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Welcome to

STM32 Zigbee workshop

Introduction of ST Zigbee solutions based on STM32WB and STM32WBA

Workshop team

STM32

Connectivity Standards Alliance members and mandate

connectivity standards alliance

CSA

- Makes IoT more accessible, secure, and usable
- Simplifying the complex

Functions

- Develop
- Certify
- Promote

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CSA technology expansion

ST is a Promoter Member of the Connectivity Standard Alliance

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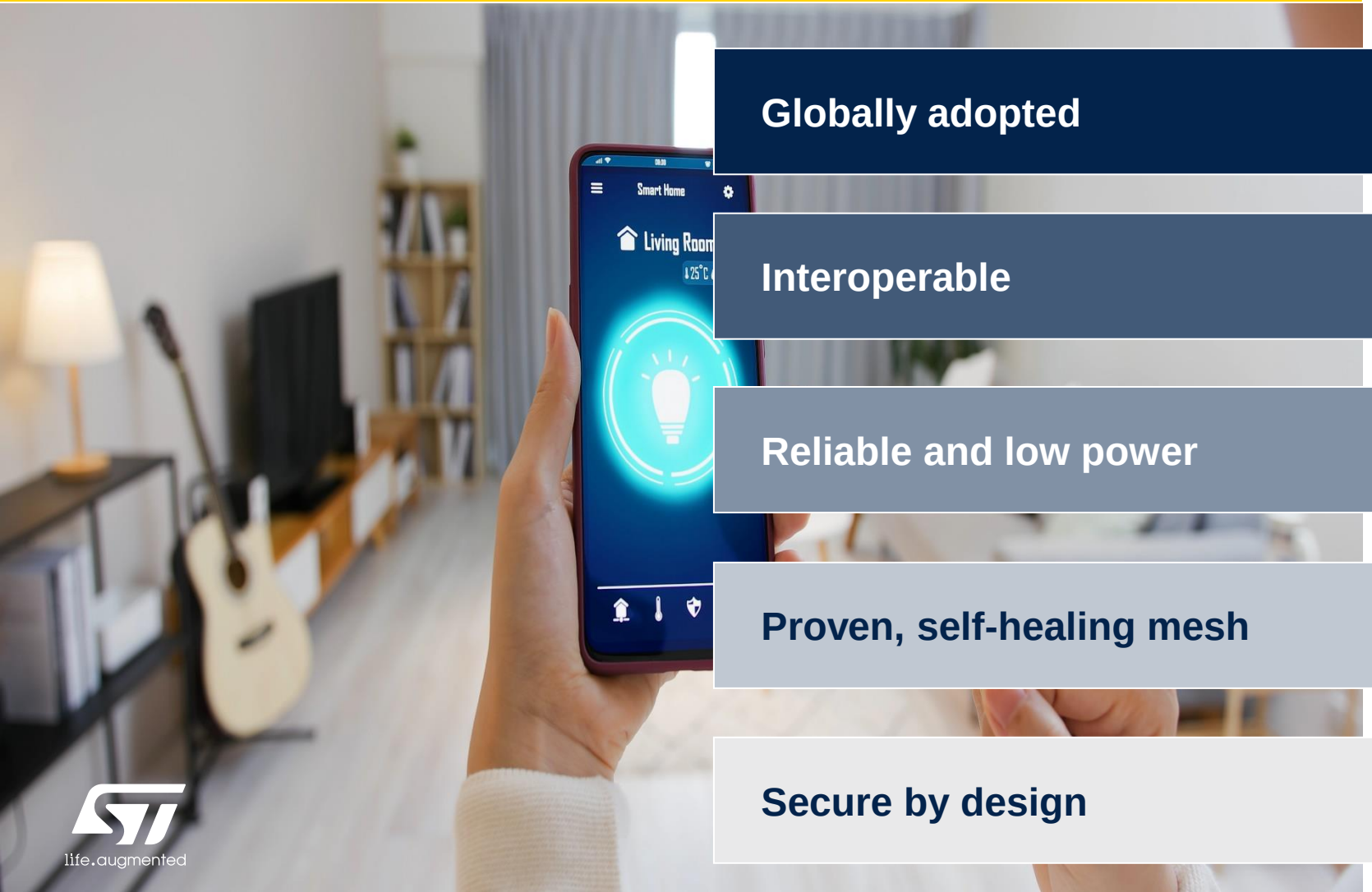
Zigbee features

"Zigbee is the complete IoT solution—from mesh network to the universal language that allows smart objects to work together."



- **Globally adopted**
- **Interoperable**
- **Reliable and low power**
- **Proven, self-healing mesh**
- **Secure by design**

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Zigbee evolution

Early Zigbee solutions	Zigbee PRO	Zigbee PRO 2015	Zigbee 3.0	Zigbee PRO 2017	Zigbee PRO 2023
• Light link • Home automation • Smart metering	• Cluster libraries • Multicasting • Many-to-one routing • Enhanced security	• R21 spec • Basis for Zigbee 3.0	• Child device management • New network topology options	• R22 spec • Dot dot library	• Enhances security • Zigbee direct • sub-GHz
2003-2006	2007	2015	2016	2017	2023

ZigBee Pro 2023 enhances connectivity

Technology/Standard	Comments
ZigBee direct 	✓ Simplifies device onboarding/configuration through Bluetooth LE. simplifies routing
Smart energy 	✓ Allows ZigBee 3.0 devices and smart energy devices to operate and interact on the same network
sub-GHz interconnect 	✓ Utilizes sub-GHz to increase range to residential and commercial locations (NA and Europe)
Enhanced security 	✓ Protects against on-boarding security threats with dynamic link key negotiation
Standardization 	✓ Standardization of all devices and hubs across the ecosystem

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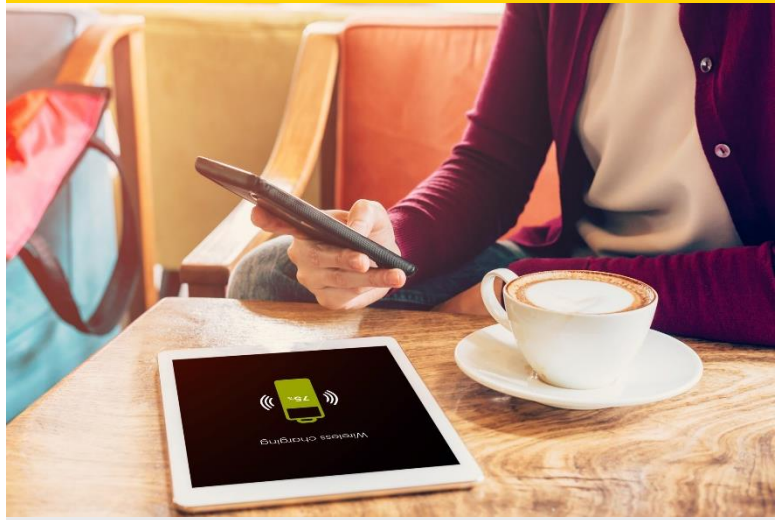
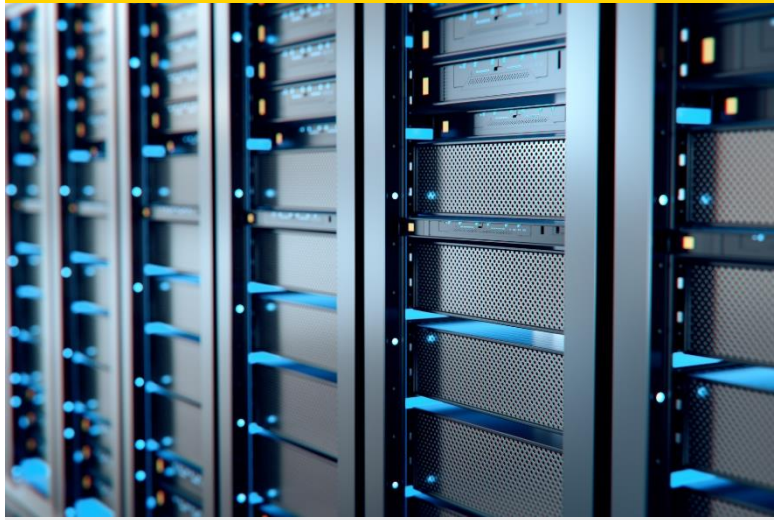
Zigbee market

Residential



- Home automation
- Security systems
- Lighting

Commercial



- Commercial building automation
- Wireless sensor networks

Utility/Energy

- Smart meters
- Home area networks
- Smart grid

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Mesh comparison

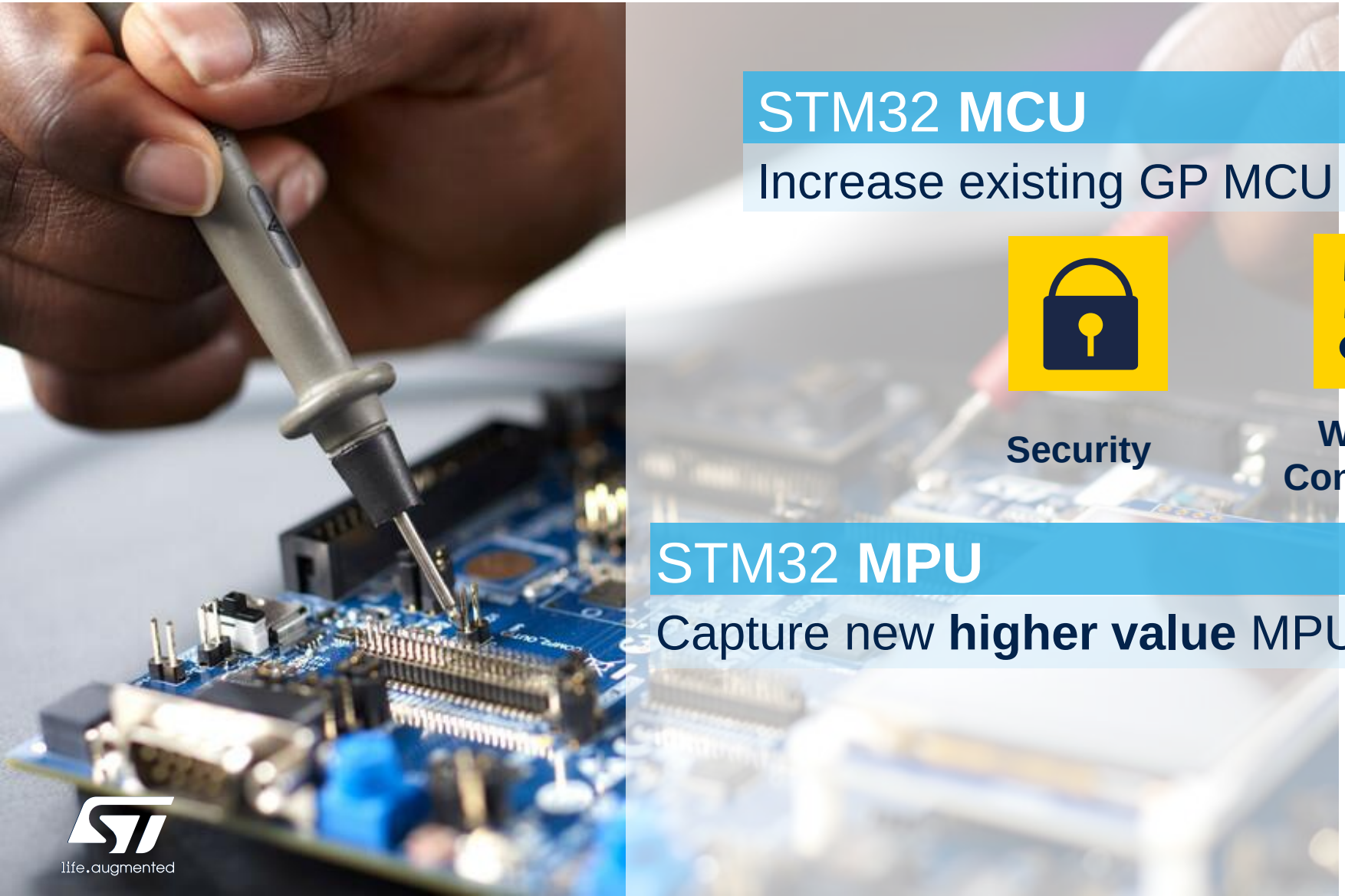
Technology	Advantage	Disadvantage	Comments
Bluetooth LE mesh	✓ **Available in smartphones** ✓ No single point of failure ✓ ZigBee direct interface	○ Small payload	▪ Managed flooding protocol ▪ No routing table stored
ZigBee	✓ No single point failure ✓ **Widely adopted 802.15.4 technology**	○ Not available in smartphones ○ **Gateway** to Bluetooth LE/WiFi or other technologies required	▪ Routing protocol ▪ Routing table stored
Thread	✓ **Native IPv6 support** ✓ No single point failure ✓ Smartphone connectivity	○ Border router required to connect to Bluetooth LE / WiFi ○ **Slow market adoption**	▪ Routing protocol ▪ Routing table stored
matter	✓ **Strong IoT connectivity** ✓ Multi-technology integration ✓ **Smartphone connectivity**	○ Implementation **size on end device** is larger than other technologies	▪ Bridge protocol
zigbee Zigbee Direct	✓ IoT expansion ✓ Connects to several ZigBee or Bluetooth LE devices	○ Requires several nodes to expand the network	▪ Routing, mesh, protocol

Next growth drivers for the STM32

#1 GP MCU Worldwide

Source: OMDIA CLT, 2022,2023

100,000+ customers



STM32 **MCU**

Increase existing GP MCU **socket value** with:

Security

Wireless Connectivity

Artificial Intelligence (AI)

STM32 **MPU**

Capture new **higher value** MPU sockets

OpenSTLinux

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STM32 portfolio

MPU

STM32MP1
Up to 1 GHz Cortex-A7
209 MHz Cortex-M4

STM32MP2
Dual 1.5 GHz Cortex-A35
400 MHz Cortex-M33

High-performance MCUs

STM32F7
1082 CoreMark
216 MHz Cortex-M7

STM32H7
Up to 3224 CoreMark
Up to 550 MHz Cortex -M7
240 MHz Cortex -M4

STM32N6
MCU with neural processing unit

STM32F2
Up to 398 CoreMark
120 MHz Cortex-M3

STM32F4
Up to 608 CoreMark
180 MHz Cortex-M4

STM32H5
Up to 1023 CoreMark
250 MHz Cortex-M33

Mainstream MCUs

Mixed-signal MCUs

STM32F3
245 CoreMark
72 MHz Cortex-M4

STM32G4
569 CoreMark
170 MHz Cortex-M4

STM32C0
114 CoreMark
48 MHz Cortex M0+

STM32F0
106 CoreMark
48 MHz Cortex-M0

STM32G0
142 CoreMark
64 MHz Cortex-M0+

STM32F1
177 CoreMark
72 MHz Cortex-M3

Ultra-low-power MCUs

STM32L0
75 CoreMark
32 MHz Cortex-M0+

STM32L4
273 CoreMark
80 MHz Cortex-M4

STM32L4+
409 CoreMark
120 MHz Cortex-M4

STM32L5
443 CoreMark
110 MHz Cortex-M33

STM32U5
651 CoreMark
160 MHz Cortex-M33

Wireless MCUs

STM32WL
162 CoreMark
48 MHz Cortex-M4
48 MHz Cortex-M0+

STM32WB0
64 MHz Cortex-M0+

STM32WB
216 CoreMark
64 MHz Cortex-M4
32 MHz Cortex-M0+

STM32WBA
407 CoreMark
100 MHz Cortex-M33

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Latest product generation
Radio co-processor only
New series introduced in 2023
Pre-announcement

A wide 2.4GHz portfolio

STM32WBx

STM32WB55 | STM32WB35 | STM32WB15

- **Dual core & security** (Arm® Cortex® M4 / M0+)
- Up to 1Mbytes flash/ 256Kbytes RAM
- Bluetooth® Low Energy 5.4, 2Mbps,
- **Zigbee R22** & Thread, proprietary, Matter

Zigbee FFD/RFD Certified

STM32WBAx

STM32WBA52 | STM32WBA54/55

- **Arm® Cortex® -M33 w/ TrustZone® @100MHz**
- 1Mbyte flash / 128Kbytes RAM
- Up to +10dBm output power; LDO/SMPS
- Bluetooth® Low Energy 5.4 (long-range, **Zigbee R22/R23** & Thread, proprietary, 2Mbps, adverting extension)
- SESIP Level 3

Zigbee FFD/RFD Certified

BlueNRG & STM32WB0*

BlueNRG-1 | BlueNRG-2

- Arm® Cortex®-M0 @64Mhz
- up to 256Kbytes flash
- 24Kbytes RAM
- Bluetooth® Low Energy 5.2

STM32WB05

- Arm® Cortex®-M0+
- 192Kbytes flash
- 24Kbytes RAM
- Bluetooth® Low Energy 5.4 (long-range, 2Mbps, adverting extension, AoA/AoD)

STM32WB06/07

- Arm® Cortex®-M0+
- 256Kbytes flash
- 64Kbytes RAM
- Bluetooth® Low Energy 5.4, long-range, 2Mbps, Adverting Ext

STM32WB09

- Arm® Cortex®-M0+ @64Mhz
- 512Kbytes flash
- 64Kbytes RAM
- Bluetooth® Low Energy 5.4, (long-range, 2Mbps, Adverting Ext)

Module Available

*: STM32WB0 series will be available June'24

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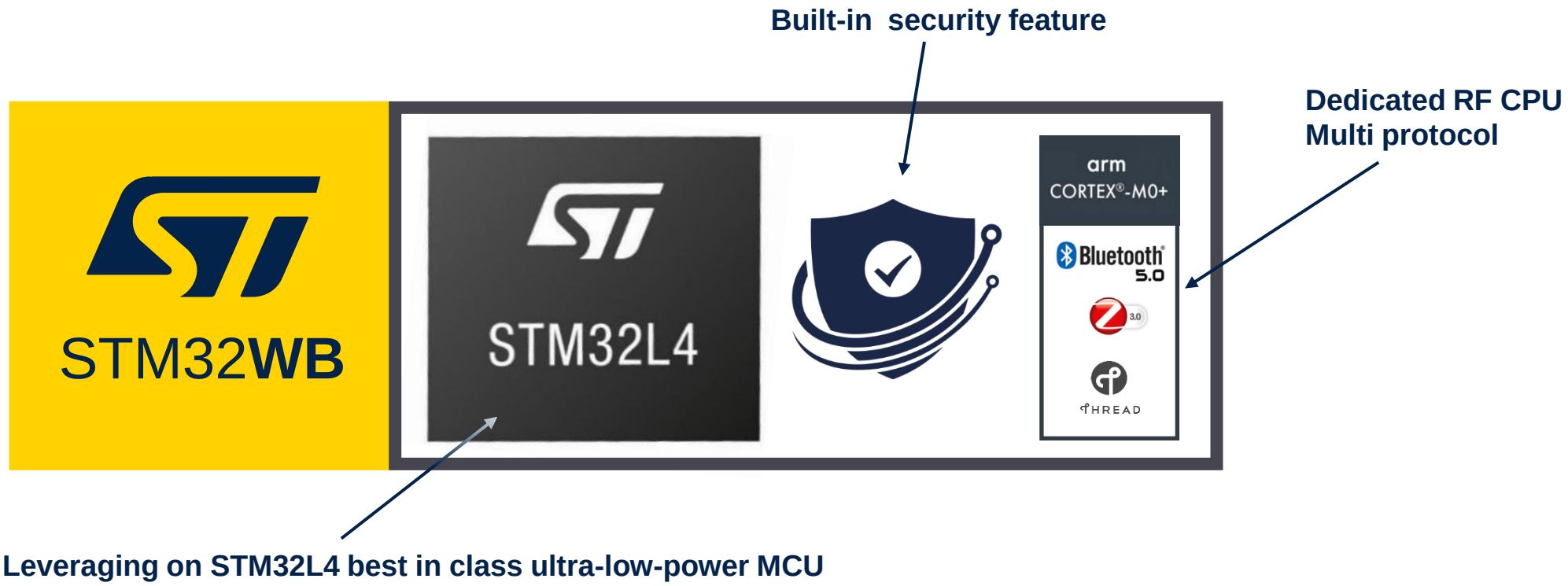
What is an STM32WB ?

A 2.4GHz wireless dual-core MCU: one die, many possibilities …



Certified Platform: BLE 5.4, Zigbee 3.0, Thread

STM32WB – signature

Key features

Real time efficiency : Dual core M4 / M0+

Self sufficient for application and connectivity: up to 1MB flash / 256KB RAM

Suitable connectivity

Multi-protocols: Bluetooth LE 5.4 and 802.15.4

Max output power: + 6dBm
Sensitivity -96dBm BLE / -100dBm 802.15.4

Battery friendly: RX: 4.5mA and TX: 5.2mA (at 0dBm)

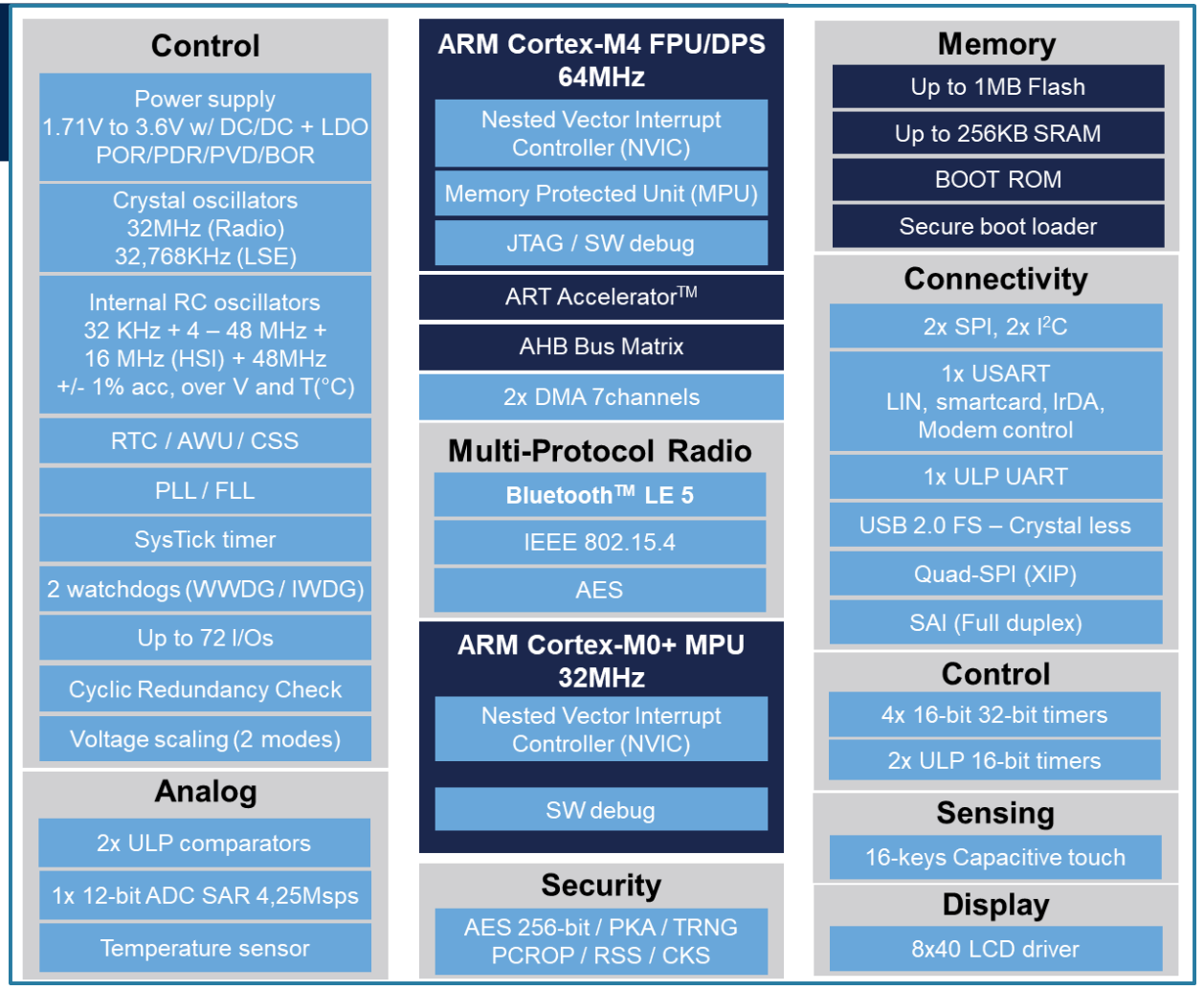
Ultra Low Power

< 50 µA/MHz Active mode (at 3.0V)

0.6 µA Standby mode (Radio standby + 32KB RAM)

< 30 nA Shutdown mode

STM32WB55 Block Diagram



Flexible

Wide package portfolio: UQFN48, VQFN68, WLCSP100, UFBGA129, WLCSP49, Module

Cross compatibility within STM32WB products

Suitable up to 105°C, and down to -40°C

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STM32WB offer

Featured product	Connectivity			Memory		Output power range (dBm)	Main peripherals		MCU Arm® Core	GPIOs	Packages
	Bluetooth LE & Mesh	Zigbee / Thread	Other	Flash (kB)	RAM (kB)						
STM32WB Standard lines											
STM32WB55	2 Mbps	Zigbee 3.0 OpenThread	MATTER End Dev Concurrent Open 2.4GHz	1024	256	-20 to +6	Touch sensing USB 2.0 FS LCD driver	ADC 16bits, Comparators Q-SPI	Cortex®-M4/M0+	72, 49, 30	UQFN48 VQFN68 UFBGA129 WLCSP100
STM32WB35	2 Mbps	Zigbee 3.0 OpenThread	MATTER Gateway Open 2.4GHz	512	96	-20 to +6	USB 2.0 FS	ADC 16bits, Comparators Q-SPI	Cortex®-M4/M0+	30	UQFN48
STM32WB15	2 Mbps		Open 2.4GHz	320	48	-20 to +6	Touch sensing	ADC 12bits Comparator	Cortex®-M4/M0+	37, 30	UQFN48 WLCSP49
STM32WB Value Lines											
STM32WB50	1 Mbps	Zigbee 3.0 OpenThread	MATTER Gateway	1024	128	-20 to +4	USB 2.0 FS	ADC 16bits	Cortex®-M4/M0+	30	UQFN48
STM32WB30	1 Mbps	Zigbee 3.0 OpenThread		512	96	-20 to +4			Cortex®-M4/M0+	30	UQFN48
STM32WB10	1 Mbps			320	48	-20 to +4			Cortex®-M4/M0+	30	UQFN48
STM32WB modules											
STM32WB5M	2 Mbps	Zigbee 3.0 OpenThread	MATTER End Dev Concurrent Open 2.4GHz	1024	256	-20 to +6	Touch sensing USB 2.0 FS LCD driver	ADC 16bits, Comparators Q-SPI	Cortex®-M4/M0+	68	LGA86
STM32WB1M	2 Mbps			320	48	-20 to +6	Touch sensing	ADC 12bits, Comparators	Cortex®-M4/M0+	27	LGA77

STM32WB

STM32WB Series - Portfolio

Flash / RAM Size (bytes)

PIN 2 PIN COMPATIBLE

	48 pins 7x7mm UQFN (p=0.5)	49 pins 3.3x3.38mm WLCSP (p=0.4)	68 pins 8x8mm VQFN (p=0.4)	100 pins 4.39x4.37mm WLCSP	129 pins 7x7mm BGAP	MODULE
1M / 256K	STM32WB55CG		STM32WB55RG	STM32WB55VG	STM32WB55VG	STM32WB5M
	STM32WB50CG					
512K / 256K	STM32WB55CE		STM32WB55RE	STM32WB55VE		
512K / 96K	STM32WB35CE					
	STM32WB30CE					
256K / 128K	STM32WB55CC		STM32WB55RC	STM32WB55VC		
256K / 96K	STM32WB35CC					
320K / 48K	STM32WB15CC	STM32WB15CC				STM32WB1M
	STM32WB10CC					

Pin count





from 1.7 V to 3.6 V
from -40°C to +105°C

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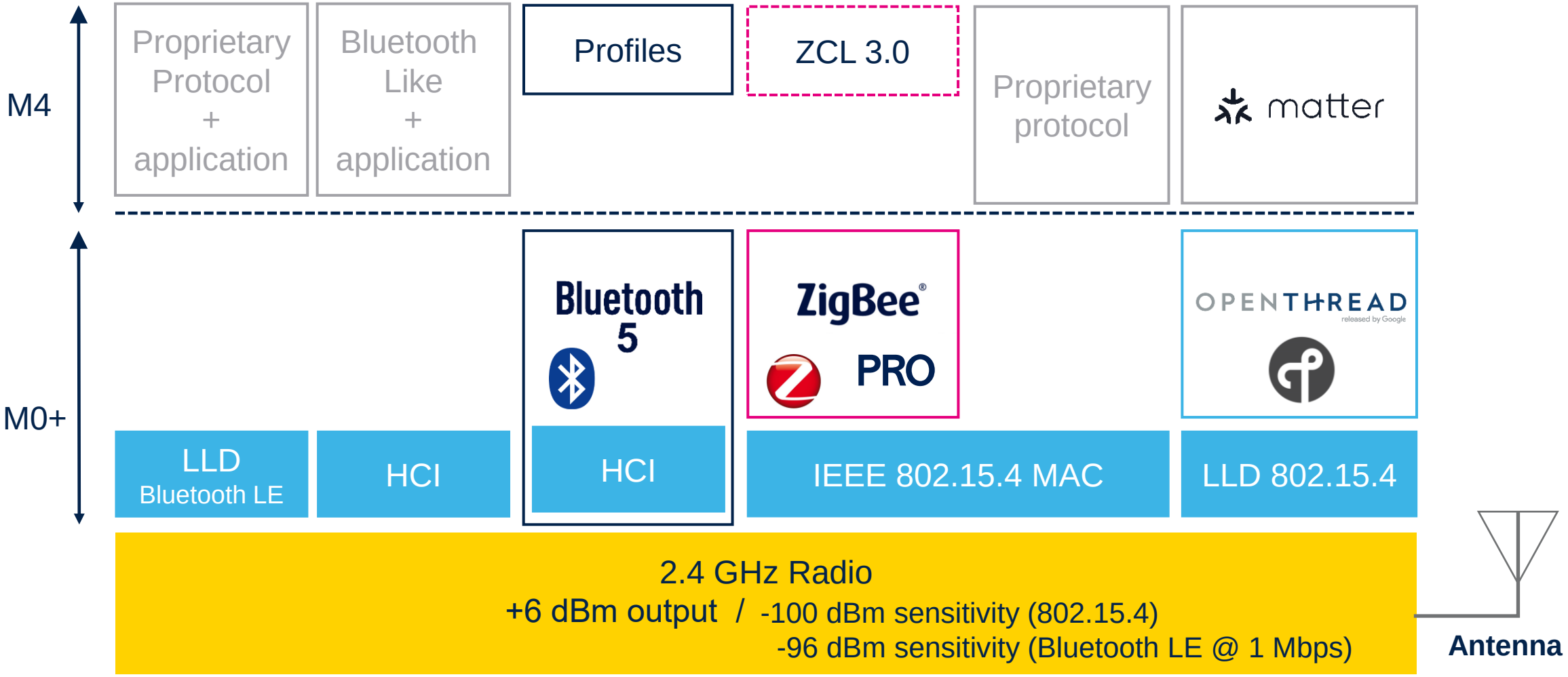
Make it yours



STM32WBAx: Next generation Wireless platform for outstanding performance

Built using **40nm process technology**

Integrated 2.4GHz radio

Multiprotocol: Bluetooth® Low Energy 5.4 (long range, 2Msps, advertising extension) and Zigbee, Thread, Matter

+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**

SESIP™

Leveraging STM32U5 ultra-low-power platform

- Flexible power-saving states with fast wake-up times
- Same digital and analog peripherals

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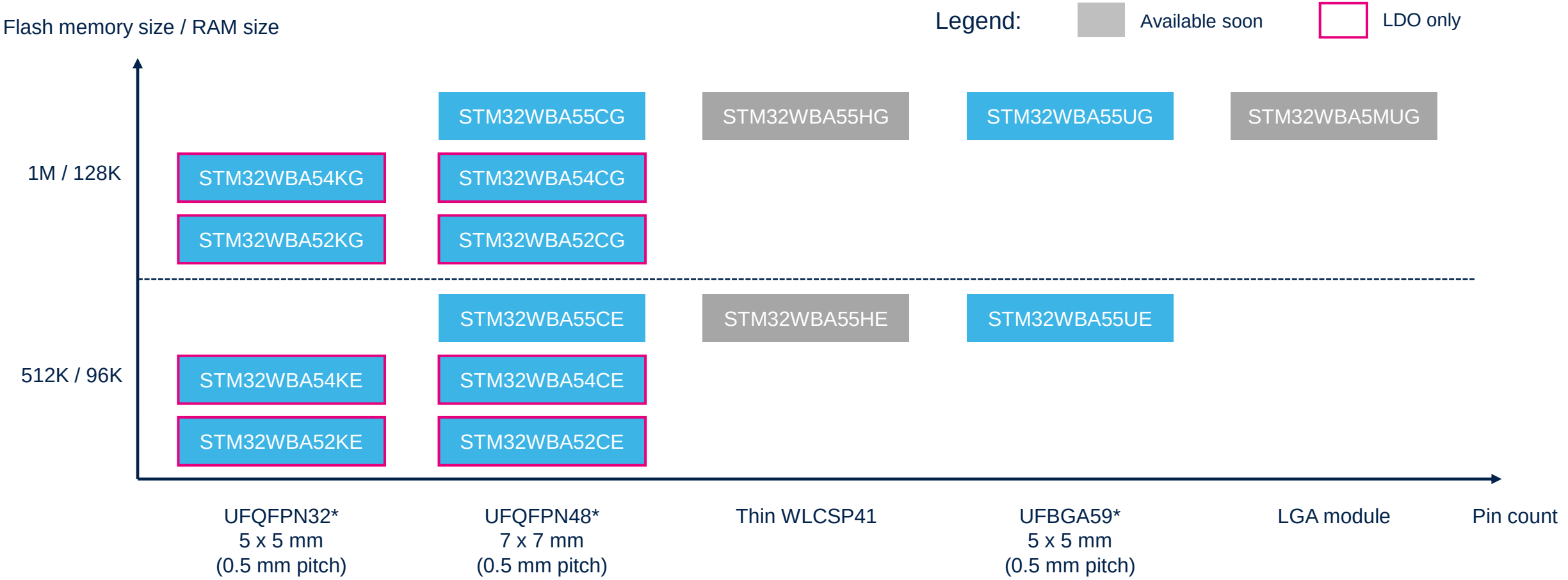
STM32WBA5x MCU series portfolio



* MLPF-WB-04D3: integrated matching RF components tailored for UFQFPN32 and UFQFPN48 packages.

STM32WBA54/55x
Product ID card & block diagram

Control
- Power supply 1.71 V to 3.6 V (LDO/DCDC) POR/PDR/PVD/BOR
- Crystal oscillators 32MHz (radio and HSE) 32,768 kHz (LSE)
- Internal RC oscillators 32,768 kHz (500 ppm)
- RTC / AWU / CSS
- PLL / FLL
- SysTick timer
- 2 watchdogs (WWDG / IWDG)
- Up to 35 GPIOs
- Cyclic redundancy check
- Voltage scaling (2 modes)

Security
- **TZ, HUK, AES 256-bit, HASH, PKA, TRNG, SHA-1/2**

Arm® Cortex®-M33 FPU/DSP 100 MHz + TrustZone®
- Nested vector interrupt controller (NVIC)
- Memory protected unit (MPU)
- JTAG / software debug

- ART Accelerator™
- AHB bus matrix
- 1x LPDMA
- 32 to 59 pins (QFN/BGA/CSP)

Multiprotocol radio
- **Bluetooth® Low Energy 5.4**
- **Zigbee / Thread / Matter**
- **Long Range / Ext adv / 2 Mbps**
- **Isochronous channel**
- **LE power control**

Total memory
- Up to 1 Mbyte flash memory
- Up to 128 Kbytes SRAM
- Secure bootloader

Connectivity
- 2x SPI, 2x I²C, SAI (1ch)
- 2x USART, LPUART

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

Analog
- 1x 12-bit ADC SAR 2 Msps
- 2x ULP Comparator

Sensing
- Capacitive touch

Side attack resistant
Active antitamper

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STM32WBA increases security

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

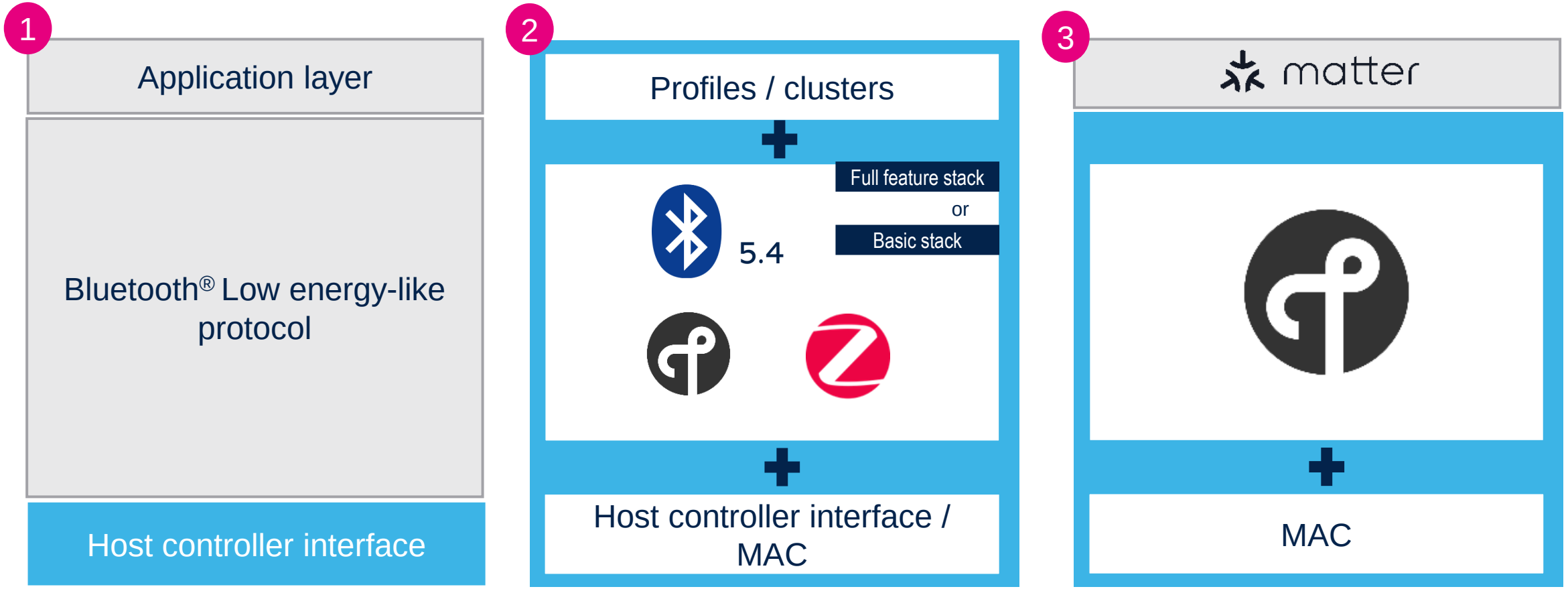
- STM32Trust **TEE TF-M**
- Secure boot & secure updates
- Secure firmware install
- **NIST - CAVP certified CryptoLib**

State-of-the-art security assurance level*

target certifications

*Ready to address the US Cyber Trust Mark and EU Radio Equipment Directive (RED) regulations due to become mandatory in 2025.

Choose from different levels of integration to customize your solutions

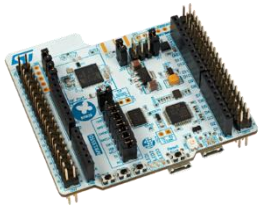


STM32WBA

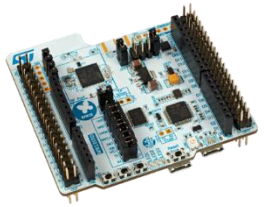
Host device

STM32WB & STM32WBA ecosystem

P-NUCLEO-WB55



NUCLEO-WB15CC



NUCLEO-WB55RG

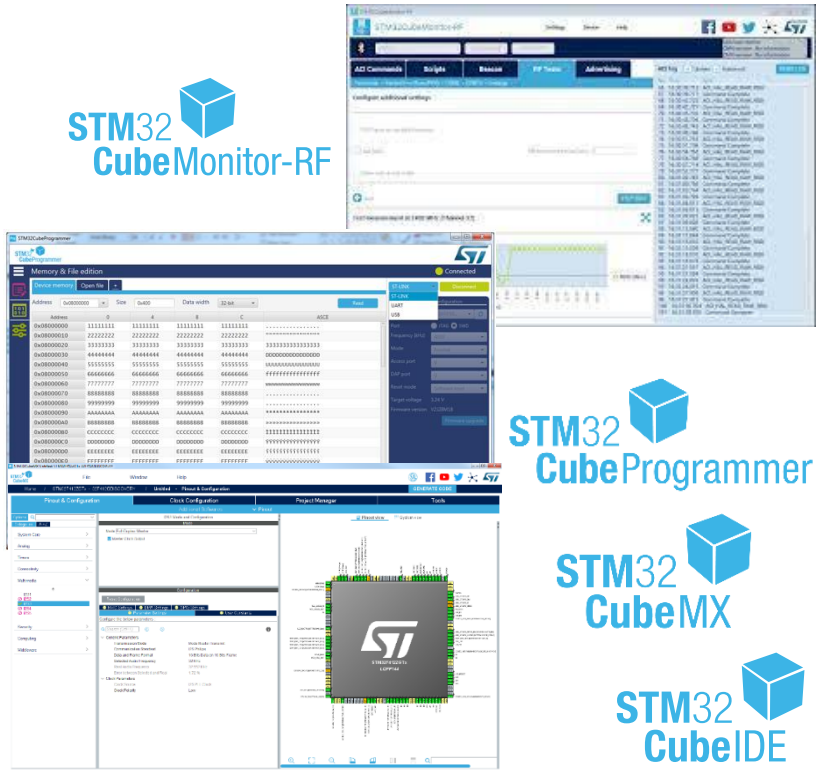
STM32WB5MM-DK

NUCLEO-WBA55CG

Hardware
Evaluation pack, Nucleo-64 board, discovery kit

arm MBED Enabled

STM32**WB**
STM32**WBA**



STM32Cube ecosystem
Code generation
Power calculation

STM32 Cube

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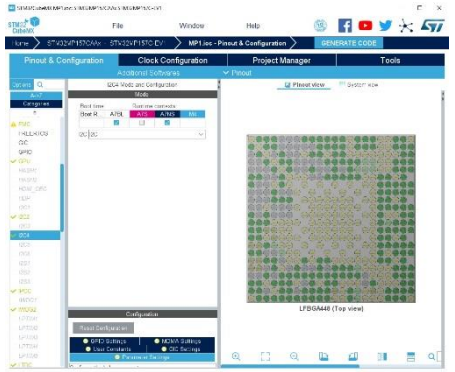
Software tools for STM32WB & STM32WBA

Complete support of Arm® Cortex®-M33 architecture

STM32 CubeMX

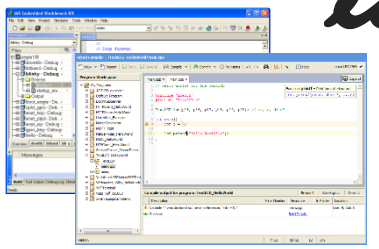


STM32 CubeIDE

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®)
- IDE based on Eclipse
- RTOS aware debug

FREE

STM32 programming & monitoring tools

STM32CubeProg
STM32CubeMonitor

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

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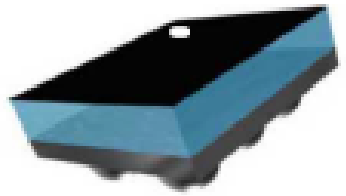
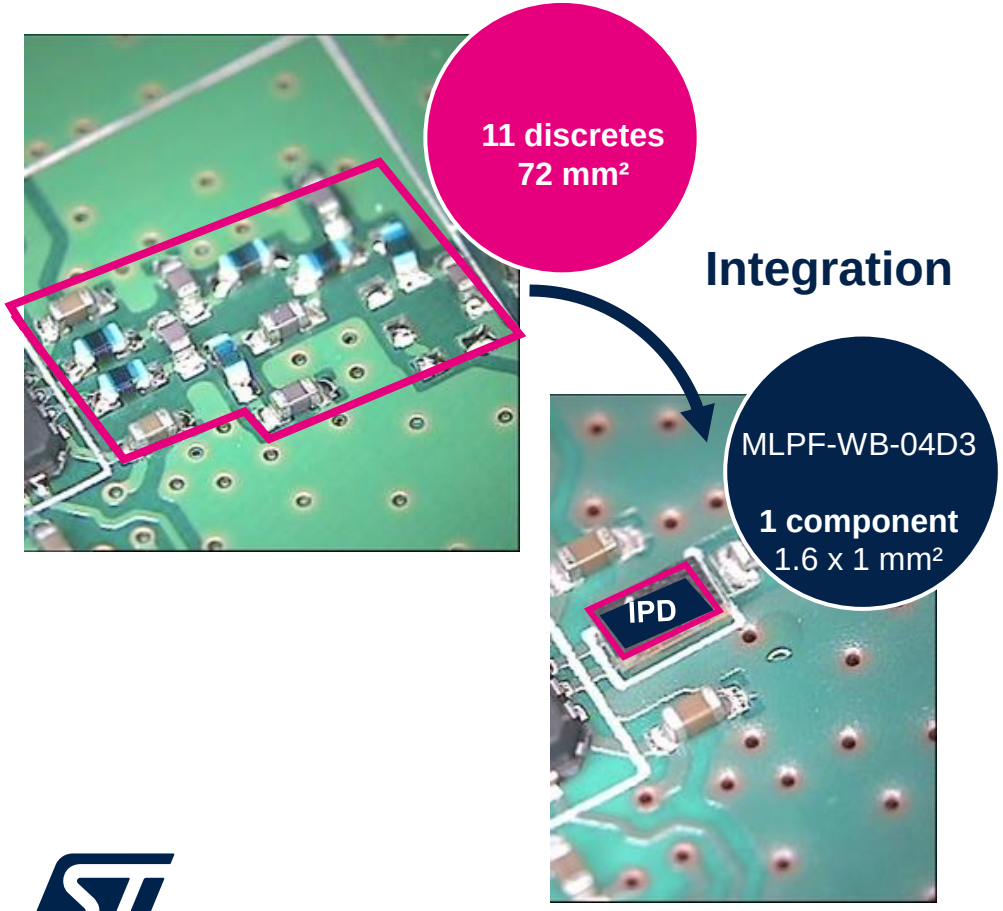
RF integrated passive devices (IPD) companion chip

Designed for the STM32WB MCUs in a QFN package,
the IPD replaces the components between the MCU and the antenna



Chip scale package on glass 6 bumps



Simpler integration

- Impedance matching, harmonics filtering and antenna protection
- Designed to simplify the RF path between STM32WB and antenna

Efficiency

- Optimizes wireless performance

Cost effective

- BOM reduction
- Reliability improvement

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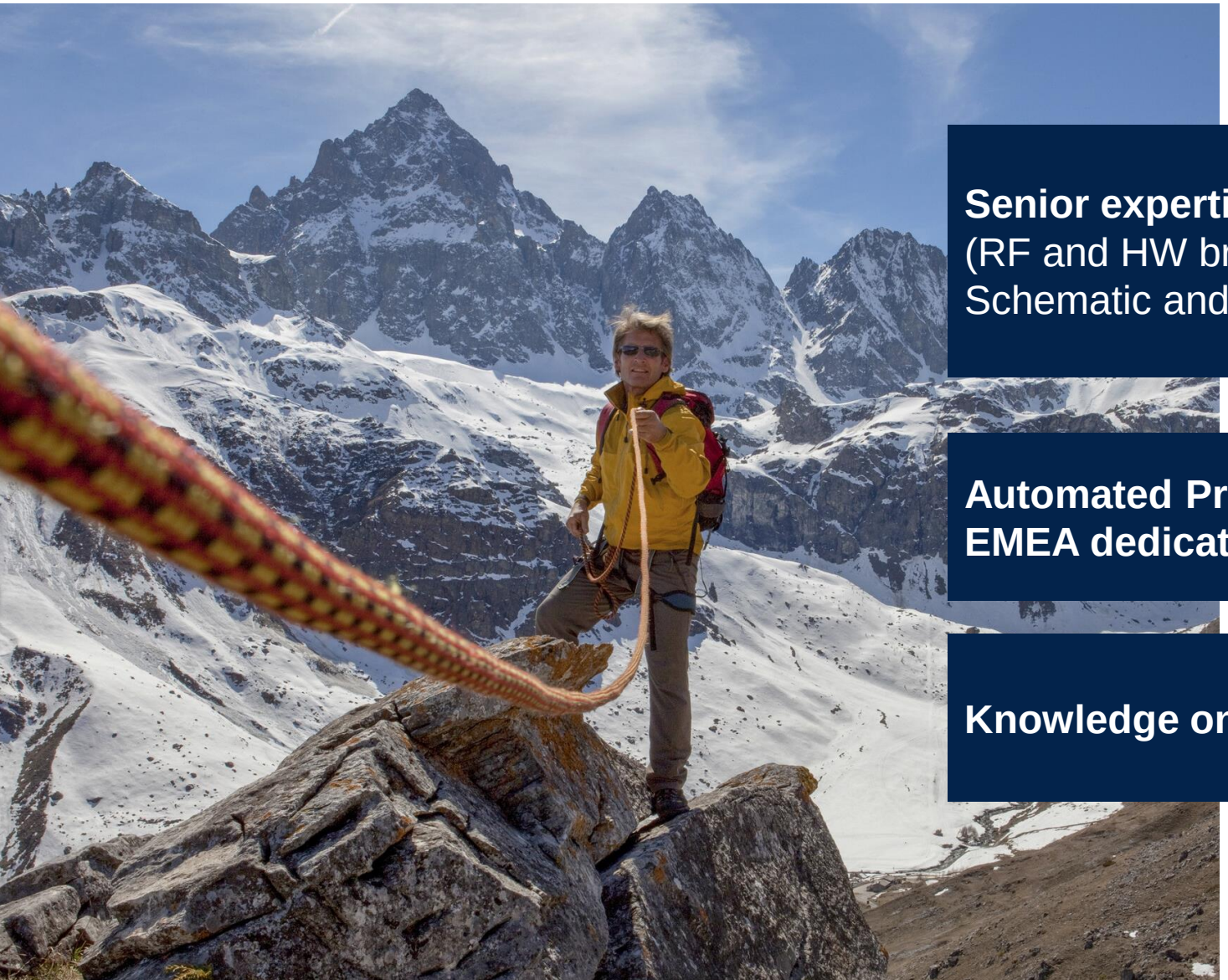
Zigbee certification Status

	STM32WB	STM32WBA
MAC	OK	OK
PHY	OK	OK
R22 (RFD, FFD)	OK	July'24
R23 (RFD, FFD)	Coming soon	OK*

* Waiting for publication at CSA website

What you can expect from our wireless support team



Senior expertise in wireless communication
(RF and HW bring-up services, SW and HW debugging, Schematic and layout review)

Automated Pre-certification capabilities
EMEA dedicated application labs

Knowledge on your application

... in a fast and agile way

Free of Charge

Your wireless journey and how **We** can help

Support you to make the right choice

Make sure your choice was the right one

- Training
- Benchmark
- Datasheet review

- Eval kit bring-up
- Performance review

- Schematic review
- Layout review
- Software porting
- 1st PCB bring-up
- 1st RF test report
- Debugging

- Regional RF test report
- Protocol RF tests
- Corner case debugging
- Certification process guidance

- RF Production tooling
- Ramp-up support

Don’t wait too long to ask for any support.
The sooner the better!!

Please contact: ST MCU Marketing or FAE to get in touch with our RF lab services

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We look forward to receive your PCB !

Fully equipped lab with skilled team

BLE & 802.15.4

PCB bring-up
& power consumption optimization

Sub-1GHz

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Bluetooth® THREAD LoRa™ sigfox

matter zigbee Wi Fi NFC M-Bus wireless

Thank you

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