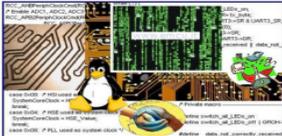


SPIRIT1 Development Kit Software Package



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SPIRIT1 Development Kit content [1/3]

- SPIRIT1 Library (STM32L, STM8L)
 - Spirit1 low level drivers: APIs to manage the features the device offers (platform independent
 - Radio, GPIO, IRQ, Calibration, CSMA etc.
 - SDK_EVAL Libraries: APIs to manage the main features of the motherboard
 - Examples: BasicGeneric, LDCGeneric, StackGeneric, ...
- WMBUS Library (Binary for STM32L)
 - library files with the PHYSICAL and LINK layer of the WMBUS STACK
 - Examples: The example has four configurations to differentiate between these combination : 169 or 868 bands and meter or concentrator
- SPIRIT1 SDK Virtual Com port
 - VirtualCom Libraries for the STM32L motherboard.
- MCU Standard Peripheral Library
 - standard peripheral library for the STM32L + STM8L microcontroller
- STM32 USB-FS-Device Library:
 - USB library for STM32L microcontroller



life.augmented

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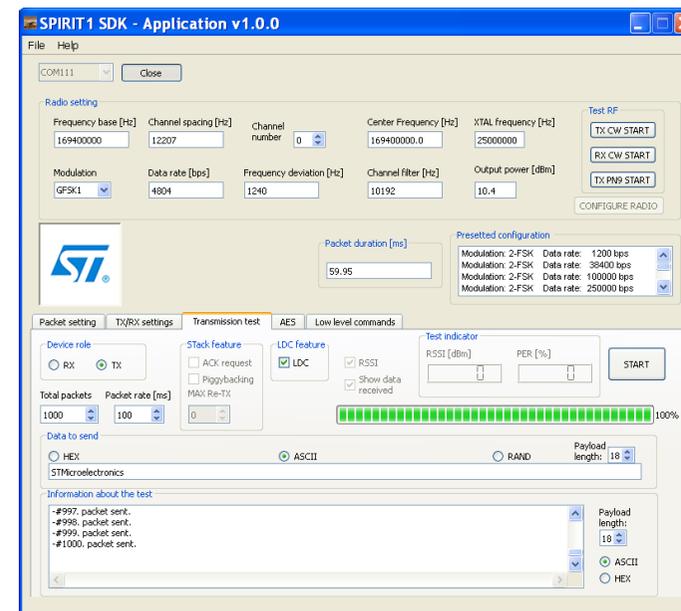


SPIRIT1 Development Kit content [3/3]

SPIRIT1 SDK Suite GUI

- SPIRIT1 SDK contains PC application (GUI) allowing:
 - Radio configuration
 - RF tests (TX of unmodulated carrier, TX PN9 sequence, RX activation)
 - Packet transmission/reception test with PER evaluation
 - AES engine encryption/decryption tests
 - Register read/write and dump
 - Store/load radio and packet configuration
 - Automatic Firmware Upgrade
 - Windows XP, 7

SPIRIT1 RF performance evaluation



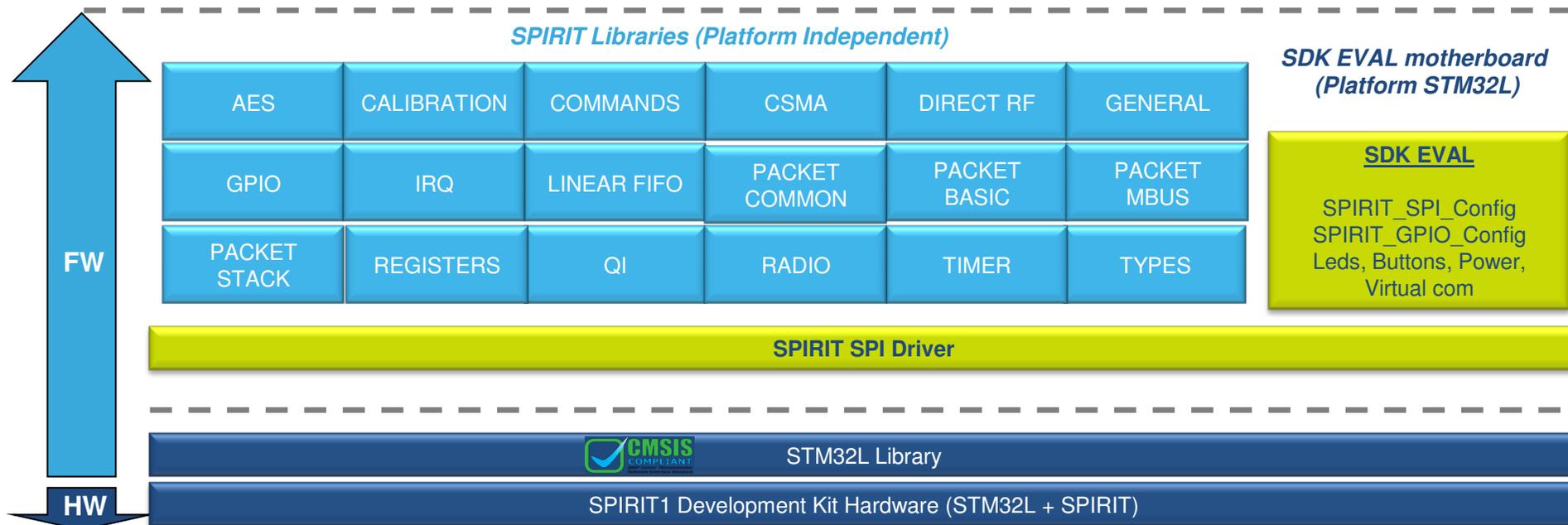
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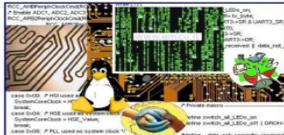
STM32L SPIRIT1 SDK Firmware Package Architecture

The firmware package of the Spirit Development Kit provides in addition to the SPIRIT1 Library:

- SDK Eval: a set of API functions to manage the motherboard of the SDK (STM32L microcontroller) including USB library and DFU project files for firmware upgrade
- STM32L library: the standard peripheral library for the STM32L microcontroller.
- SPIRIT1 Examples: BasicGeneric, LDCGeneric, StackGeneric etc.
- Developed under EWARM IAR v.6.40 IDE (ST-Link, J-Link required for debugging)



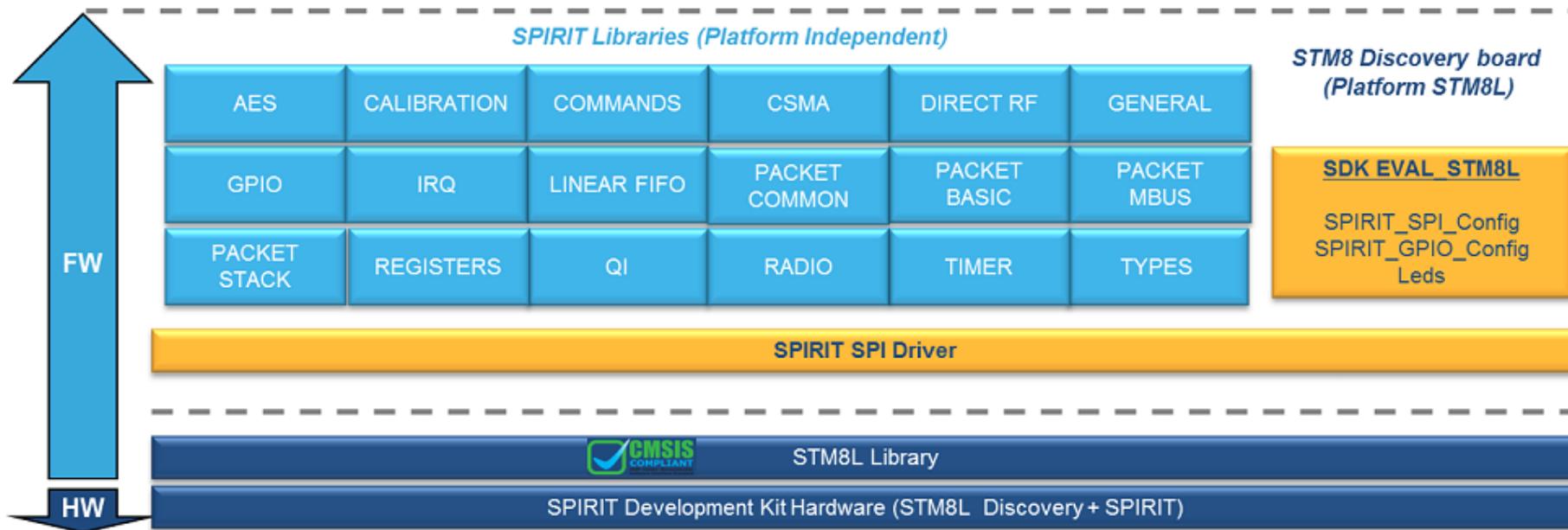
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STM8L SPIRIT1 SDK Firmware Package Architecture

The firmware package of the Spirit Development Kit provides in addition to the SPIRIT1 Library:

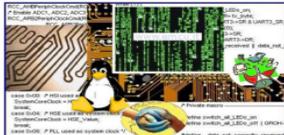
- SDK Eval: a set of API functions to manage the STM8L discovery board (STM8L microcontroller)
STM8L library: the standard peripheral library for the STM8L microcontroller.
- SPIRIT1 Examples: BasicGeneric, LDCGeneric, StackGeneric etc.
- Developed under EWARM IAR v.6.40 IDE (ST-Link, J-Link required for debugging)



STM8L Firmware architecture



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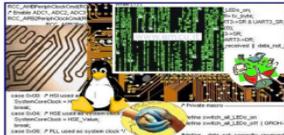
SPIRIT1 library Memory Foot print STM32L

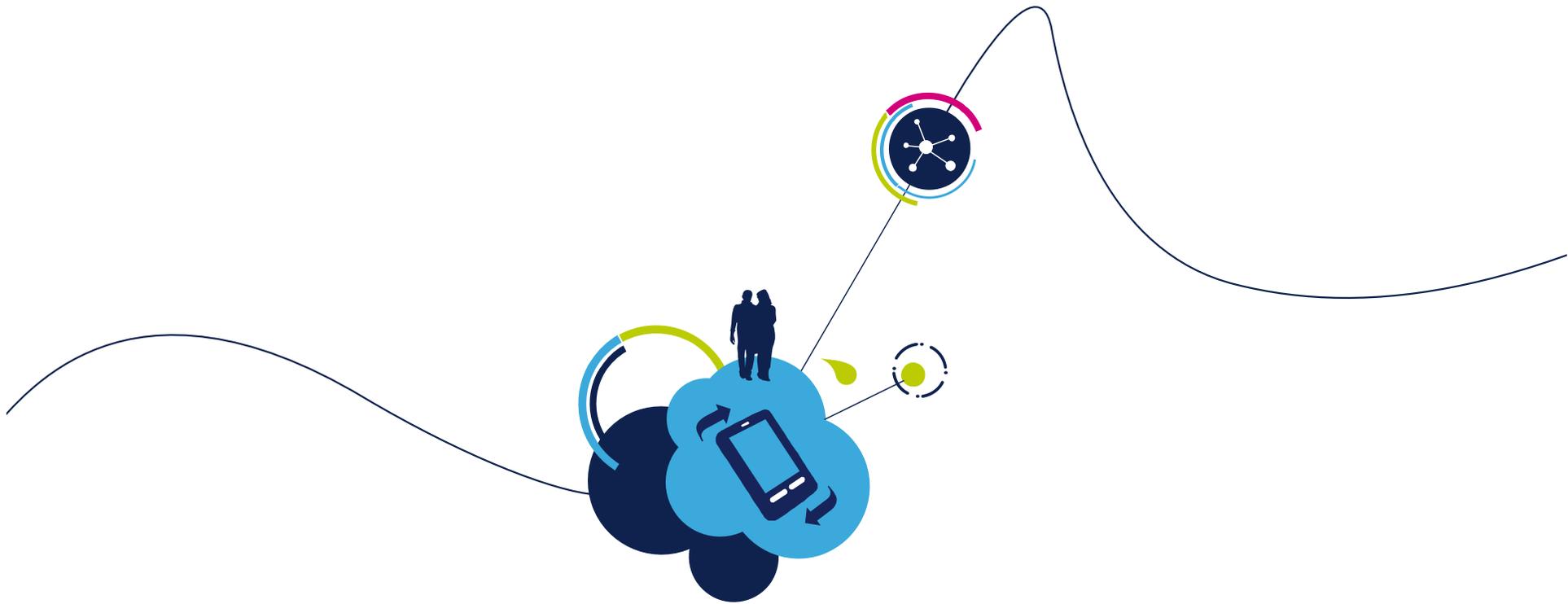
	Flash (KBytes)	Ram (Bytes)
SPIRIT1 Library (on STM32L)	20	28

- Maximum usage using all the driver features (Typical application will use much lower flash, e.g 4K)
- Preliminary data

	Flash (KBytes)	Ram (Bytes)
WM-BUS protocol stack	9.1	2148

- Maximum usage of the Wireless M-Bus library
- Both data are referred from libraries in SPIRIT1 Dev Kit version 1.0.6 compiled with IAR with high optimization on the code size

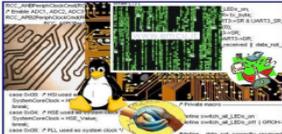




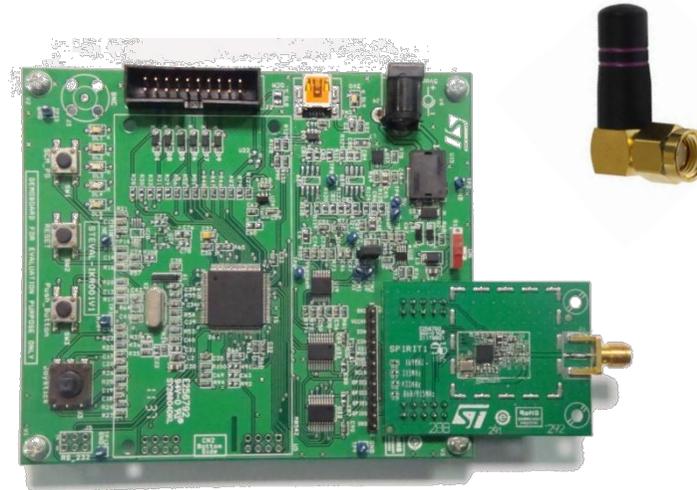
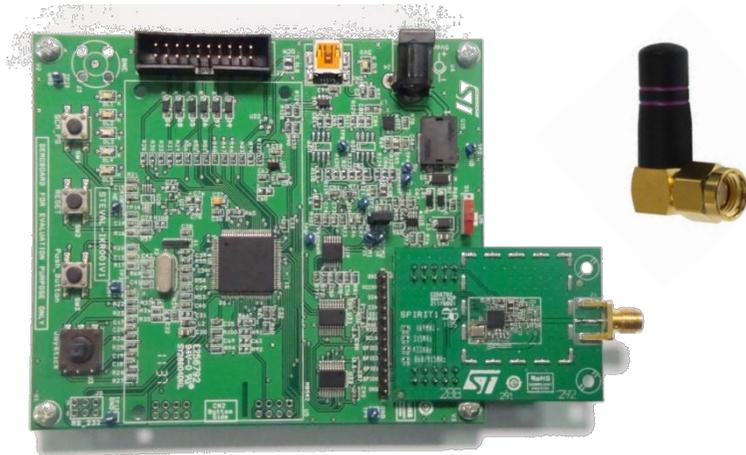
Getting Started with the SPIRIT1 Development Kit (DK)



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SPIRIT1 DK content



SPIRIT1 Development Kits

- STEVAL-IKR001V1 – 169 MHz
- STEVAL-IKR001V2 – 315 MHz
- STEVAL-IKR001V3 – 433 MHz
- STEVAL-IKR001V4 – 868MHz
- STEVAL-IKR001V5 – 915 MHz
- STEVAL-IKR001V6 – 920 MHz



*DK – Development Kit



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SDK Download

STMicroelectronics
HOME ABOUT ST CONTACTS PRESS LOGIN
Home > Entertainment and Connectivity > Communication & Connectivity ICs > Wireless Communication ICs > SPIRIT1
SPIRIT1 Low data rate, low power Sub 1GHz transceiver
Evaluation

Quick view **Design support** Orderable products

Boards and Tools

Part Number	Description
STEVAL-IKR001V3	Sub-GHz (band)
STEVAL-IKR001V6	Sub-GHz (band)
STEVAL-IKR001V5	Sub-GHz (band)
STEVAL-IKR001V1	Sub-GHz (band)
STEVAL-IKR001V4	Sub-GHz (band)
STEVAL-IKR001V2	Sub-GHz (band)

- Go to SPIRIT1 website

http://www.st.com/internet/imag_video/product/253167.jsp

- Under Design Support TAB **1** click on the link of the board you have,

- i.e. [STEVAL-IKR001V1](#) **2**

STMicroelectronics
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STEVAL-IKR001V1 Sub-GHz transceiver development kit based on the SPIRIT1

Active

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Software & Development Tools

- SOFTWARE FUNCTIONS
- CONFIGURATION UTILITIES
- FIRMWARE
- OPERATING SYSTEMS
- SOFTWARE DRIVERS
- TEST UTILITIES

SW FUNCTIONS

Description	Version
SPIRIT1 DK Setup	1.0.4

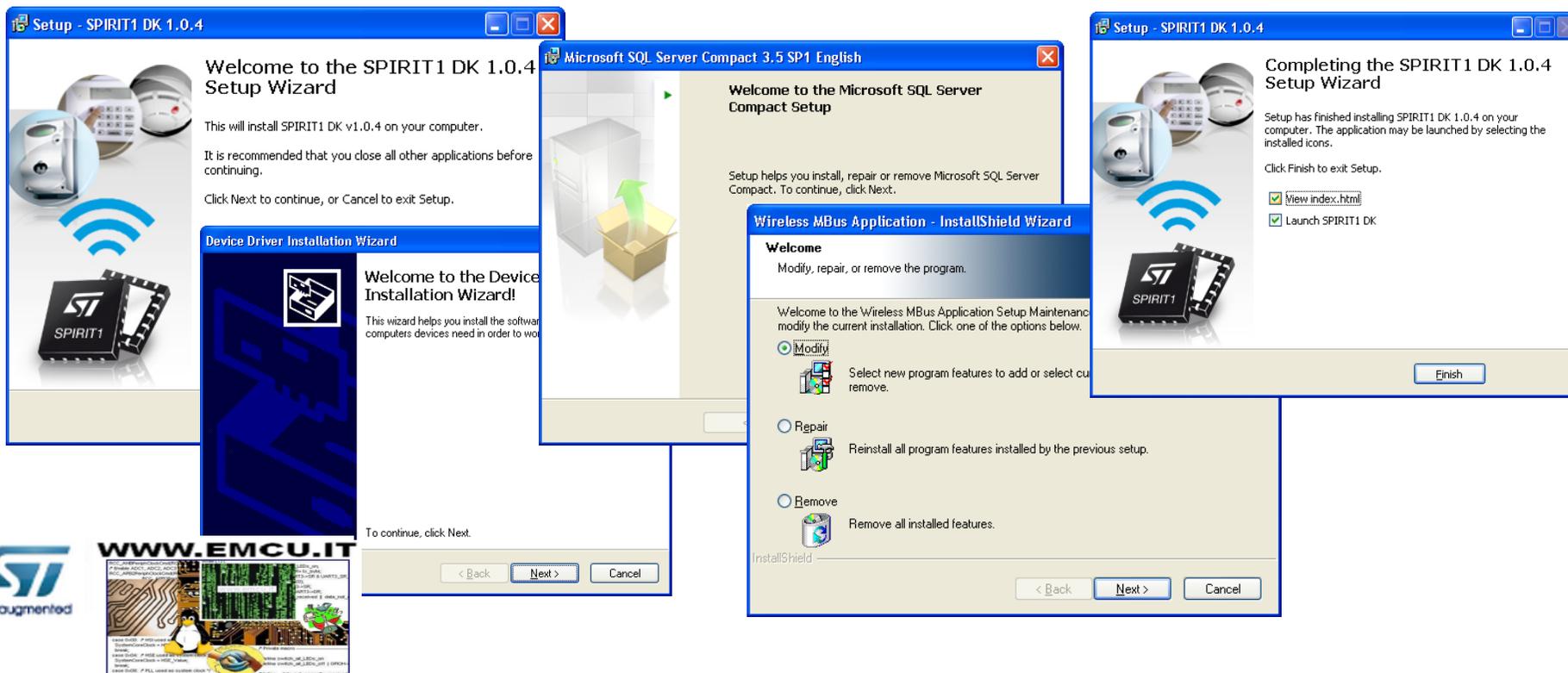
- In the Design Support TAB click download and install the latest SPIRIT1 DK Setup **3**



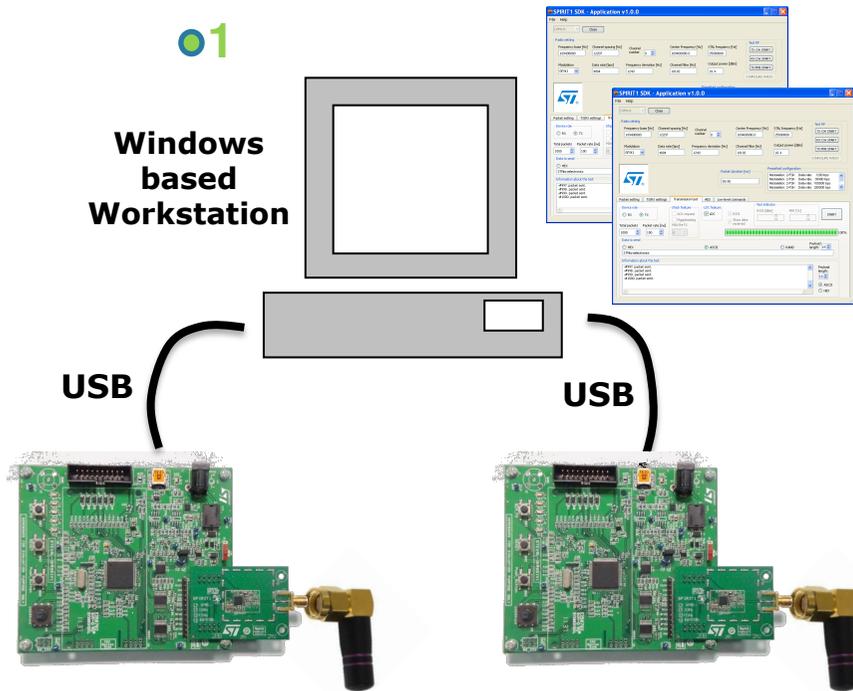
*SDK – Software Development Kit

SDK installation

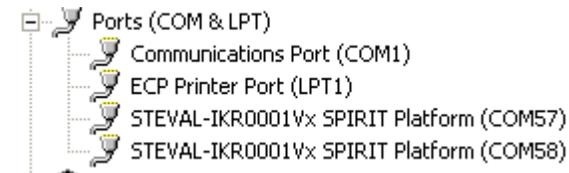
- Run the **SPIRIT1 DK-Setup-1.0.x.exe** downloaded from www.st.com
 - Follow the instruction given in the dialog box
 - You will be prompted to accept device driver installation (VCOM driver). Click next and follow the instructions to install it
 - Microsoft SQL Server Compact installation will be started automatically. Proceed with the installation in case you want to use the W-Mbus (optional)
 - Finally, accept to install the W-Mbus Application (optional)



HW & SW set-up

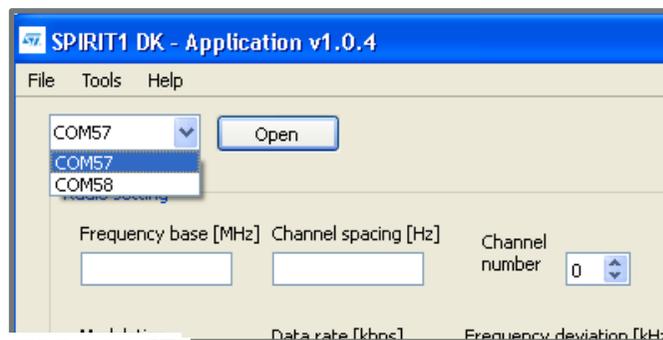


- Connect both STM32L motherboards to the PC 01
- Check the device manager, two devices with different VCOM numbers should be visible



- Run two instances of the SPIRIT1 DK GUI (Start -> Programs-> STMicroelectronics -> SPIRIT DK_1.0.x -> SPIRIT1 DK)
- In each SPIRIT1 DK GUI, select one of the COM ports 02
 - Click Open port in both GUIs -> you are ready to test SPIRIT1

02



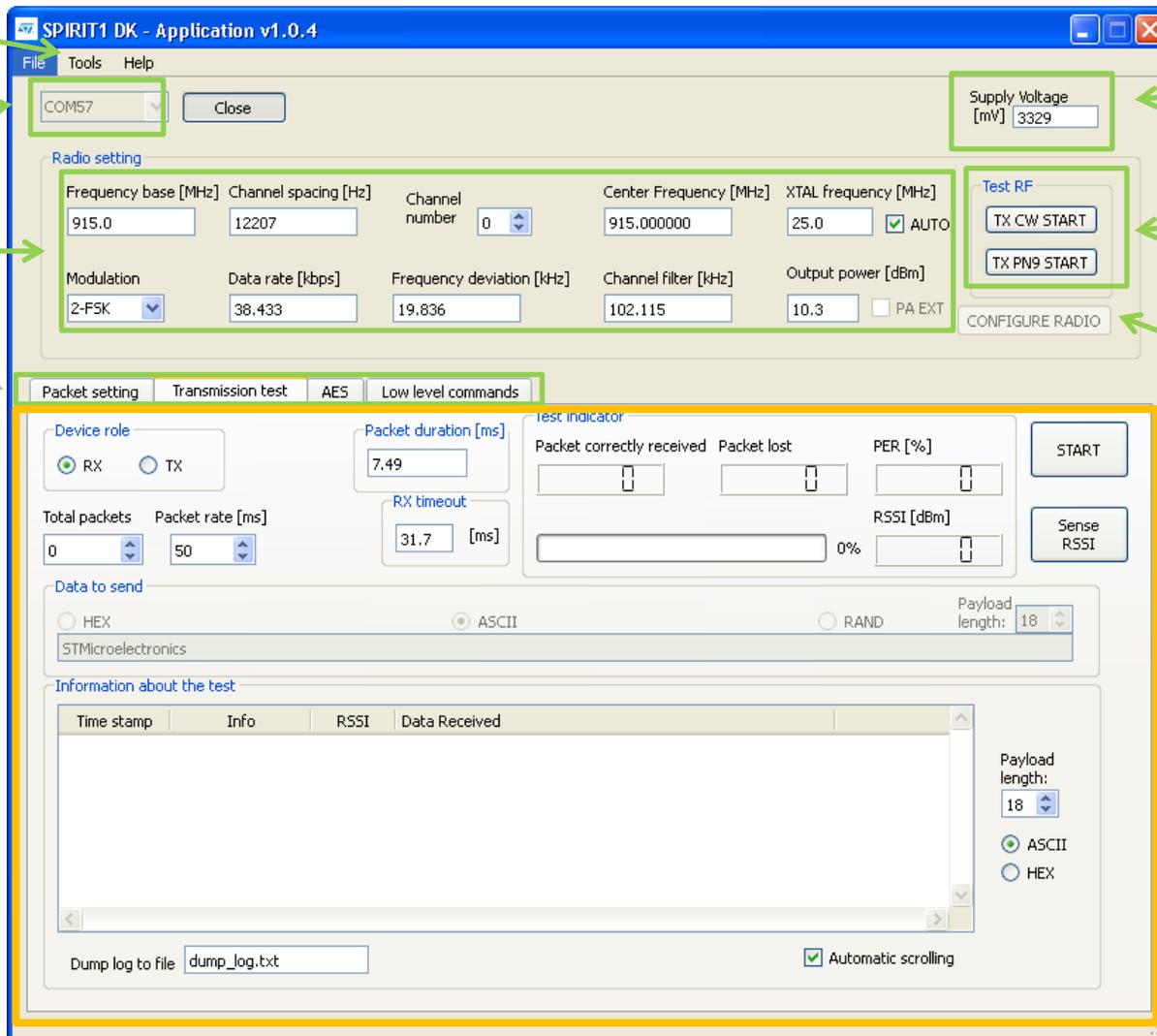
SPIRIT1 DK GUI - 1/5

Tools, firmware
flasher

Connection panel
COM port

Radio settings

Non-RADIO
SPIRIT1 set-up,
register access,
Communication
test



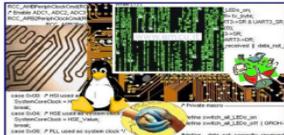
SPIRIT1 supply
voltage

Test RF – generates
Carrier Wave or
pseudorandom
binary sequence

Click CONFIGURE
RADIO button when
you change any
Radio settings

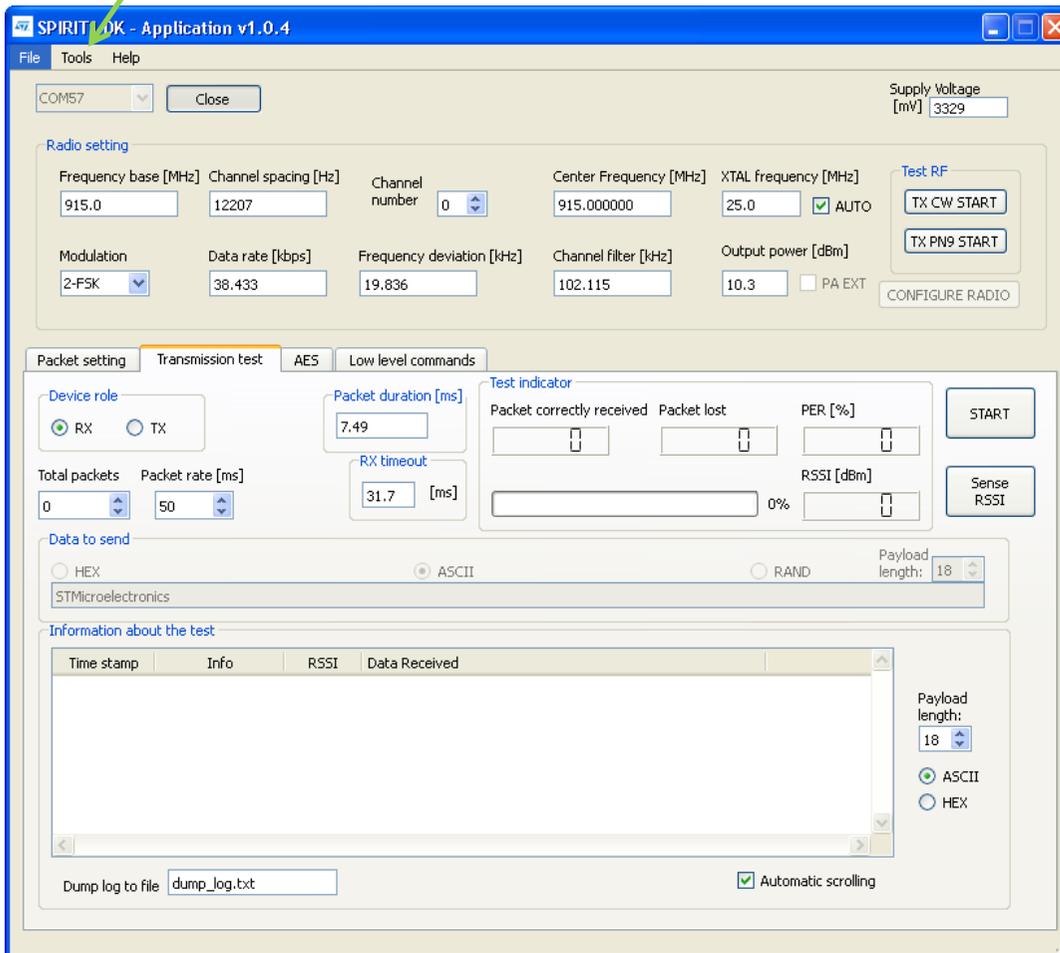


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SPIRIT1 DK GUI - 2/5

Tools



Tools

- **Firmware Upgrade**
 - Uses DFU boot loader (read details in the board user manual about how to put DK board in the DFU mode)
- **Firmware Version**
 - Reads the board firmware version, in case it does not correspond to the DK GUI version, it is recommended to flash the corresponding one (you can find it at [...\Firmware\Binary file\SPIRIT1_DK.hex](#)) - Firmware Upgrade
- **Save the Current Configuration**
 - Stores the SPIRIT1 DK GUI configuration you made
- **Load the Saved Configuration**



SPIRIT1 DK GUI - 3/5

The screenshot displays the SPIRIT1 DK GUI with the following settings and annotations:

- Radio setting:**
 - Frequency base [MHz]: 915.0
 - Channel spacing [Hz]: 12207
 - Channel number: 0
 - Center Frequency [MHz]: 915.000000
 - XTAL frequency [MHz]: 25.0
 - Modulation: 2-FSK
 - Data rate [kbps]: 38.433
 - Frequency deviation [kHz]: 19.836
 - Channel filter [kHz]: 102.115
 - Output power [dBm]: 10.3
 - XTAL AUTO:
 - PA EXT:
 - Buttons: TX CW START, TX PN9 START, CONFIGURE RADIO
- Packet setting:** (Selected tab)
 - Packet format: BASIC (selected), WMBUS (highlighted)
 - Preamble length: 4 (range 1-32 Bytes)
 - Sync: Length [bytes]: 4, Sync word: 0x 88888888
 - CRC: Poly 0x8005 (CRC Polynomial selection)
 - Data elaboration: FEC (unchecked), Data whitening (checked)
 - Button: CONFIGURE PACKET

Annotations with arrows point to these specific settings:

- Packet Setting (points to Packet setting tab)
- Packet Format (points to WMBUS radio button)
- Preamble Length; 1 – 32 Bytes (points to Preamble length dropdown)
- Sync Word, Length (1- 4 Bytes) (points to Sync Length dropdown)
- CRC Polynomial selection (points to CRC Poly dropdown)
- Forward Error Correction (points to FEC checkbox)
- Data Whitening (points to Data whitening checkbox)
- Similar for WMBUS packet format (points to Data elaboration section)



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SPIRIT1 DK GUI - 4/5

Transmission Test

Select the device Role (different for each board)

Number of packets to transmit (0 = infinite nbr)

Packet rate; set the same for TX and RX role

Payload data format

Payload data for transmitting

Overview of the received or transmitted packets

The screenshot shows the SPIRIT1 DK GUI with the following settings and data:

- Radio setting:** Frequency base [MHz]: 169.0, Channel spacing [Hz]: 12207, Channel number: 0, Center Frequency [MHz]: 169.000000, XTAL frequency [MHz]: 25.0, Modulation: 2-FSK, Data rate [kbps]: 38.433, Frequency deviation [kHz]: 19.836, Channel filter [kHz]: 102.115, Output power [dBm]: 10.8.
- Transmission test:** Device role: TX, Total packets: 0, Packet rate [ms]: 50, Packet duration [ms]: 7.49, RX timeout: 31.7 [ms].
- Data to send:** Format: ASCII, Payload length: 18.
- Test indicator:** Packet correctly received: 0, Packet lost: 0, PER [%]: 0, RSSI [dBm]: -99.
- Log:**

Time stamp	Info	RSSI	Data Received
76 13:33:35.85	Packet sent		
77 13:33:35.89	Packet sent		
78 13:33:35.94	Packet sent		
79 13:33:36.00	Packet sent		
80 13:33:36.05	Packet sent		
81 13:33:36.10	Packet sent		
82 13:33:36.14	Packet sent		

Packet duration – calculated from the data rate and number of bytes transmitted

Start Receiving or transmitting

Packet Error Rate Statistic

Number of Bytes to send as payload

Number of Bytes expected in the receiver



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SPIRIT1 DK GUI - 5/5

The screenshot shows the SPIRIT1 DK GUI v1.0.4 interface. The window title is "SPIRIT1 DK - Application v1.0.4". The menu bar includes "File", "Tools", and "Help". The main interface is divided into several sections:

- Radio setting:** Includes fields for Frequency base [MHz] (915.0), Channel spacing [Hz] (12207), Channel number (0), Center Frequency [MHz] (915.000000), XTAL frequency [MHz] (25.0), Modulation (2-FSK), Data rate [kbps] (38.433), Frequency deviation [kHz] (19.836), Channel filter [kHz] (102.115), and Output power [dBm] (10.3). There are also buttons for "Test RF" (TX CW START, TX PN9 START) and "CONFIGURE RADIO".
- Packet setting:** Includes "Transmission test", "AES", and "Low level commands" (highlighted).
- Low level commands section:**
 - Read registers:** Fields for "First Register" (0x 0) and "No. registers" (5), with a "Read" button.
 - Write registers:** Fields for "Register to change" (0x) and "New value" (0x), with a "Write" button.
 - Save register values:** A text field "register.txt" and a "Save" button.
 - Vcc_RF regulator [mV]:** A dropdown menu set to "1800" and a "Set" button.
 - GPIO controls:** Buttons for "RX Data on GPIO", "Send Data from GPIO", and "RX Data on GPIO No Packet".
- SPIRIT1 information:** Includes buttons for "SPIRIT state" and "SPIRIT version".
- Information block:** A box displaying "SPIRIT Status : READY".
- Supply Voltage [mV]:** A field set to "1805".

Annotations with green arrows point to various features:

- Low level Commands:** Points to the "Low level commands" tab.
- Read the register content:** Points to the "Read registers" section.
- Save register content (e.g. to copy it to your C code):** Points to the "Save register values" section.
- Set the supply voltage (1.8 - 3.4V):** Points to the "Vcc_RF regulator" section.
- Set the Direct mode RX/TX through GPIOs:** Points to the "RX Data on GPIO" and "Send Data from GPIO" buttons.
- Write any particular register:** Points to the "Write registers" section.
- Reads the current state of SPIRIT1:** Points to the "SPIRIT state" button.
- Information block:** Points to the "SPIRIT Status : READY" box.
- SPIRIT1 silicon version:** Points to the "SPIRIT version" button.



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