practical explanation:

Figure 9. Set the destination address to embed in the packets from the nodes to the HUB



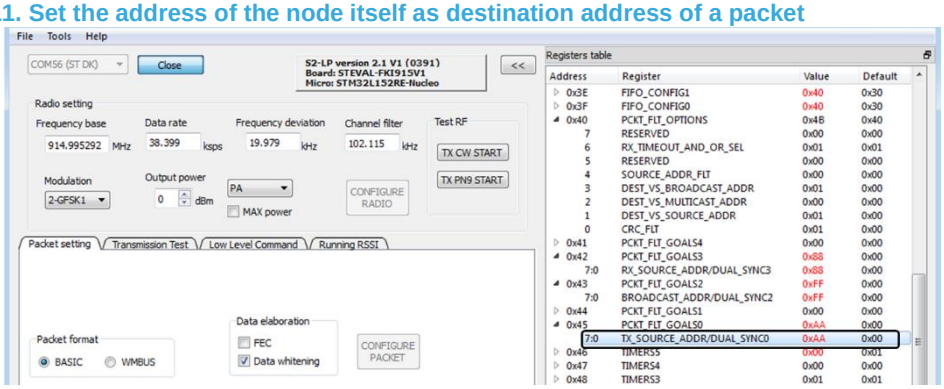
9) Write the register PCKT_FLT_GOALS2 = 0xFF as broadcast address to let all the node receive global packets from the HUB.
This gives like the possibility to use the broadcast address, in order for the HUB to be able to send global packets to be received by all the nodes. See the Fig.10 below for a simpler/practical explanation:

Figure 10. Set the broadcast address to receive global packets from the HUB to all nodes



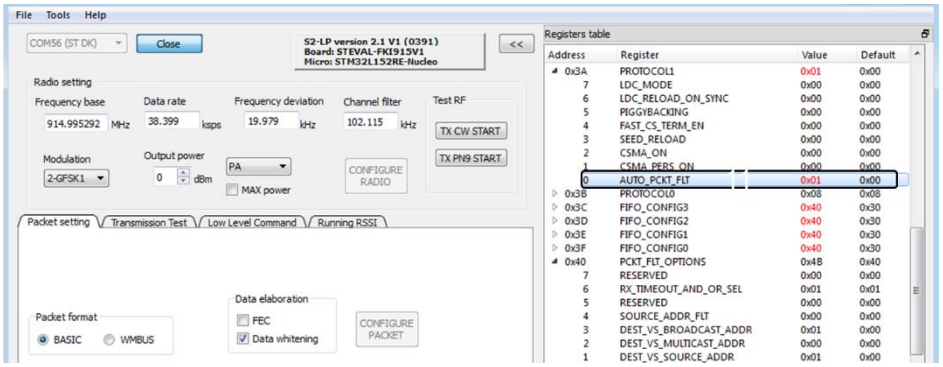
10) Write the register PCKT_FLT_GOALS0 = ex. 0xAA, this is the address of a Node which the HUB has to embed as destination address for the packets meant to be sent to this specific Node. See the Fig.11 below for a simpler/practical explanation:

Figure 11. Set the address of the node itself as destination address of a packet



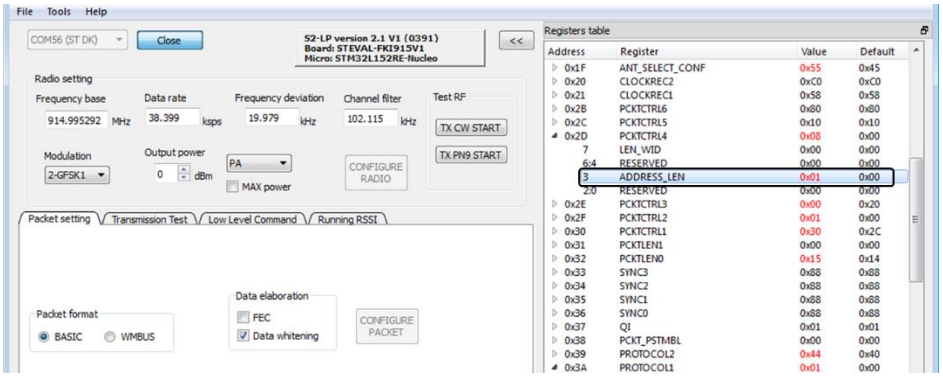
11) Write the register PROTOCOL1:AUTO_PCKT_FLT = 0x01 in order to enable automatic packet filtering. See the Fig.12 below for a simpler/practical explanation:

Figure 12. Enable automatic packet filtering



12) Write the register PCKTCTRL4:ADDRESS_LEN = 0x01 in order to enable automatic filtering based on destination address. See the Fig.13 below for a simpler/practical explanation.

Figure 13. Enable automatic filtering based on destination address



Support material

Related design support material
STEVAL-FKI433V2 - Sub-1GHz (430-470 MHz) transceiver development kit based on S2-LP
STEVAL-FKI512V1 - Sub-1GHz (452-527 MHz) transceiver development kit based on S2-LP
STEVAL-FKI868V2 - Sub-1GHz (860-940 MHz) transceiver development kit based on S2-LP
STEVAL-FKI915V1 - Sub-1GHz transceiver development kit based on S2-LP
X-NUCLEO-S2868A1 - Sub-1GHz 868 MHz RF expansion board based on S2-LP radio for STM32 Nucleo
Documentation
Datasheet S2-LP - Ultra-low power, high performance, sub-1GHz transceiver
UM2149 - Getting started with the S2-LP development kits
Embedded Software
STSW-S2LP-DK - Evaluation SW package based on S2-LP

Revision history

Date	Version	Changes
26-Nov-2018	1	Initial release

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