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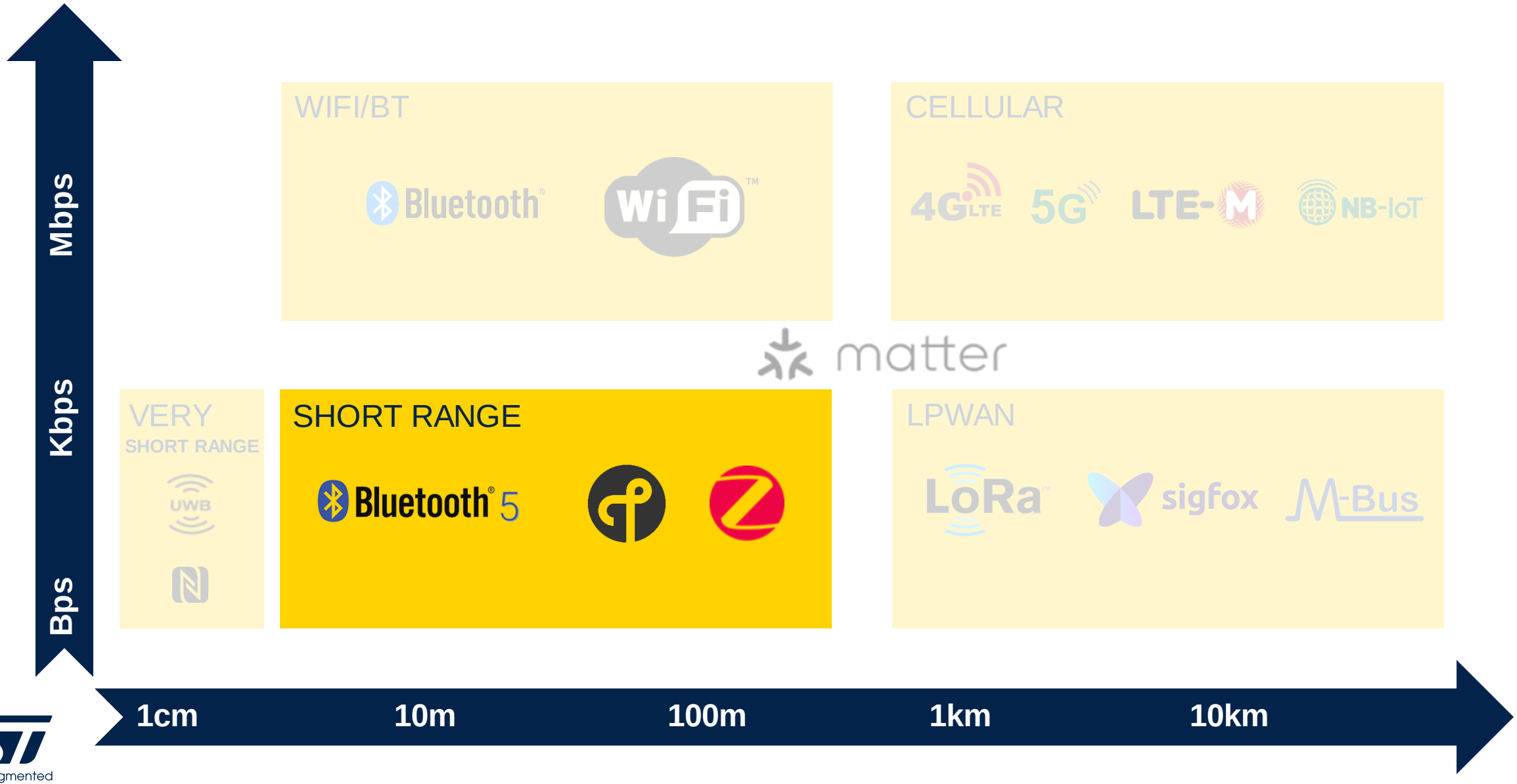
STM32WBA wireless MCU series

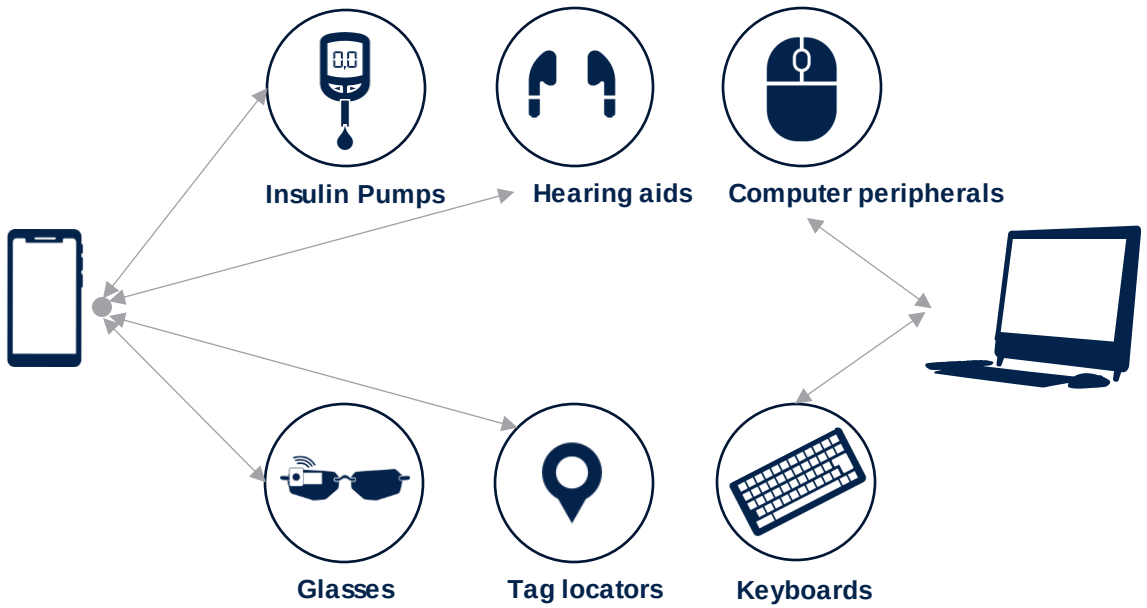
Low-power, secure Bluetooth® Low Energy 5.4 communications

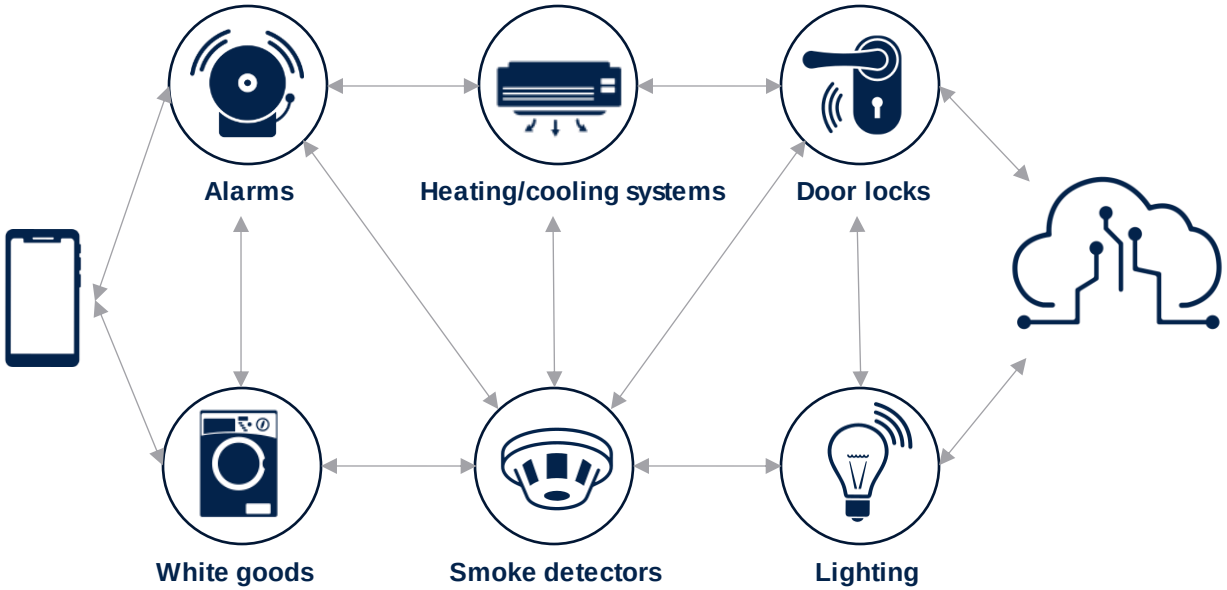
STM32

Communication technologies



Bluetooth® technology is all around us





P2Point or P2Multi-Comm. devices

Connected to smartphones, laptops…
Mostly battery powered

Bluetooth®

Proprietary protocols

Mesh communication devices

Home automation, Industry 4.0, consumer power supply and/or battery powered

Bluetooth®

Mesh

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Bluetooth® Low Energy
High performance and scalable integration

Home control

- Long distance capability
- Data privacy
- Cost optimized

Medical

- Anti-cloning
- Brand protection
- High interoperability

Door locks

- Fingerprint accessible with high processing capability
- Market-proven security grade

The STM32 portfolio

Five product categories

Wireless MCU

Short- and long-range connectivity

Ultra-low-power MCU

Mainstream MCU

High-performance MCU

32-bit general-purpose microcontrollers: from 75 to 3,224 CoreMark score

Embedded MPU

32- and 64-bit microprocessors





Enabling edge AI solutions

Scalable security

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MPU portfolio

MCU portfolio

STM32 MCU 2.4 GHz portfolio

STM32WB series

- **Dual core** & security (Arm® Cortex® -M4 / -M0+)
- Up to **1 Mbyte** of flash memory / **256 Kbytes** of RAM

MCUs: STM32WB55, STM32WB35, STM32WB15, STM32WB50, STM32WB30, STM32WB10

Modules: STM32WB5M, STM32WB1M

5.4 & Mesh

matter

STM32WBA series

STM32WBA52

5.4

- Arm® Cortex® -M33 / **TrustZone®** 100 MHz
- **1 Mbyte of** flash memory / **128 Kbytes** of RAM
- Up to **+10 dBm** output power

BlueNRG series

- Arm® Cortex® -M0/M0+
- Up to **256 Kbytes** of flash memory / **64 Kbytes** of RAM

System on Chips: BlueNRG-1, BlueNRG-2/2N, BlueNRG-LP, BlueNRG-LPS

5.2 to 5.4 & Mesh

Module: BlueNRG-M2SP/SA

EVOLUTION

STM32WB0 series

STM32WB09

5.3

- Arm® Cortex® -M0+ at 64 MHz
- **512 Kbytes** of flash memory / **64K bytes** of RAM
- Bluetooth® Low Energy 5.3 (long range, 2 Mbps, Adverting ext, **AoA/AoD, Isochronous channel**)
- Up to **+8 dBm** of output power

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The building blocks to reach final application

Applications

Fitness

Medical

Lighting

Home automation

Wireless connectivity

Bluetooth 5.4 Point2Point

Bluetooth 5.0 Multipoint

Bluetooth 5.4

Security

Anti cloning

App Radio

Isolation
Trusted environment

Anti roll back SW
Secure bootloader
Data corruption check

Hardware, software & tools

STM32 CubeMX

STM32 CubeProgrammer

STM32 CubeIDE

STM32 CubeMonitor-RF

Best in-class solution

NUCLEO-WBA52CG

Mobile applications

ST BLE Toolbox

ST BLE StarNet

An ultralow power Bluetooth® Low Energy 5.4 platform

Bluetooth Low Energy 5.4

Built using **40nm process technology**

Integrated 2.4GHz radio

Bluetooth® Low Energy 5.4 (long range, 2Msps, advertising extension)
+10 dBm output power

High performance

- Arm® Cortex®-M33 at 100MHz
- 407 CoreMark score
- 100 K cycles for 256 Kbytes of Flash

Enhanced security

- TrustZone® technology, **target SESIP Level 3**

Leveraging STM32U5 ultra-low-power platform

- Low-power direct memory access (LP-DMA)
- Flexible power-saving states with fast wake-up times
- Same digital and analog peripherals

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A versatile product

STM32**WBA**

Lighting

- Robust RF link **106dBm** with **Bluetooth® Low Energy**
- and
- **+10 dBm** output power
- **Update securely** radio and stack firmware with SBSFU
- Bluetooth 5.4 **multi-connections** to extend network range

Fleet maintenance

- Retrofit legacy product to **Bluetooth® Low Energy 5.4**
- Remotely upgrade device with **OTA capability**
- **Brand protection** with authenticated **FW upgrade** system
- **IoT protection ready**

Industrial devices

- Down to **2.4µA mode with RTC** and 64KB of RAM
- **Security:** AES, PKA side attack resistant
- **Security:** RTC active tampers enabled
- **Robustness:** 100KB cycle flash memory cycle capable

Fitness/ healthcare

- **Multipoint** Bluetooth® Low Energy connections, up to 20 links
- Battery lifetime care with **< 140 nA** standby mode
- Dynamic efficient **45µA/MHz**
- Battery care thanks top GPDMA acquisition mode
- Handle advanced algorithm with **1 Mbyte** of flash memory

Beaconing and sensors

- **Beacon** profile available among a huge list
- **Bluetooth® Low Energy, long-range** capable
- **Embedded balun + matching** to minimize design cost
- **Advertising extension** for increased beacon lifetime
- **Up to +10 dBm** output power to get best beacon range
- 2.4µA ULP-mode with full RAM for **battery life** optimization
- Down to 1.71V power supply full feature capable

Home automation

- **10 years lifetime**
- High output power **+10dBm**
- **Capacitive Touch**
- **Fast** wake-up
- High MCU efficiency for advanced features **407 CoreMark**

STM32WBA52x
Product ID card & block diagram

Control

- Power supply 1.71V to 3.6V (LDO) POR/PDR/PVD/BOR
- Crystal oscillators 32MHz (radio and HSE) 32,768KHz (LSE)
- RTC / AWU / CSS
- PLL / FLL
- SysTick timer
- 2 watchdogs (WWDG / IWDG)
- 35 GPIOs
- Cyclic redundancy check
- Voltage scaling (2 modes)

Security

- HUK, AES 256-bit, HASH, PKA, TRNG, SHA-1/2, SBSFU, SKS

Arm® Cortex®-M33 FPU/DSP 100 MHz + TrustZone®

- Nested vector interrupt controller (NVIC)
- Memory protected unit (MPU)
- JTAG / SW debug
- ART Accelerator™
- AHB bus matrix
- 1x LPDMA

Radio protocol

- **Bluetooth® Low Energy 5.4**
- Long Range / Ext Adv / 2Msps
- Flexible Master/Slave setting

- 32 to 48 pins (UFQFPN)

Total memory

- **Up to 1 Mbyte flash**
- **Up to 128 Kbytes SRAM**
- Secure bootloader

Connectivity

- 2x SPI, 2x I²C
- 2x USART

Control

- 1x 32-bit timer
- 4x 16-bit timer (1xMotor control)
- 2x 16-bit timer (ULP)

Analog

- 1x 12-bit ADC SAR 2Msps

Sensing

- Capacitive touch

Side attack resistant
Active antitamper

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STM32WBA52 power performances

High performance

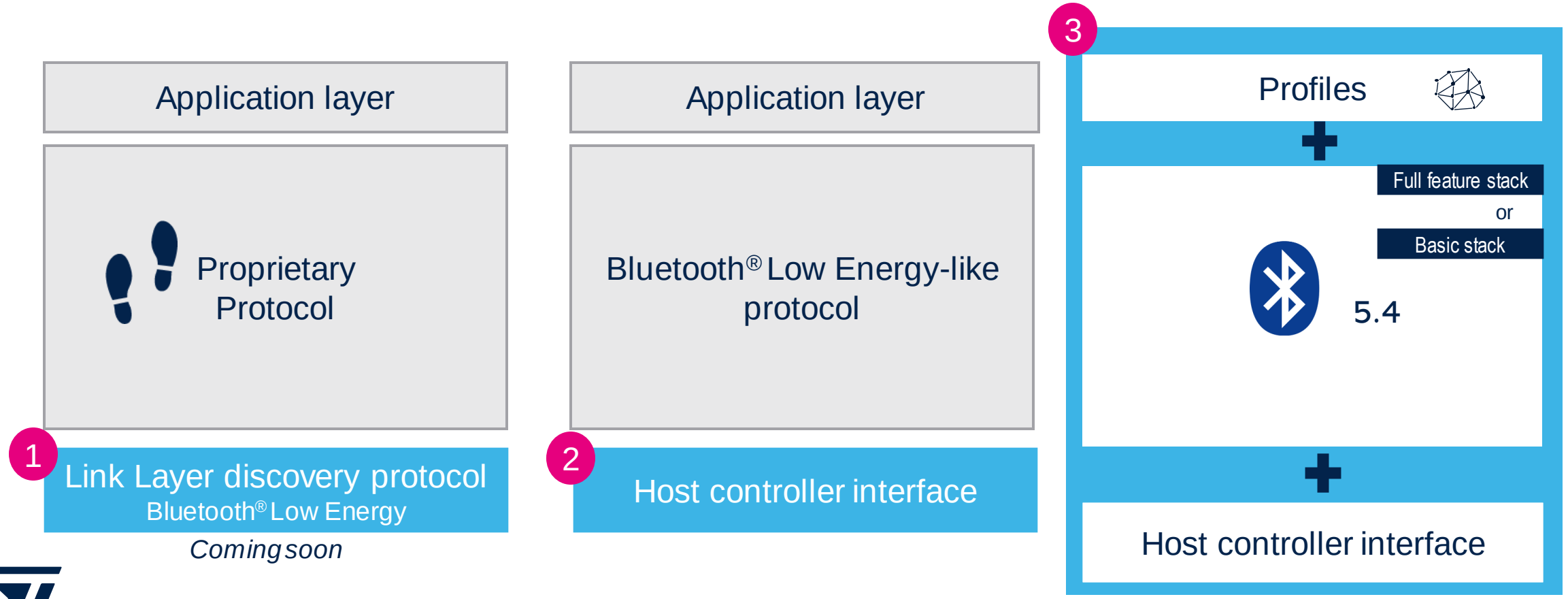
- CoreMark score: 407
- 45µA/MHz from M33

Typ @ LDO ON 1.8V @ 25 °C

** with RTC*

Make it yours

Different levels of integration so you can customize your solution



Available in STM32CubeWBA

STM32WBA increases security in wireless devices

Extensive functionalities to protect your assets

Memory protections
against illegal access control

OTP, **HDP**, WRP, MPU
Secure Debug
Active Tamper, 4 pairs & V/T

Cryptography
for hardware robustness

Side channel AES, PKA
Additional AES, SHA, TRNG,
HUK (Hardware Unique key)

Platform protection
during product lifecycle

RDP: 4 protection level states
Password based regression

Code isolation
for runtime protection

4 isolation stages
Arm® TrustZone® technology

Security services

STM32Trust **TEE TF-M**

Secure boot & secure updates

Secure firmware install

NIST - CAVP certified CryptoLib

State-of-the-art security assurance level

SESIP™3

psacertified™ level three

target certifications

New features for STM32**WBA** are **highlighted**

STM32WBA ecosystem simplifies your design journey

NUCLEO-WBA52CG

Hardware

STM32 Nucleo board
64-pin daughter board

STM32**WBA**

STM32CubeWBA
(connectivity + examples + peripherals)
STM32CubeMX
(code generation + power calculation)
STM32CubeMonRF
STM32CubeProg

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STM32WBA development board

Discover many use cases with the STM32WBA using Arduino connectivity and I/Os

NUCLEO-WBA52CG

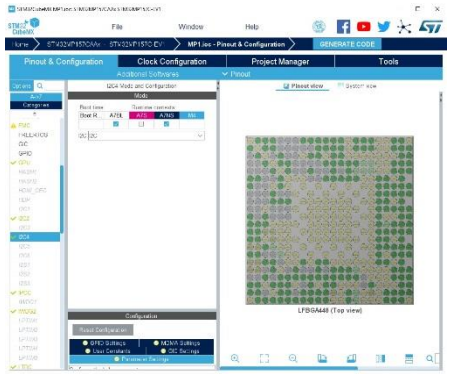
Nucleo 64-pin daughter board

- UFQFPN48 package
  7 x 7 mm 0.5 mm pitch
- 35 GPIOs
- Arduino connector
- Morpho connector
- RF-certified

Software tools for STM32WBA

Complete support of Arm® Cortex®-M33 architecture

STM32 CubeMX

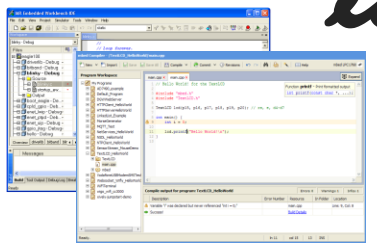


STM32 CubeIDE

arm KEIL

iar

eclipse



STM32 CubeProgrammer

STM32 CubeMonitor

STM32CubeMX

Graphical tool for easy configuration

- Configure and generate code
- Peripherals and middleware configuration

IDEs
Compile and debug

Simple, powerful solutions

- Partners IDE (Arm® Keil®) FREE
- IDE based on Eclipse FREE
- RTOS aware debug

STM32 programming & monitoring tools

STM32CubeProg
STM32CubeMonitor

- Device and memory configuration
- Program the application
- Monitor variables at runtime

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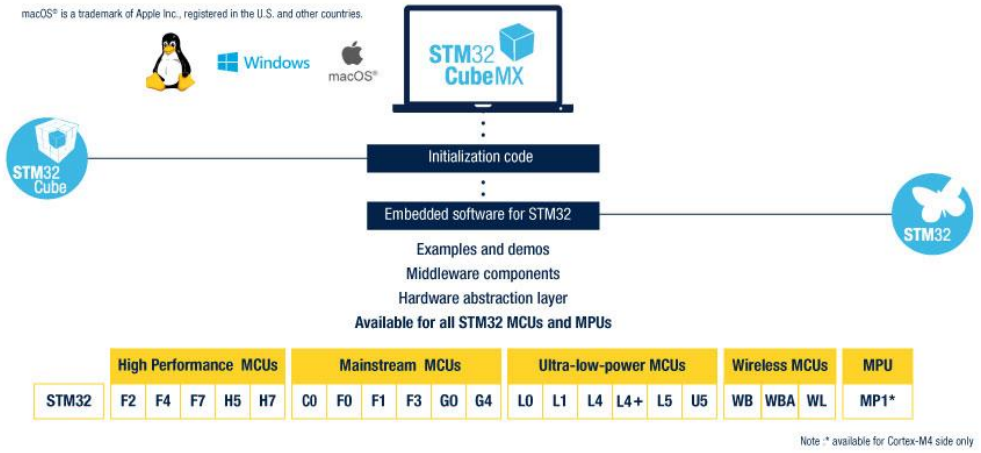
STM32CubeMX

Better and more extensive radio stack support



- Enablement of the STM32_WPAN
- Integration of RTOS and radio use cases
- Configuration GUI for Bluetooth® Low Energy
- Examples generated with STM32CubeMX
- Bluetooth® Low Energy standardized and custom profiles

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STM32CubeMonitor-RF

Making the lives of developers easier

- Performance monitoring
- Radio testing
- Advanced scripting capabilities
- Data logging and report generation

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ST Bluetooth® Low Energy smartphone apps

ST BLE Sensor

ST BLE StarNet

new

ST BLE Toolbox

ST BLE Sensor – Used with our OOB demo

Read the data exported by a Bluetooth® Low Energy device using the BlueST protocol.

ST BLE StarNet (Star topology)

View the data exported by a Bluetooth® Low Energy gateway connected to a network of devices.

ST BLE ToolBox

Discover peripherals, services, and characteristics, and perform R&W. Users can collect cloud-based analytics on the Azure App Center, bond devices, test throughput, log messages.

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STM32WBA ecosystem takeaways

- Dedicated Nucleo board for prototyping
- Full support & integration of Bluetooth® Low Energy 5.4 stacks
- Advanced RF stacks integration with STM32CubeMX
- Advanced QoL features for STM32CubeMonRF
- Mobile applications to address applicative use cases
- Resources on GitHub, including STM32 hotspot

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STM32WBA takeaways

Wireless	Bluetooth® Low Energy 5.4 certified (long range, 2Msps, advertising extension)
Performance	Arm® Cortex®-M33 at 100MHz Efficiency
Power efficiency	Extended battery lifetime Autonomous low-power mode
Security	TrustZone® DPA resistant
Integration	1 Mbyte of flash memory, 128 Kbytes RAM Reduced BOM
Free ecosystem	Faster time to market Enhanced design journey

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Releasing your creativity

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community.st.com

www.st.com/stm32wba

wiki.st.com/stm32mcu

github.com/stm32-hotspot

STM32 MCU Developer Zone

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Our technology starts with You

Find out more at www.st.com/STM32WBA

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