STM32WB

E.Marinoni – v 1.0 October 2018

STM32WB Series MCU
with Built-in **BLE 5 and IEEE 802.15.4**

STM32WB

Bluetooth 5
THREAD
ZigBee

Open 2.4 GHz radio
Multi-protocol

Dual-core / Full control
Ultra-low-power
M4 and M0+

IoT Protection ready

Massive integration
Cost saving

1MB Flash
3.6 V
100-pin
1.7 V
48-pin
256KB Flash

A large offer

STM32 Cube
STM32 CubeMonitor-RF

Advanced RF tool, Energy control
with C code generation

LONGEVITY 10 YEARS COMMITMENT

No matter what!

STM32WB

Bluetooth 5

- BLE 5.0 radio
- 2x faster speed with 2Mbps capable mode
- Extend network coverage with BLE Mesh

THREAD ZigBee

- Last IEEE 802.15.4 standard ready
- OpenThread
- BLE and OpenThread in Static and Dynamic concurrent mode

2.4 GHz
Open

- Proprietary protocol capable (BLE like or 802.15.4)
- Best-in-class RF with up to +6dBm output power and 102 dB link budget
- Energy sensitive application with only 3.8mA in RX and 5.5mA in TX (@ 0dBm)
- BOM cost reduction thanks to Integrated balun

Simplicity of development

2 independent cores for real-time execution

Mono-core

CPU -x

Application Firmware
+
Peripherals
+
Radio stack

STM32WB

Arm Cortex-M4
Application Firmware + Peripherals

Arm Cortex-M0+
Radio Stack

- **Drawbacks**
  - Time sharing
  - Longer processing time – Greedy current consumption
  - Need companion MCU (increased cost)

- **Benefits**
  - SOC solution (1 single die)
  - Full flexibility - Easy development – User experience
  - Increase battery life
  - All-in-1 solution - cost saving
  - Speed up time to market

STM32WB

KEY FEATURES

- **2 independent cores for real time execution**
- **Ultra-low-power consumption**
  - 50 µA/MHz Active mode (at 3.0V)
  - 1.8 µA Stop mode (Radio in standby + 256KB RAM)
  - < 50 nA Shutdown mode
- **Peripherals**
  - 2xI²C, 1xUSART, 1xLP-UART, 2xSPI, 1x USB 2.0 FS device supporting Battery Charging Detection, 1xSAI, Q-SPI (XIP), 6x 16-bit timer (including LPWM and low-power one)
- **1.71 to 3.6V voltage range (DC/DC, LDO)**
- **-40°C to +105°C temperature range**

Security
PCROP, PKA, TRNG
AES 256-bit, CKS

Arm® Cortex®-M4 MPU + FPU
+ DSP Inst.
@ 64 MHz

ART Accelerator™
Up to 1MB Flash
Up to 256KB SRAM

LCD 8x40

ADC 12-bit
2x Comp
Temp sensor
Cap. Touch

USB 2.0 FS
Crystal-less
SPI, I²C
LP-UART
SAI, Quad-SPI

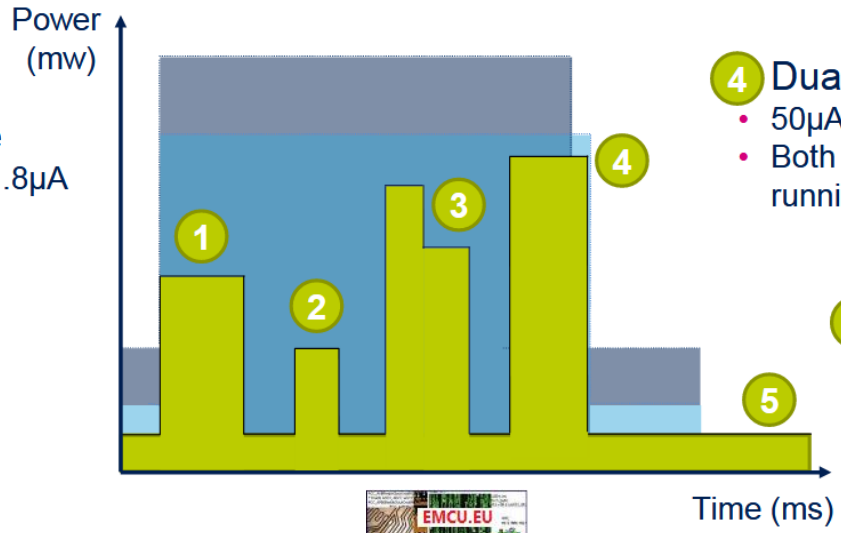
Cortex-M0+ Core
@ 32 MHz
2.4 GHz Radio
BLE 5
802.15.4
Concurrent mode

Benefit of Dual Cores processing

1 Independent Radio activity:
- Uploading data to mesh network or smartphone
- OTA of Radio protocol stack or application FW
- Running on arm CM0+

3 Main application activity:
- Computing data (sensor fusion …)
- Flexible arm CM4 CPU speed up to 64 MHz
- Batch Acquisition Mode (BAM) with CPU and Flash turned off

2 Energy saving mode
- RAM + RTC running @ 1.8µA
- Fast wake up @ 5µs



4 Dual CPU activity
- 50µA/MHz only!
- Both Radio and Application running independently

5 Super saving mode
Shutdown < 50 nA
- Battery energy saving

Competitor A

Competitor B

STM32WB

All in one MCU - Full flexibility control

Lighting

- Robust RF link -**100dBm** sensitivity with IEEE 802.15.4 and **+6 dBm** output power
- Upgrade legacy 802.15.4 device to **BLE 5**
- **Update** securely Radio and stack firmware with build-in RSS
- BLE 5 and 802.15.4 protocols **Mesh capable** to extend network range

Fleet maintenance

- Retrofit legacy product to **BLE 5** and concurrency mode
- Remotely upgrade device with **OTA capability**
- **Brand protection** with Authenticated **FW upgrade** system

Industrial devices

- **Up to 105**°C radio capable
- Down to **600 nA mode with RTC** and 32KB of RAM
- Only **5µs wakeup** time over 16 wakeup lines
- PCROP, ECC, TRNG, **PKA**, for best design robustness
- Reduce BOM cost with **built-in LCD booster**

Fitness/ Healthcare

- **Multipoint** BLE 5 connections
- Small form factor design with CSP**100 pins**
- Battery life time care with **< 50 nA** Shutdown mode
- Dynamic Efficient **50 µA/MHz**
- Extend memory storage with **Quad-SPI**
- Handle advanced algorithm with **1 Mbyte** of Flash
- Cost optimized product with USB 2.0 **crystal-less** device

Beaconing

- **Beacon** profile available among a huge list
- **Embedded balun** to minimize design cost
- Only **5.5mA Radio TX** current to extend beacon life time
- **Up to +6 dBm** output power to get best beacon range
- < 1.8 µA Stop mode with full RAM for **battery life** optimization
- Down to 1.71 full feature capable

Home security and Audio

- **-100 dBm** sensitivity to increase area coverage
- **Customer Key Storage (CKS)** for trustable Application update
- Manage full duplex **audio** with embedded SAI
- USB FS 2.0 with Battery **Charging Detection** for remote device

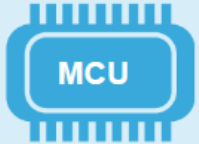
STM32WB

IoT Protection Ready

Advanced

Basic

Attacks	Attacks description	STM32WB Countermeasures

Non Invasive Attacks 	• Environment modification
	  • Temperature
	  • Voltage
	  • Clock ….
	• Fault injection (glitches….)
	• Exploit debug features
	• Side channel, power Analysis, …
		• Temperature sensor
		• Power supply integrity monitor
		• Clock security system
		• Tamper pads
		• Memory ECC, Parity check
		• RTC alarm, registers, SRAM mass erase
		• JTAG Read out protection
		• BOOT from Flash only

Software Attacks 	• Low Authentication / Encryption • Extract keys • Exploitation of applicative test features • Malware / Virus • Replay, privilege escalation	• Customer Key Storage (CKS) • RNG, Crypto accelerator, CRC • Write memory protection • Read Out memory protection • Memory Protection Unit (MPU) • Root Secure Service (RSS) • Secure Firmware Update (SFU) • Proprietary Code Read-Out Protection (PCROP) • 96-bit ID

STM32WB - A large offer

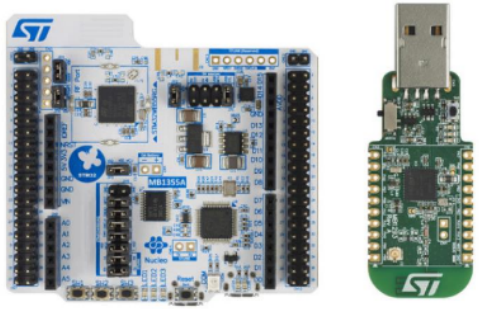
Bluetooth 5, Thread, ZigBee 3.0 and proprietary protocol capable

Flash memory / RAM size (bytes)	48-pin UQFN (0.5 mm pitch)	68-pin VQFN (0.4 mm pitch)	100-pin WLCSP (0.4 mm pitch)
1 M / 256 K	STM32WB55CG	STM32WB55RG	STM32WB55VG
512 K / 256 K	STM32WB55CE	STM32WB55RE	STM32WB55VE
256 K / 128 K	STM32WB55CC	STM32WB55RC	STM32WB55VC

Pin count

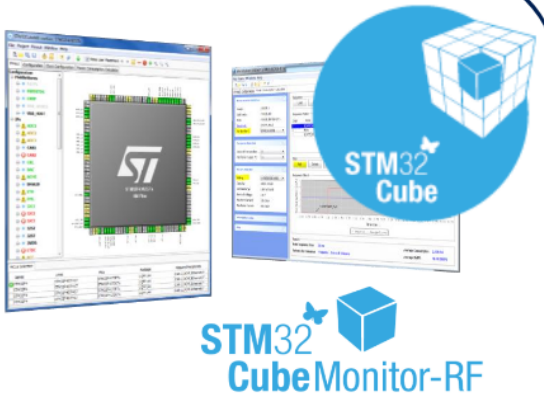
From 1.71 to 3.6V and from -40°C to +105°C !

Prototyping made as easy



Hardware
Evaluation Pack

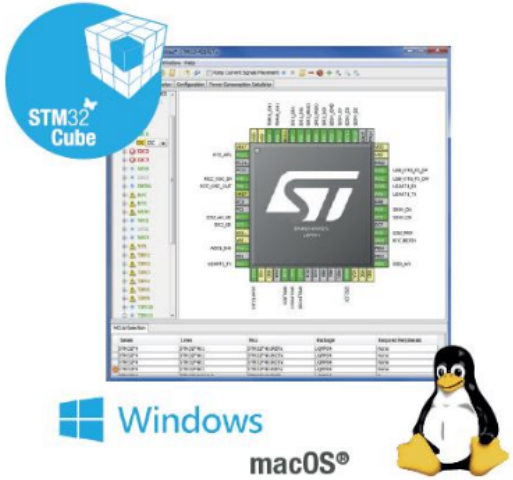
STM32 WB

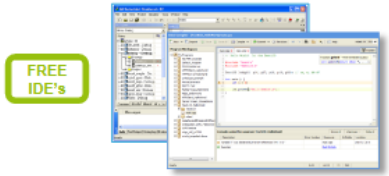


STM32CubeMX
Code generation
Power calculation
STM32CubeMonRF

STM32WB

A complete flow, from configuration up to monitoring

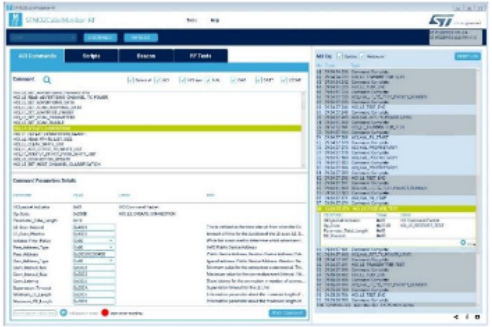




IAR SYSTEMS | arm KEIL | arm MBED | ac6 | atollic

More to come after mass market launch

STM32 CubeMonitor-RF



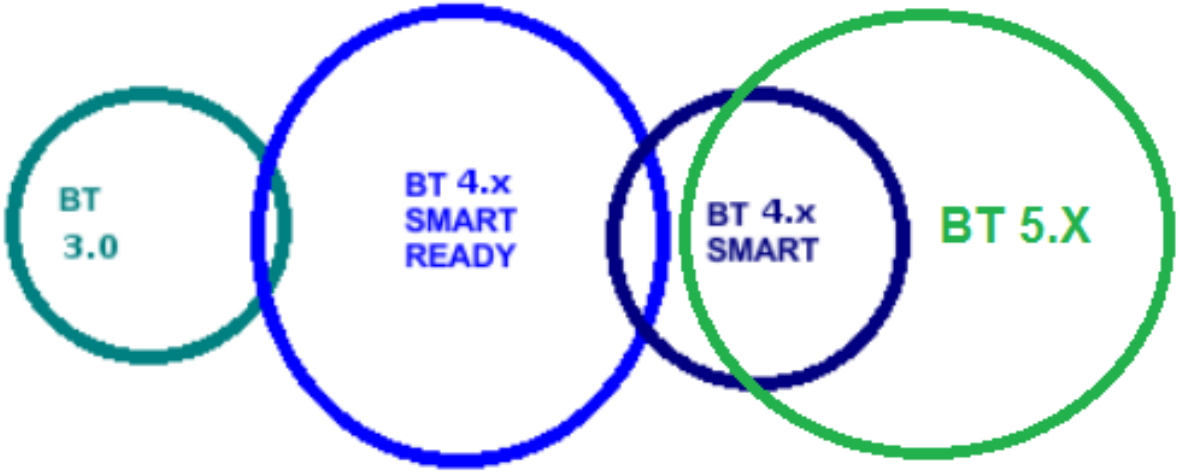
STM32CubeMX
Configure & Generate Code

Partners IDEs
Compile and Debug

STM32CubeMonRF
Monitor

extra information

BlueTooth - **Technology**



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Click below to see the STM32WB presentation

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For more info see below

STM32


From STM32 tool installation
your own IoT application
Getting Started
STM32 step-by-step


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STM32


Simplified clock tree
STM32 Online Training
In depth education


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Thank you!