Focus on ST Connectivity

EMEA Regional Product Marketing

Oct. 2019 – Antonio Cirone

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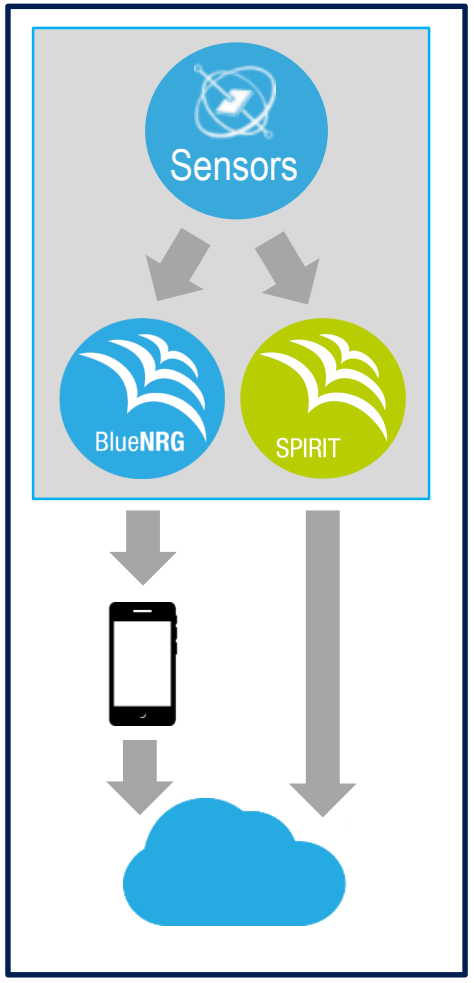
Low-Power RF product lines

Enabling the Sensor-to-Cloud wireless connectivity

BlueNRG Family

Ultra Low Power ARM-Based
Bluetooth Low Energy Processors

BlueNRG-MESH



SPIRIT Family

Sub-1GHz Radio Transceivers
And LPWAN networking

sigfox

M-Bus

LoWPAN

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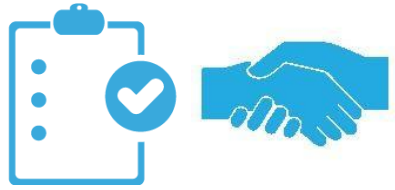
ST Low-Power RF Total Solution

- INTEROPERABILITY
- SECURITY and RELIABILITY
- PERFORMANCE
- SUPPORT



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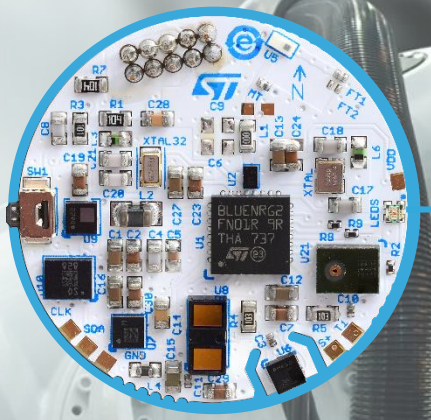
Low Power | Quality | Scalability | Upgradability



Low Power RF

Connectivity, efficiency and robustness

BlueNRG

SPIRIT

- **Robust radio** for reliable wireless connectivity
- **Sensor ready** for seamless Sensor-to-Cloud solutions
- **Low-power** for longer battery life and lower maintenance costs
- **Scalable packages** for space and cost saving applications
- **RF module catalog** to ease design-in, costs and time-to-market
- **SW and tools eco-system** to shorten development time

LONGEVITY 10 YEARS COMMITMENT

Bluetooth LE SoC and **Sub-1GHz / LPWAN / Sigfox** radio

Programmable Bluetooth LE radio for smarter IoT applications (sense, monitor and control)

Sub-1GHz/LPWAN/Sigfox radio transceivers for local, remote and global IoT connectivity

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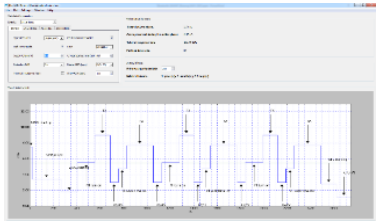
Low-Power RF ecosystem

RF CHIPSET

EVALUATION KIT and DEVELOPMENT TOOLS

RF MODULES

GRAPHICAL UI



RF Power Simulator

GUI PC application

SW DEVELOPMENT

IAR SYSTEMS

KEIL™ Tools by ARM

BlueNRG/Spirit NAVIGATOR

PROTOCOLS / SW IP

Sensors

Mic

MOTION SW libraries

VOICE SW libraries

6LoWPAN
IPv6-based Low-power Wireless Personal Area Networks

M-Bus wireless

sigfox

iOS/Android SDK

BLUENRG-MESH TRIPLE SDK

Android SDK

iOS SDK

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Low-Power RF Focus Technologies

Bluetooth 5 | 2.4GHz Proprietary | Bluetooth SIG Mesh | sigfox | M-Bus wireless | LoWPAN

Wearable, Healthcare, Smart Appliances

- ❑ Security
- ❑ Interoperability
- ❑ BT SIG Standard

Toys, Gaming and Remote Controllers

- ❑ Open Radio
- ❑ Low latency
- ❑ High Throughput

Sensor networks, Home Appliances and Industrial

- ❑ Mesh topology
- ❑ Large scale
- ❑ BT SIG Standard

Asset Tracking and Sensor-to-Cloud

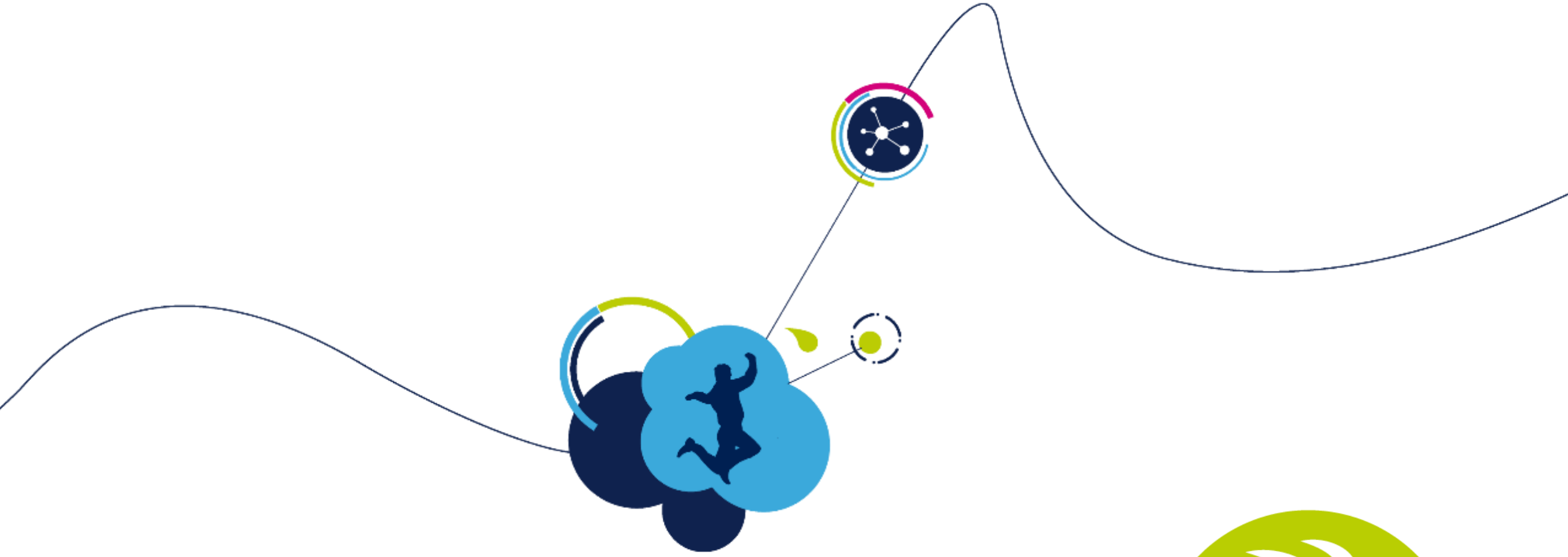
- ❑ Global and Reliable
- ❑ Geolocalization
- ❑ Connectionless

Remote Metering and Energy Management

- ❑ European standard
- ❑ Star topology
- ❑ Master/slave

Sensor networks, home and industrial automation

- ❑ Mesh topology
- ❑ Large scale
- ❑ Installation Flexibility - IPv6



SPIRIT

Sub-1GHz wireless connectivity

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SPIRIT Sub-1GHz markets

Smart Industry

Smart City

Smart Home

Smart Agriculture

Asset Tracking

Metering

Alarm System

Heat Cost Allocator

SPIRIT family: Performance, Flexibility, Scalability

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Sub-1GHz proprietary radio

For the Remote monitoring and control

SPIRIT1

150-174 MHz
300-348 MHz
387-470 MHz
779-956 MHz

- RX: **9.2mA** / TX: **19.5mA** @ +11dBm
- Sleep/Stby: **850nA** / **600nA**
- Max.Out: **+16dBm**
- Sensitivity: -120dBm
- Mod: 2(G)FSK, OOK
- QFN20 4x4

S2-LP / S2-LPCB

413-479 MHz **452-527 MHz**
826-958 MHz **904-1055 MHz**

sigfox

- RX: **7 mA** / TX: **10mA** @ +10dBm
- Sleep/Stby: **700nA** / **500nA**
- Max.Out: **+16dBm**
- Sensitivity: **-130dBm**
- Mod: 2(G)FSK, 4(G)FSK, OOK/ASK
- QFN24 4x4

Home and Building automation

Smart Metering

Alarm Systems

Industrial Monitoring and Control

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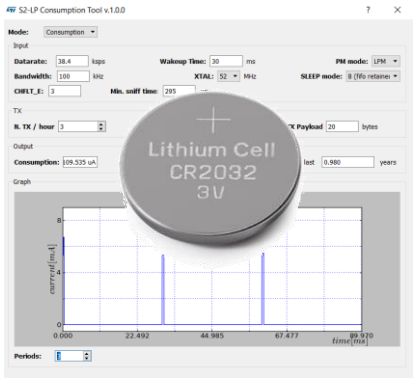
S2-LP enables battery operated systems

S2-LP increases the battery life-time !

S2-LP is the best solution for battery operated system thanks to the extremely low peak current consumption values, the ultra low power mode and the ability to transition quickly between power-saving and active modes

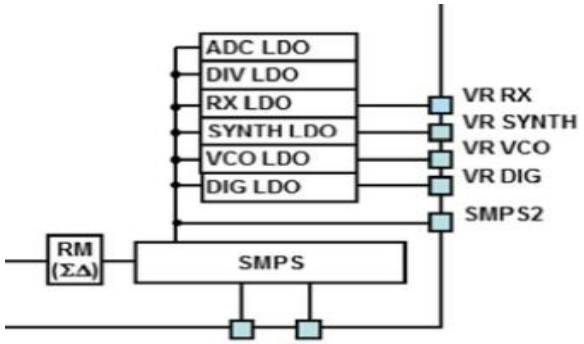


S2-LP Power Consumption Estimation tool included in STSW-S2LP-DK

S2-LP power management

SMPS HIGHLIGHTS

- High Efficiency design / one single external coil required
- Used for both internal LDO's and PA bias voltage
- By-passable (external LDO needed)



PROGRAMMABLE Vsmps: from 1,1 up to 1,8V (by 0,1V step)

BOOST MODE

- Vsmps = 1,8V
- +16dBm output power
- 30mA in TX / 10mA in RX
- Excellent selectivity

HIGH-PERF MODE

- Vsmps = 1,5V
- +14dBm output power
- 20mA in TX / 8,4mA in RX
- Excellent selectivity

LOW-POWER MODE

- Vsmps = 1,2V
- +10dBm output power
- 10mA in TX / 7mA in RX
- Good selectivity

One PCB with same BOM ➔ 3 modes possible!

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S2-LP Overview

RF Features Overview

- Frequency bands:
  - 413-479 MHz, 826-958 MHz (S2-LPQTR)
  - 452-527 MHz, 904-1055 MHz (S2-LPCBQTR)
- Modulation schemes: (**2G**) FSK, (**4G**) FSK, OOK and ASK
- Air data rate from **0.3** to 500 kbps
- Programmable output power: -30dBm to +16dBm
- RX sensitivity: **-124dBm** @ 1.2kbps / **-130dBm** @ 300bps
- **SigFox** modulation compliancy
- Built-in SMPS block for optimum current consumption

MAC Features

- Embedded packet handler, LDC/Sniff mode, CSMA/CA
- **Advanced** packet handler flexibility :
  - Bit granularity for preamble (up to 256Bytes) and sync (up to 64bytes)
  - **Configurable** pattern recognition down to bit granularity
  - Manchester encoding/decoding
- **IEEE 802.15.4g** MAC for Home Energy Management System

Protocol Support

- 6LowPAN, Wireless M-BUS, SIGFOX and 802.15.4g

Top-Notch Low-Power figures	
RX Power (peak)	**7** mA
Tx Power	**10** mA @ +10dBm, 20mA @ +14dBm
Sleep/Shutdown	**700** nA /2.5nA

S2-LPTX

S2-LP based Radio Transmitter

S2-LPTX

- **Pin to Pin compatible** with S2-LP
- QFN24 4x4x1

Radio performance

- Frequency bandwidth
  - 413-479 MHz
  - 826-958 MHz
- 300bps to 500kbps
- **+16dBm** output power

Ultra low-power consumption

- Sleep / Shutdown: 700nA / 2.5nA
- Tx peak current: **10mA @ +10dBm**

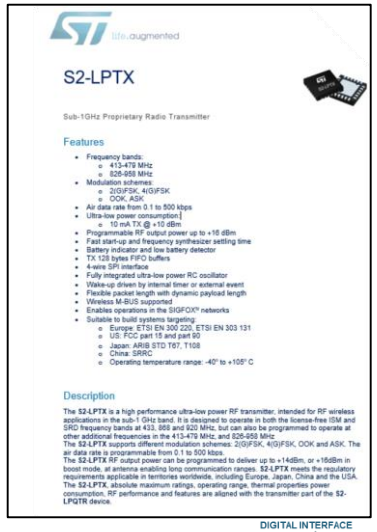
Applications

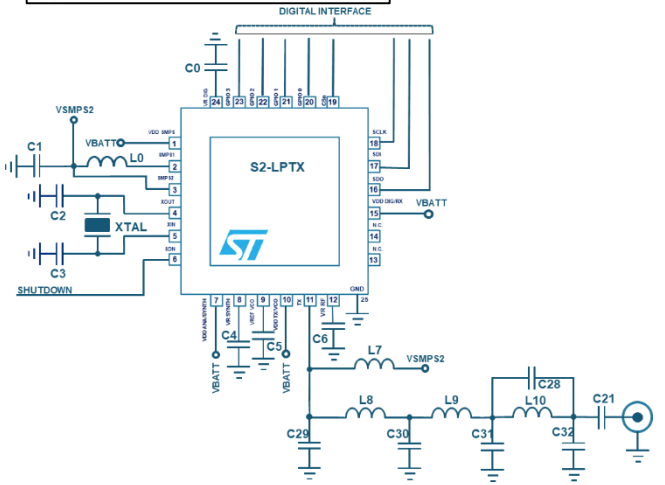
- Asset Tracking
- Alarm System
- Home and Building Automation
- Remote key entry
- Wireless Sensor Networks

NEW !

ES: available

MP: Q4'19





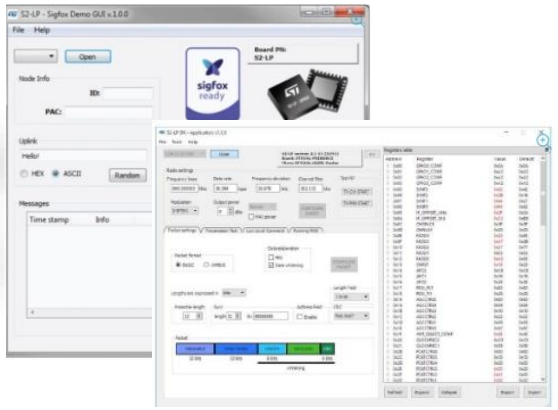
S2-LP Evaluation Kit

STEVAL-FKI868V2 / STEVAL-FKI433V2 / STEVAL-FKI512V1 / STEVAL-FKI915V1

Sub-1GHz RF kits
Wireless M-BUS, Sigfox, 6LowPAN, LPWAN

ST IoT development kit (STEVAL-FKI868V2, STEVAL-FKI433V2, STEVAL-FKI512V1, STEVAL-FKI915V1) based on the ultra-low-power sub-1GHz S2-LP radio IC are available. The 868MHz and 915MHz kits coms with a **full-featured SDK** and supports SIGFOX connectivity out-of-the-box. The bundle includes an STM32 Nucleo board to start prototyping Sensor-To-Cloud solutions with no need for a local gateway or access point.

Development Kit for Out-of-the-box Sensor-to-Cloud Connectivity



Available SIGFOX software libraries for STM32 Cortex M0, M0+, M3 and M4

SOFTWARE PACKAGES:

- STSW-S2LP-DK
- STSW-S2LP-SFX-DK

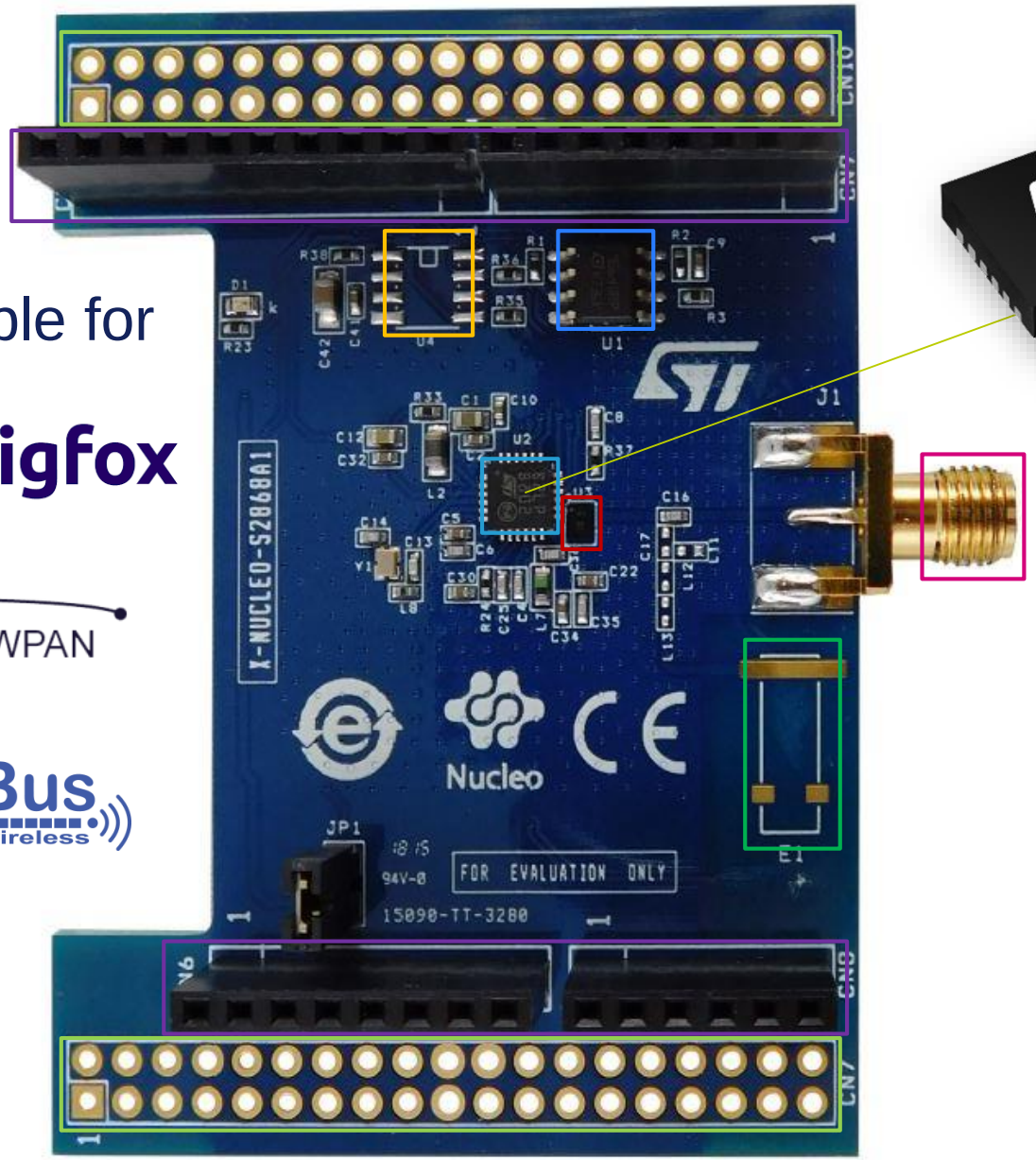
S2-LP X-NUCLEO-S2xxxA1

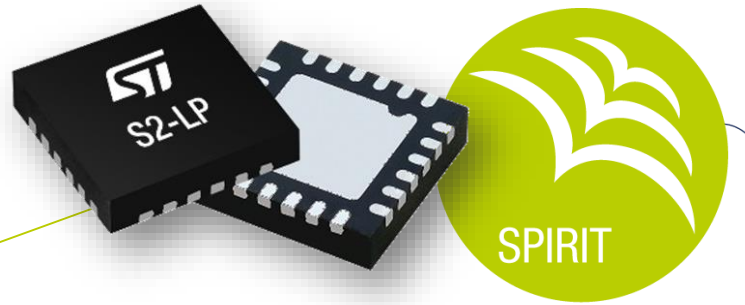
Suitable for

sigfox

LoWPAN

M-Bus wireless





X-NUCLEO HARDWARE:

- X-NUCLEO-S2868A1 (868 MHz) - now
- X-NUCLEO-S2915A1 (915 MHz) – Q4'19
  Sigfox's Monarch in HW

SOFTWARE PACKAGES:

- X-CUBE-SUBG1
- X-CUBE-SFXS2LP1
- FP-ATR-SIGFOX1

STM32 Open Development Environment

S2-LPQTR	M95640	ST Morpho connector (opt)
BALF-SPI2-01D3	STSAFE-A100 (opt)	Arduino UNO R3 connector
SMA antenna	SMD antenna (opt)	

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S2-LP for Sigfox networking

Industrial Asset Tracking in 3 simple steps

1

The Sigfox Tracker locate the ‘asset’

Find Coordinates by GPS or Sigfox Geolocation

2

The coordinates are sent to Sigfox Basestations

sigfox

(Longitude; Latitude) of the GPS, or Sigfox Geolocation

3

…and send it directly to your IT system interface

‘Asset’ #737 is located in the corridor 7, middle side

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S2-LP for Sigfox networking

Sensors cut-the-wire

Sensors

Air Interface

1 Sigfox Message
=
12 Bytes (UL)
8 bytes (DL)

Global LPWAN Network

Cloud

aws

…unleashing the Sensor-to-Cloud connectivity

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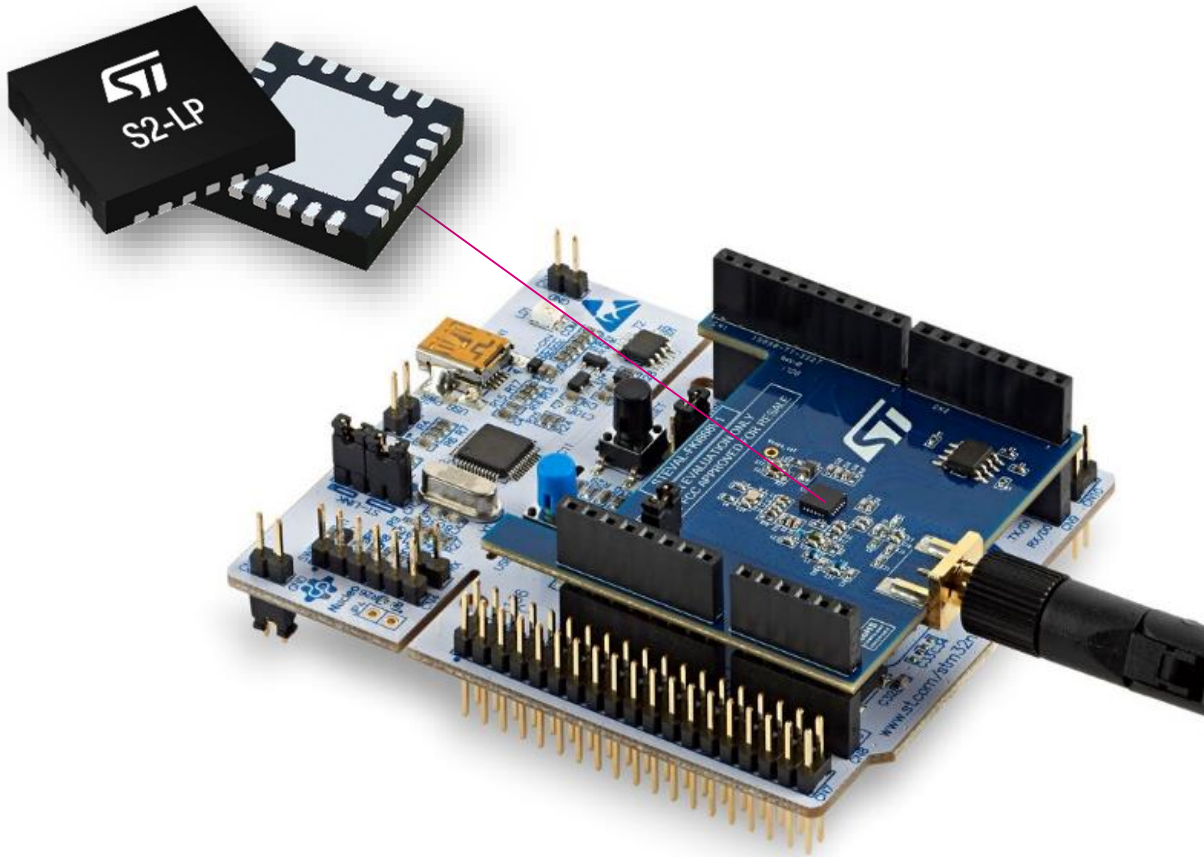
S2-LP for Sigfox Asset Tracking

Pre-integrated solution for low power device location, tracking and recovery

Development environment combining hardware & software

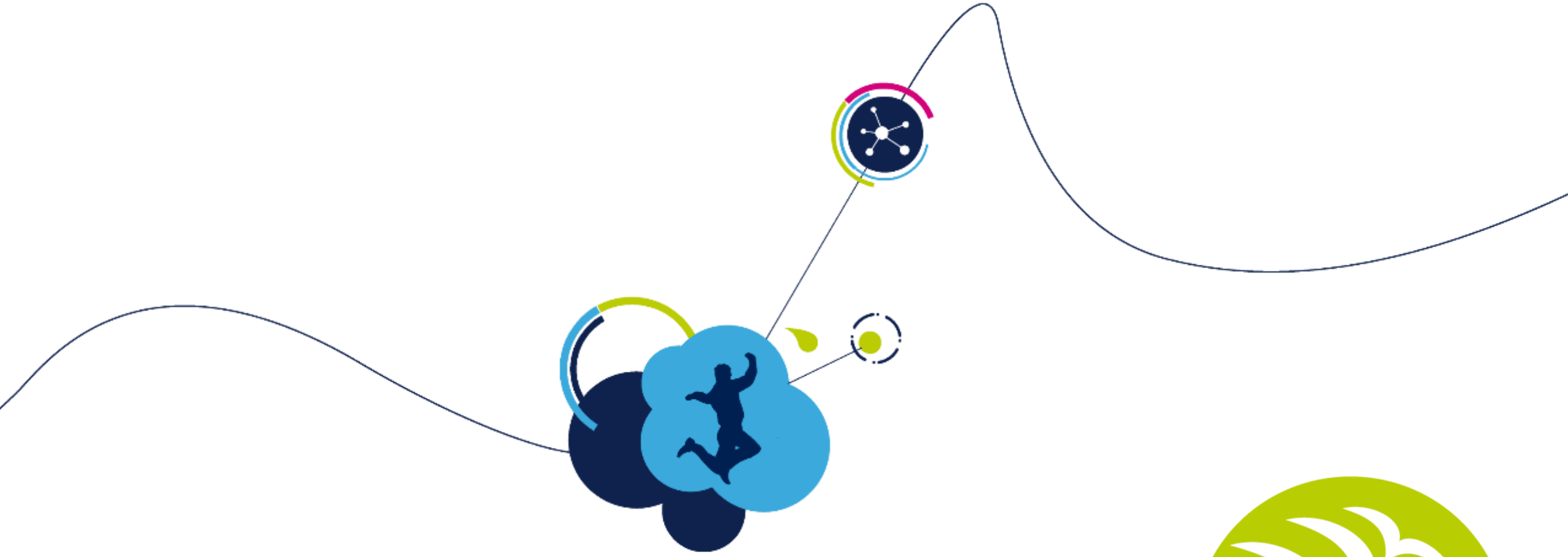
Sigfox gateway coverage
Sigfox cloud services
Sigfox geo-location



FP-ATR-SIGFOX1

HARDWARE KIT (FUNCTION-PACK):

- Low Power Nucleo Board (NUCLEO-L0/L4)
- Connectivity (X-NUCLEO-S2868/915A1, X-NUCLEO-IDB05A1)
- Sensing (X-NUCLEO-IKS01A2/3)



SPIRIT based module portfolio

Wireless connectivity made easy

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SPIRIT Modules Portfolio

Based on SPIRIT1

SPSGRF-868
SPSGRF-915

Antenna option

- Two carrier frequency versions: 868 MHz and 915 MHz
- Including high efficient chip antenna, filter and balun **BALF-SPI-01D3**
- CE/RED qualified [-868], FCC and IC modular approval certified [-915]

SPSGRFC-433
SPSGRFC-868
SPSGRFC-915

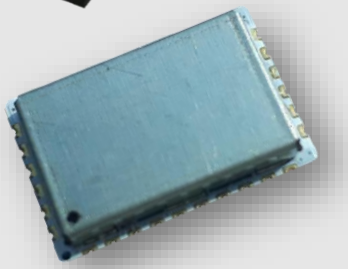
Connector option

- Three carrier frequency versions: 433 MHz, 868 MHz and 915 MHz
- Including U.Fl. connector, filter and balun **BALF-SPI-01D3** [-868 & -915] or **BALF-SPI-02D3** [-433]
- CE/RED qualified [-433 & -868], FCC and IC modular approval certified [-915]

- Up tp **+11.6 dBm** output power
- **-118 dBm** Rx sensitivity
- 4-wires **SPI interface** to external host
- Shutdown line
- 4 programmable GPIOs
- Included AES-128 security co-processor
- Modulation schemes: 2-FSK, GFSK, MSK, GMSK, OOK and ASK
- Packet format: **Basic, MBUS and STack**
- Forward Error Correction (FEC with interleaving)
- Low Duty Cycle (LDC) mode with automatic acknowledgement
- Embedded CSMA/CA protocol, based on listen-before-talk
- Automatic CRC handling
- Whitening and de-whitening of data
- **Small** form factor: 13.5 x 11.5 x 2 mm
- **Industrial** temperature range: -40 °C to +85 °C
- Power supply voltage from **1.8V to 3.6V**

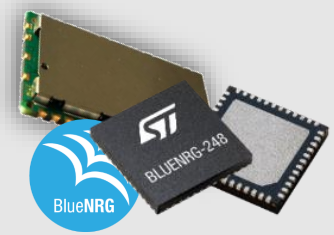
S2-LP 3rd party modules

MIDATRONICS



Tracky **MDX-SFX-01**

ATiM



ARM-NWW-Sigfox

XOVER IoT

SIGFOX-MOD1-C / E

S-T-E-A-M
INDUSTRIAL AND EMBEDDED SOLUTIONS

SIGFOX-MOD1-C

Radio controlli
Wireless Modules

RC-S2LP-868 / 915 / 434
RC-S2LP-868 / 915-HA

WEPTECH elektronik GmbH

Phoenix

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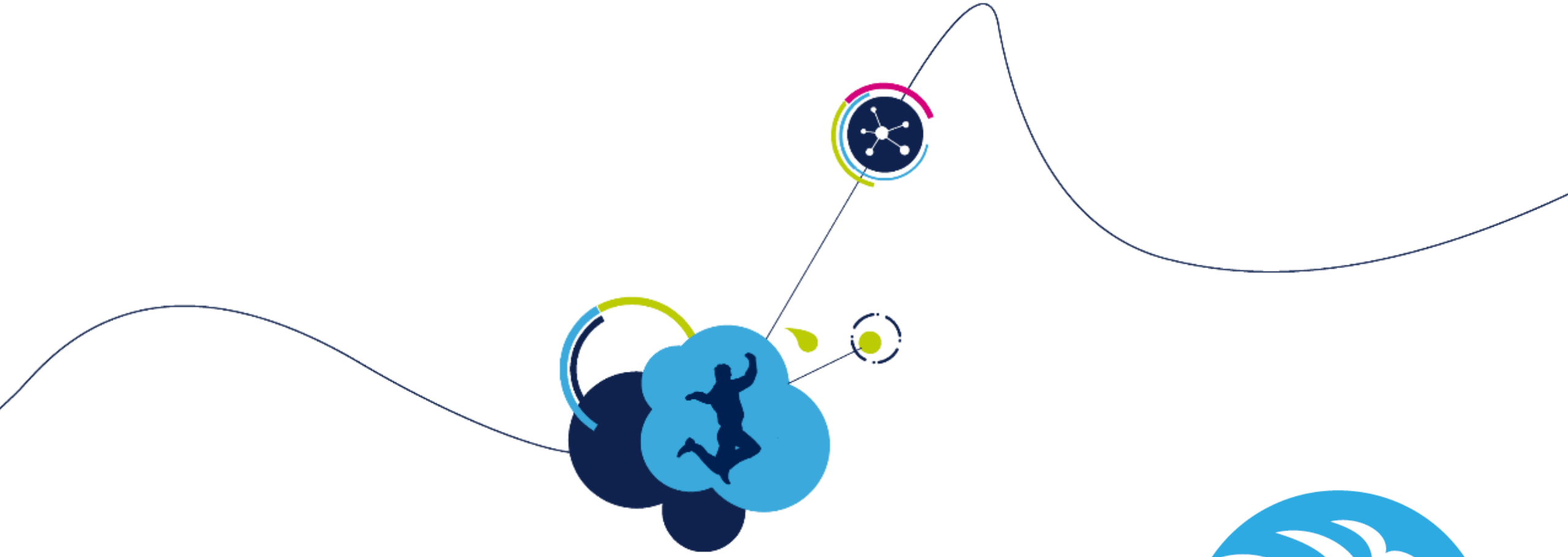
M-Bus wireless

sigfox

LoWPAN



BLUENRG

Bluetooth LE wireless connectivity

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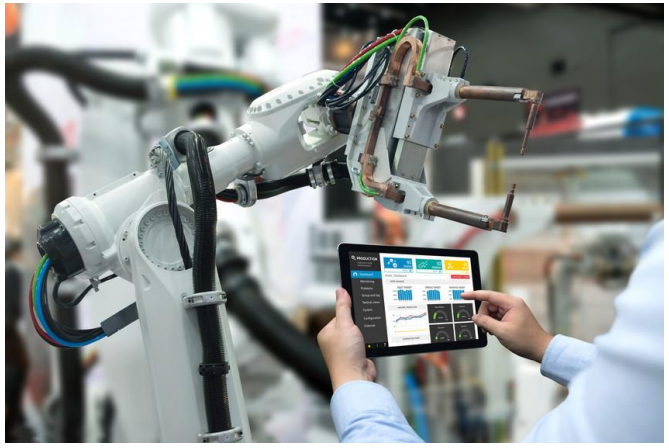
BlueNRG SoC simplifies IoT

Low-Power Bluetooth Low Energy Radio Processor
(ARM Cortex-M0+ programmable core with up to 256KB eFLASH)



- Simplified HMI
- Easy customization
- Remote reading
- Service and maintenance
- Firmware upgrade
- Added-value services

QFN48
6 x 6 mm

QFN32
5 x 5 mm

WLCSP34
2.66 x 2.56 mm

Scalable packages

Bluetooth® 5 certified

The lowest power consumption	Processing power on demand	Flexible memory architecture	Maximum security
>3 years lifetime on CR2032(*) 25 µA/MHz 0.9 µA sleep	Low-power architecture, Cortex-M0 @ 32 MHz	256 KB eFLASH 24 KB ULL SRAM (with full SRAM data retention)	ECC-256 AES-128 Factory UID Secure KEY

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BlueNRG-2 Wireless SoC

Bluetooth LE programmable processor

Bluetooth LE
5.0
ULP radio

RF
PHY
+8
dBm

BLE 5.0

ARM
Cortex M0
32 MHz

Flash
256 KB

SRAM
24 KB

PROGRAMMABLE
MCU
with eFLASH
to host application code

Advanced High-Performance Bus (AHB)

DMA

PROGRAMMABLE
PERIPHERALS

PDM
Interface

Decimation
filter

I2C

RTC
(timers)

GPIO
x 26

ADC 10 bit
4 channels

UART

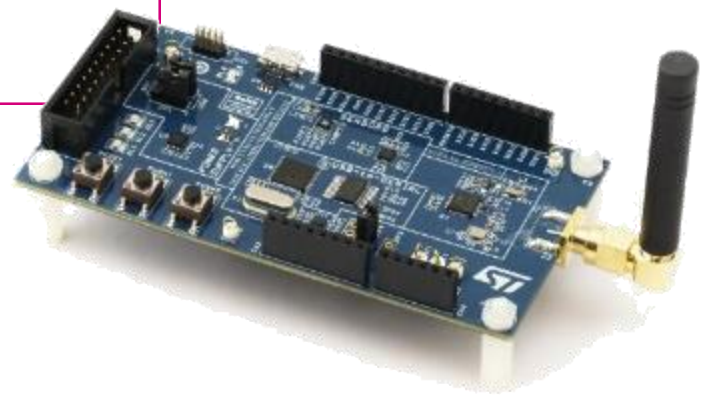
SPI

DC/DC
LDO

PROGRAMMABLE
Digital I/O

IAR SYSTEMS

KEIL™ Tools by ARM



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BlueNRG-2 Wireless Processor

Technology highlights

RELIABLE CONNECTION	The higher **maximum output power (+8dBm)** will enable to cover greater distance and to communicate in the most effective way
LONGER BATTERY LIFE	Optimized power consumption thanks to the **ultra-low-leakage memories** and **sophisticated power-management architecture (< 1µA in sleep mode**)
LOWEST POWER CONSUMPTION	**Fast switching between sleep and active modes** enabling ultimate power saving in low duty-cycle scenarios(16uA @ 1.28s advertisement interval)
OPTIMIZED CODE SIZE	Unused parts of the BLE stack are automatically removed by the linker, leading to an **optimized code footprint** for the specific application
ST OWNERSHIP of BLE stack	**Highly optimized, upgradable and robust-proven BLE stack** developed and maintained by ST expertise team
SCALABLE PACKAGES	**BlueNRG-2** portfolio is available in **QFN32** (BlueNRG-232), **QFN48** (BlueNRG-248) and **WLCSP34** (BlueNRG-234)

BlueNRG-2 overview

SoC featured IPs

ARM Cortex-M0	○ 25 µA/MHz up to 32 MHz core speed ○ Ultra-low leakage retention state ○ SWD debug port
Ultra-low-power BLE radio	○ Bluetooth Low Energy 5.0 radio ○ TX 8.3mA @ 0dBm / RX 7.7mA ○ Ultra-low-power sleep @ 0.9µA
256kB Flash	○ Provide storage for BLE 5.0 certified and upgradable stack ○ About 150KB available for application code (full featured BLE stack)
24kB RAM Ultra Low Leakage	○ One 12kB block always in retention ○ One 12kB block switchable
10 bit ADC	○ Single Ended or Differential mode ○ Continuous or single acquisition ○ Support for PDM stream decimation
I/O Peripherals	○ SPI: Master and Slave support ○ I2C: Up to 400 kb/s ○ UART and PDM for Digital MEMS Mic
GPIO	○ Up to 26 GPIOs (QFN48 package) ○ Fast wake up function from GPIO
Crypto Engine	○ Hardware AES-128 and RNG ○ Public Key Accelerator for computation of ECC cryptographic public key primitives
TIMERS	○ MFTX: Two multi function timers ○ Programmable PWM output ○ Sleep timers and Watch Dog
DMA	○ Up to 8 configurable channels ○ Programmable IRQ priorities

BlueNRG interoperability test

Legacy and future proof mobile interoperability

Uncompromised user experience

18

Worldwide Top Brands

223

Most popular mobile devices

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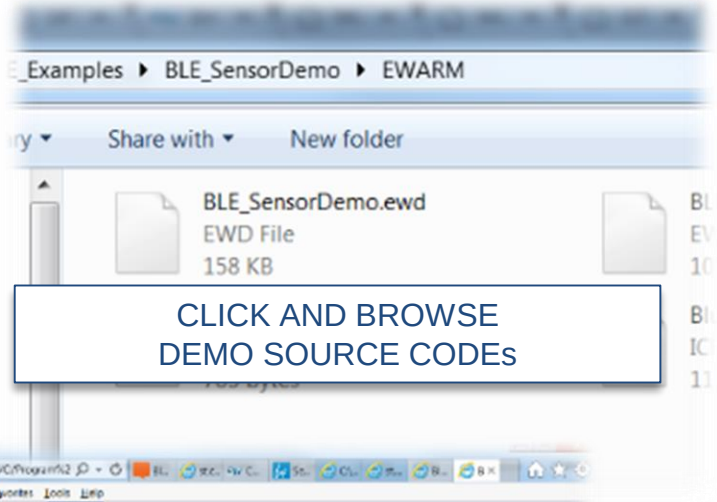
BlueNRG Navigator

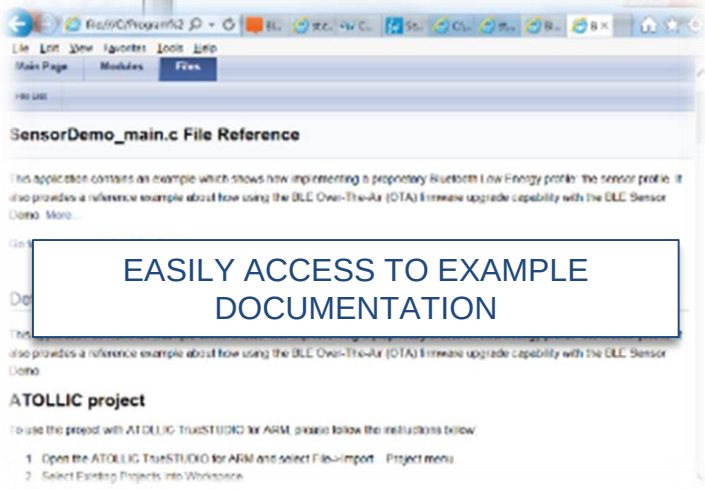
Bluetooth LE out-of-the-box

BlueNRG Navigator

It is a graphical user interface (GUI) that provides simple and user friendly interface to browse, flash, and run application examples included in the SDK package. It also allows to explore STEVAL KIT in each and all of its features.



CLICK AND BROWSE
DEMO SOURCE CODEs



EASILY ACCESS TO EXAMPLE
DOCUMENTATION

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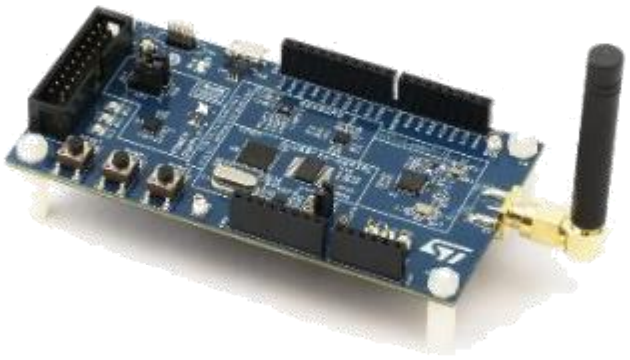
BlueNRG: 2.4GHz proprietary radio

2.4GHz Wireless SoC solution

Ultra-low latency RF link (~ 100µs) for HID and gaming solutions

HIGHLIGHTS

- Built-in acknowledge mechanism
- Proprietary implementation possible
- Improved data rate (~600 Kbps)
- Small memory footprint (~5 Kbyte)
- Encryption feature supported



1 Byte	4 Bytes	1 Byte	1 Byte	0 to 31 Bytes	3 Byte
Preamble	NetworkID	Header	Length	Data	CRC

Same BlueNRG device can be used for both Bluetooth LE and 2.4GHz proprietary communication

Out-of-the-box examples available with the BlueNRG Navigator package

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BlueNRG-2 and MEMS Sensors

Ready-to-go software libraries for Voice and Motion

- RELIABLE CONNECTION
- LONGER BATTERY LIFE
- LOWEST POWER CONSUMPTION
- OPTIMIZED CODE SIZE
- BLE 5.0 COMPLIANT STACK
- SCALABLE PACKAGES

VOICE CAPTURE

Voice over BLE

High quality voice capturing and compression (ADPCM)
More codec supported through external host (Speex, Opus, …)

MOTION CAPTURE

Motion Algorithms

Lightweight 6 or 9 axis sensor fusion (up to 50Hz ODR) and gesture recognition algorithms

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BlueNRG-MESH

Brings smart-home to your fingertip

Easily connecting appliances to iOS/Android, out-of-the-box

- Bluetooth **Mesh 1.0 certified Profile Library** and **Bluetooth LE stack**
- **Two-layer security** (128-bit AES-CCM and 256-bit ECDH protocol)
- **Low-power** and **Friendship** supported
- Provisioned node **database transfer** among smartphones via Email and Cloud application
- **Embedded** and **Mobile SDK** to build both your Android and iOS Apps
- Reduces development costs and accelerates time-to-market

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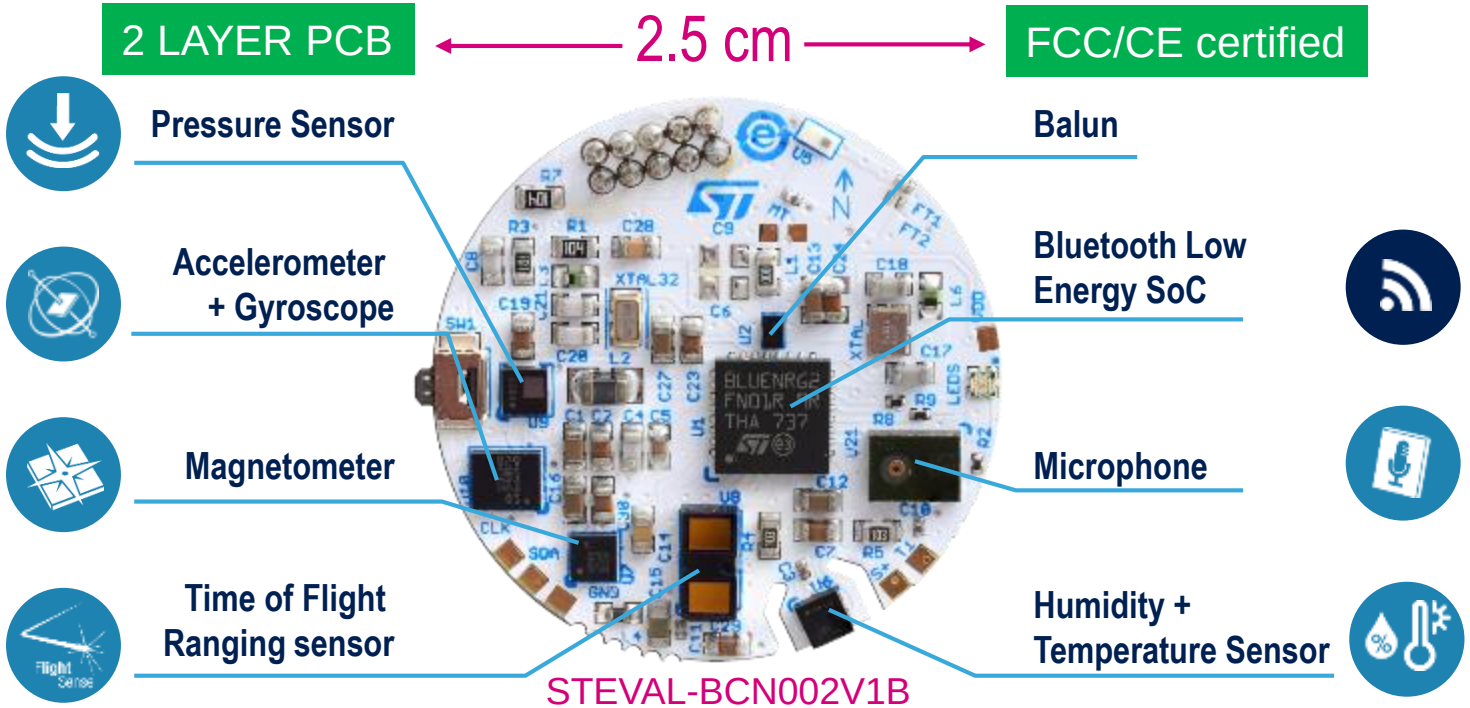
STEVAL-BCN002V1B - BlueNRG-Tile

Sensing, processing and streaming



Ultra-low-power software libraries for

- **Motion Algorithms**: Gesture and Activity recognition
- **Voice over BLE**: High quality voice capturing and compression
- **BLE Mesh**: Range-extending networks with duplex communication

Ready-to-use Software Development Kits

STSW-BLUETILE-DK: **Motion Algorithms** and **Voice over BLE**

- Gesture and Activity recognition
- High quality voice capturing and compression

STSW-BNRG-MESH v1.08.000 **: Mesh over BLE**

- Range-extending networks with duplex communication

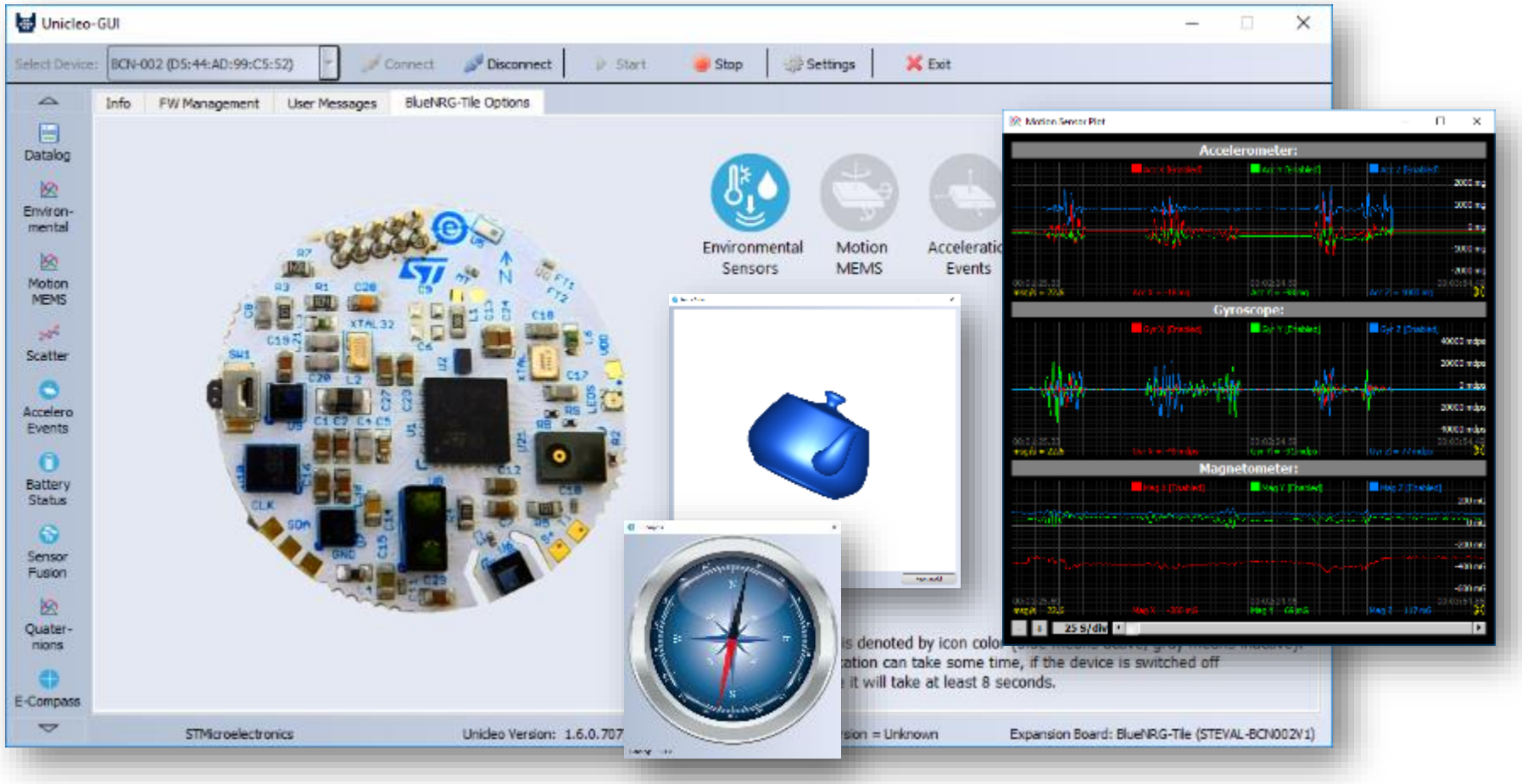
Unicleo-GUI for BlueNRG-Tile

Easy configuration of MEMS Sensors and Algorithms

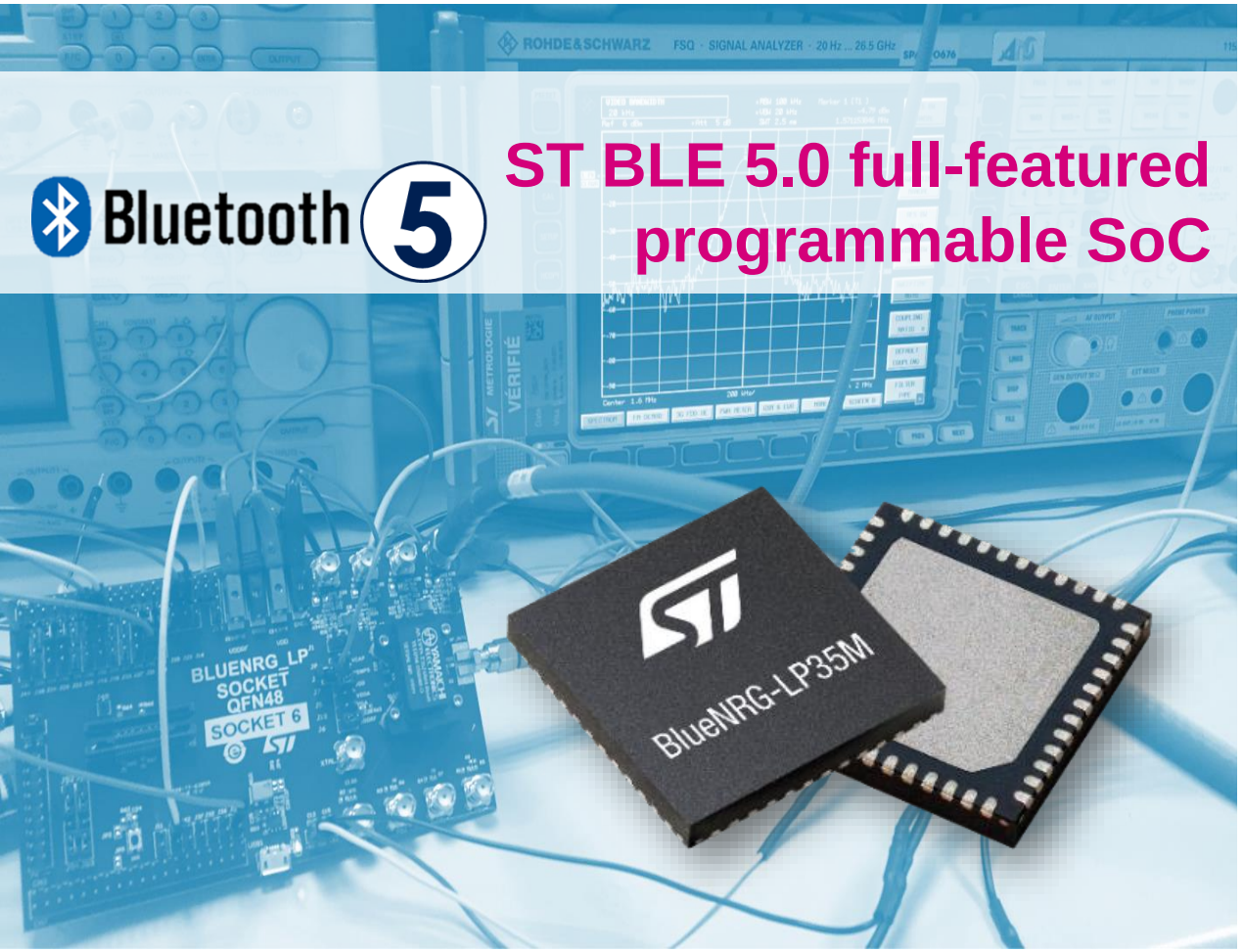
Seamless BlueNRG-Tile integration now available!

Available features:

- Environmental data
  Temperature,
  Humidity,
  Pressure
- Motion Data
  Acceleration,
  Angular velocity,
  Magnetic field
- Acceleration events
- Compass outputs
- Sensor Fusion library outputs
- Battery status
- Data logging to CSV, TSV file



BlueNRG-LP is coming…



- **High speed 2 Mbps** for faster data transfer
- **Long Range** (125/500kbps) connectivity
- **Advertisement Extension** and Dataset
- **Improved channel selection** and mapping

LONGEVITY 10 YEARS COMMITMENT

Go faster, go further!

SAMPLING Q1 2020
MP e/o Q2 2020

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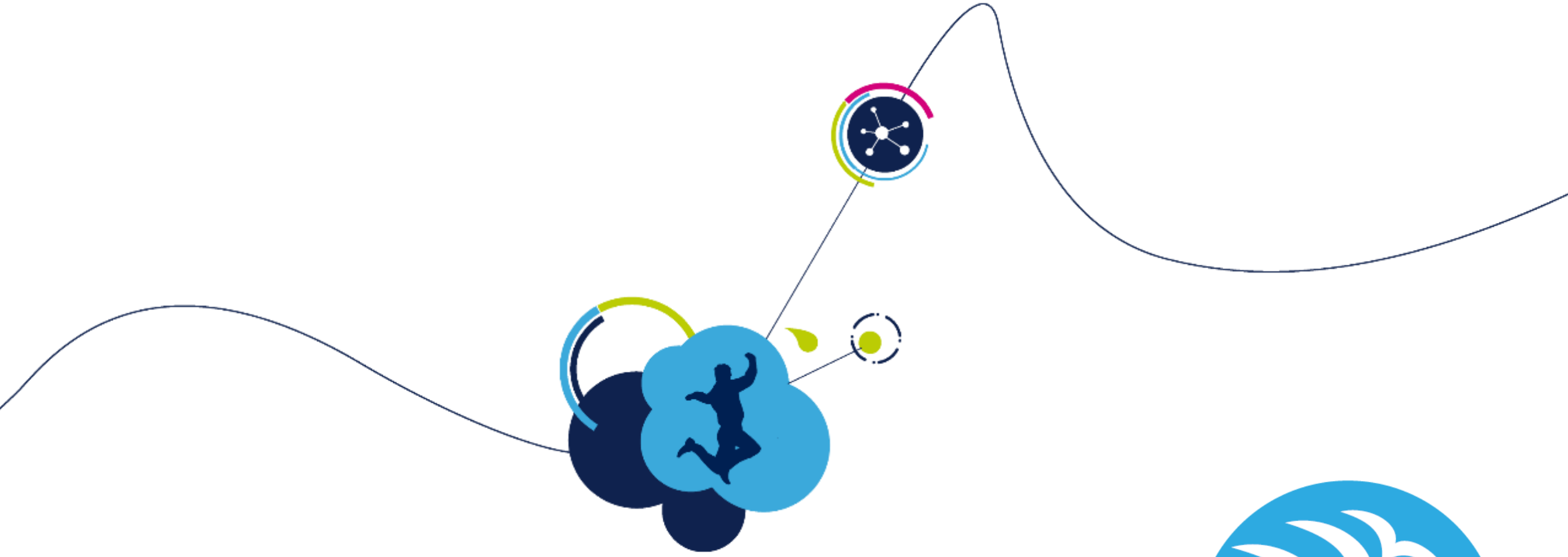

Bluetooth LE module portfolio

Wireless connectivity made easy

BlueNRG

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BlueNRG Modules Product Family

LONGEVITY 10 YEARS COMMITMENT

SPI to BLE Module

BlueNRG-M0

BT4.2 Certification
Basic features

- BlueNRG-M0A
- BlueNRG-M0L

Wireless SoC Module

BlueNRG-M2

BT5.0 Certification
LE Privacy 1.2
LE Secure Connection
LE Data Len ext

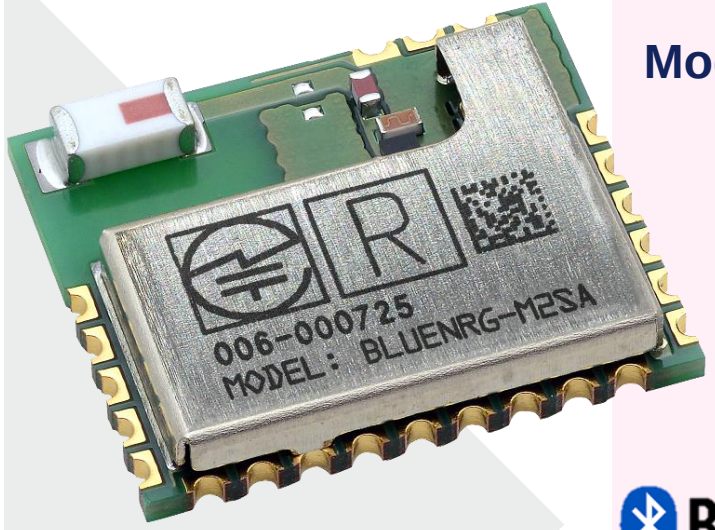
MEMORY: 256KB/24KB

- BlueNRG-M2SA
- BlueNRG-M2SP

Features / Antenna

- Full / SMD
- Light / SMD
- Light / PCB

Value



BlueNRG Module Family
Suitable for

2.4GHz Proprietary

Bluetooth 5

Bluetooth SIG Mesh

BlueNRG Modules Evolution

LEGACY PORTFOLIO	UPCOMING PORTFOLIO	HIGHLIGHTS
	5.0 **BlueNRG-M2SP**	▪ PCB Antenna ▪ LDO Regulator
4.2 SPBTLE-1S	5.0 **BlueNRG-M2SA**	▪ SMD Antenna ▪ SMPS Regulator ▪ 32KHz LSE Clock
4.1 SPBTLE-RF	4.2 **BlueNRG-M0A**	▪ SMD Antenna ▪ SMPS Regulator ▪ 32KHz LSE Clock
4.1 SPBTLE-RF0	4.2 **BlueNRG-M0L**	▪ SDM Antenna ▪ LDO Regulator

COMPATIBILITY: same package 13.5 x 11.5 x 2 mm same temperature range -40°C / +85°C same operating voltage 1.7V / 3.6V

BLE radio only

Programmable BLE SoC

P/N	Ramp-up
BlueNRG-M0A, BlueNRG-M0L	August 2019
BlueNRG-M2SA, BlueNRG-M2SP	November 2019

BlueNRG Modules Portfolio

Suitable for Motion Algorithms, Audio, and Mesh over BLE

BLE Radio

based on

BlueNRG-MS

BlueNRG-M0L
BlueNRG-M0A

Ramp-up Now

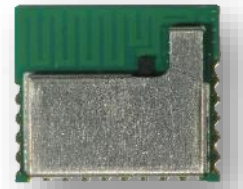
- Including high efficient chip antenna, filter and balun **BALF-NRG-01D3**
- BLE4.2 certification
- Up to **+6 dBm** output power
- 5-wires **SPI interface** to external host

BLE SoC

based on

BlueNRG-2

BlueNRG-M2SA
BlueNRG-M2SP



Ramp-up Nov'19

- Including high efficient chip antenna [-M2SA] or PCB antenna [-M2SP], filter and balun **BALF-NRG-02D3**
- BLE5.0 certification
- Up to **+5 dBm** [-M2SA] or **+7 dBm** [-M2SP] output power
- Extensive **peripheral set**

- **Bluetooth SIG End Product certification**
- CE/RED qualified, FCC/IC/TELEC modular approval certified
- **-85 dBm** Rx sensitivity
- **Small** form factor: 13.5 x 11.5 x 2 mm
- **Industrial** temperature range: -40 °C to +85 °C
- Power supply voltage from **1.7V to 3.6V**

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BlueNRG Modules product family

	SPBTLE-RF0TR	SPBTLE-RFTR	BLUENRG-M0L	BLUENRG-M0A	SPBTLE-1S	BLUENRG-M2SA	BLUENRG-M2SP
BlueNRG device	BlueNRG-MS				BlueNRG-1	BlueNRG-2	
Balun	Companion BALF-NRG-01D3					Companion BALF-NRG-02D3	
Bluetooth certification / SIG **End Product** certification	BLE4.1 / D028766 – QDID 71984		BLE4.2 / D043964 – QDID 122868		BLE4.2 / D034470 – QDID 92838	BLE5.0 (*) / D043965 – QDID 121363	
Core	Companion MCU				Cortex-M0 up to 32MHz		
Memory [KB]	-				**160KB Flash** 24KB Ram	**256KB Flash** 24KB Ram	
Antenna	SMD (N.M. U.Fl connector option by 0Ohm)		-		SMD (pin option by 0Ohm)	-	PCB
Sensitivity [dBm]	-86		-85		-84	-85	
Max Power level [dBm]	+4		+6		+4	+5	+7
LSE clock	N/A	Included	N/A	Included			N/A
Voltage regulator	LDO	SMPS	LDO	SMPS			LDO
Modular approval	RED, FCC, IC	RED, FCC, IC, TELEC			RED, FCC, IC SRRC	RED, FCC, IC, TELEC	
Form factor	Castellation Holes						
Size [mm]	13.5 x 11.5 x 2						
Family Pin2Pin compatibility	SPBTLE-RFTR (full)	SPBTLE-RF0TR (full)	SPBTLE-RFx (full)		SPBTLE-RFx (partial)	SPBTLE-1S (full)	SPBTLE-1S (partial)
Status	Active		Sampling		Active	Sampling	

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(*) Supported features:

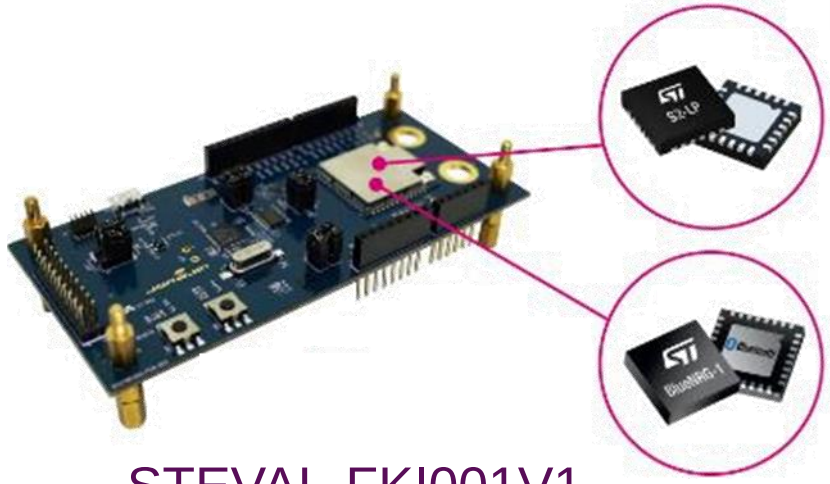
- Enhanced security with LE Secure Connections
- Power-efficient privacy with LL Privacy 1.2
- Up to 2.6x higher throughput with LE Data Length Extension

Dual-radio SDK: BLE + SIGFOX

sigfox

STSW-BNRG-S2LP

Dual-Radio SDK
based on BlueNRG-1 and S2-LP



STEVAL-FKI001V1

Software Development Kit

- STSW-S2LP-SFX-DK
- STSW-BNRG-S2LP-DK

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Combo-radio IoT Node

Dual-radio turnkey programmable solution

Dual-radio Bluetooth LE + LPWAN enables both local and remote monitoring and control

SMARTPHONE

- User Interface
- Configurability
- Local monitoring
- Diagnostic
- Firmware upgrade

Bluetooth™ sigfox

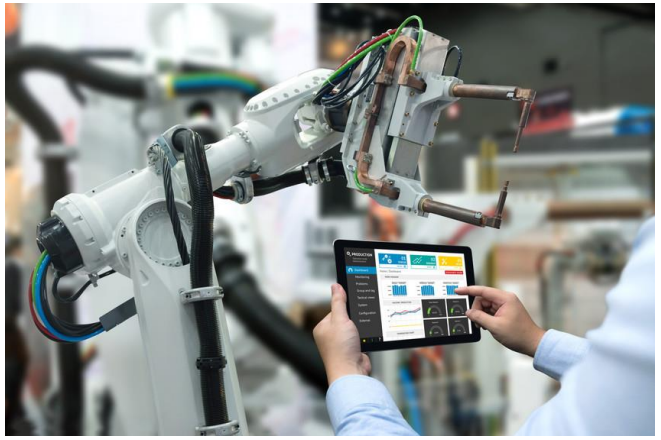
BlueNRG

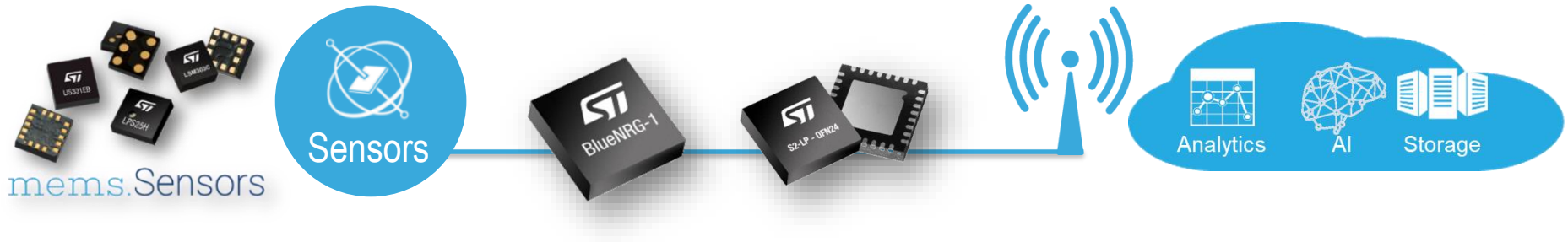
IoT Node
BLE/LPWAN
Dual-Radio

SPIRIT

CLOUD

- Remote monitoring
- Tracking and Positioning
- Notifications of events
- Data aggregation
- Diagnostic and assistance





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BlueNRG SPIRIT