



life.augmented



STM32WL MCU series wireless System-on-Chip

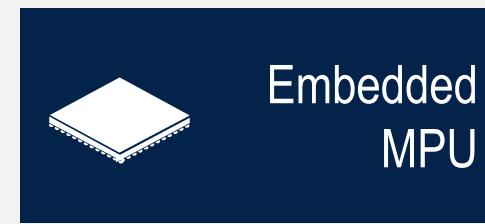
Long-range communications





The STM32 MCU & MPU portfolio

General-purpose MCUs



5 product ranges

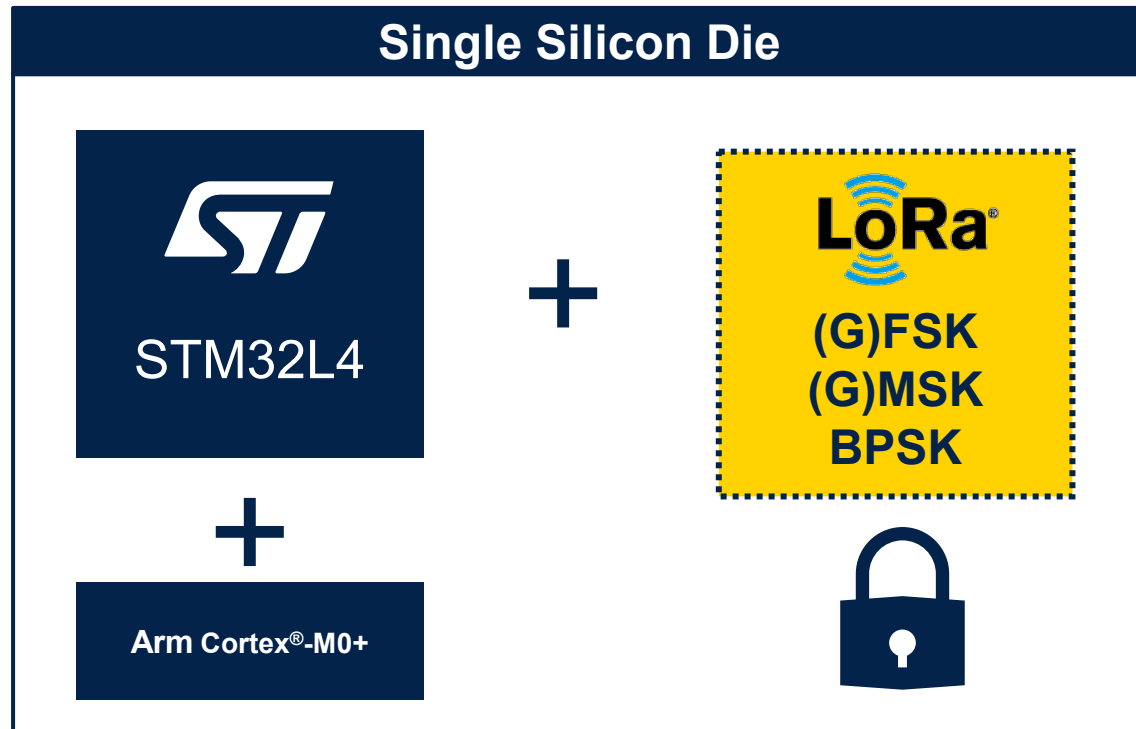
3,300+ part numbers



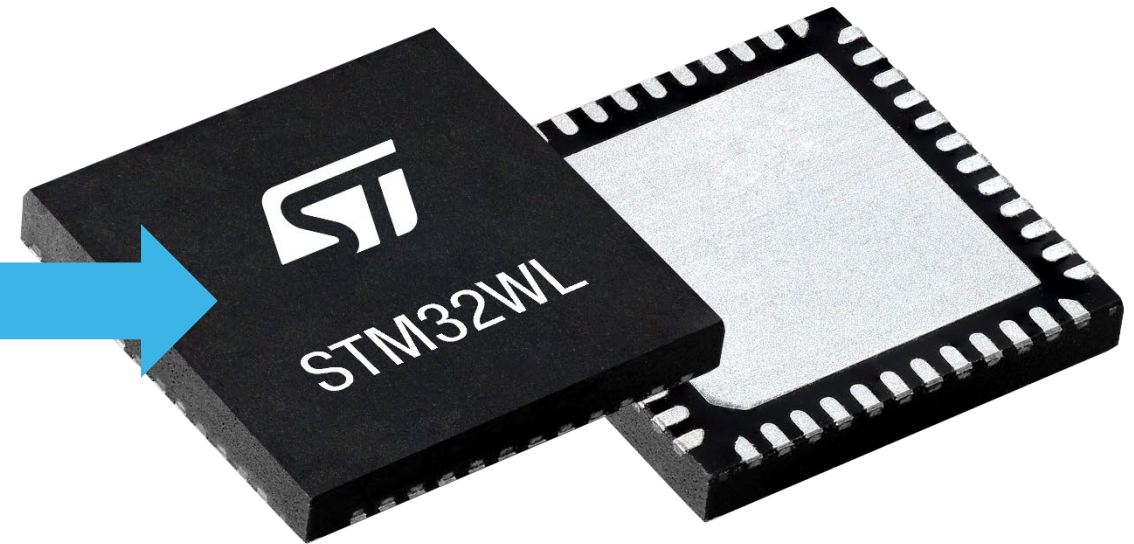


A long-range System-on-Chip solution

One die, many IoT possibilities



World first!



The integration pyramid

STM32WL

First LoRa-enabled SoC in the world

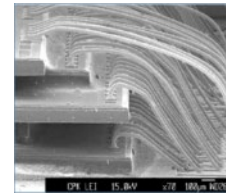


System-on-Chip (SoC)

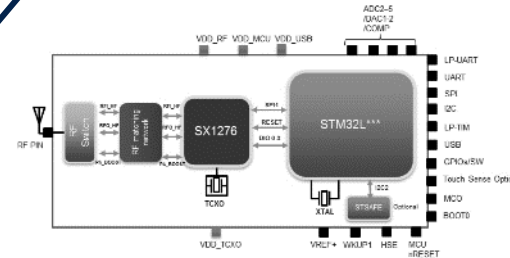
Only one **silicon die** in one package

System-in-Package

*Different **silicon dice** inside the same package*



Source: PTI Blog



*Different **packages** on a very tiny piece of re-packaged PCB*

Module

PCB

*Different discrete **packages** on a **BIG** electronic board*



Make the choice of the STM32WL series

The 8 key points that make the difference



(G)FSK
(G)MSK
BPSK

Multi-modulation



Massive integration
Cost saving



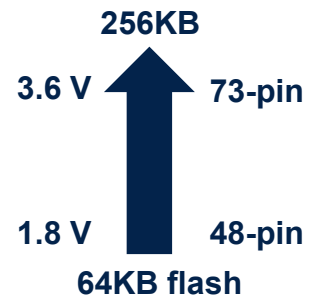
Open dual-core platform



Ultra-low-power



STM32 security



A large offer

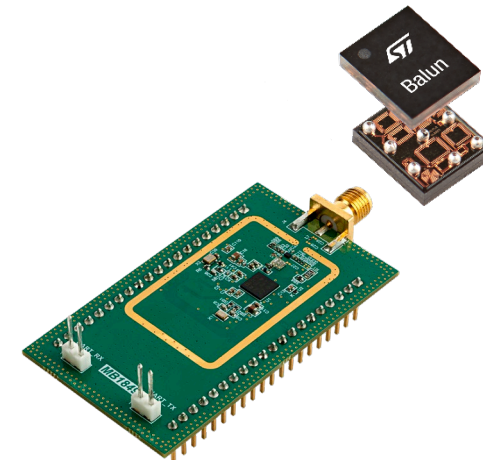
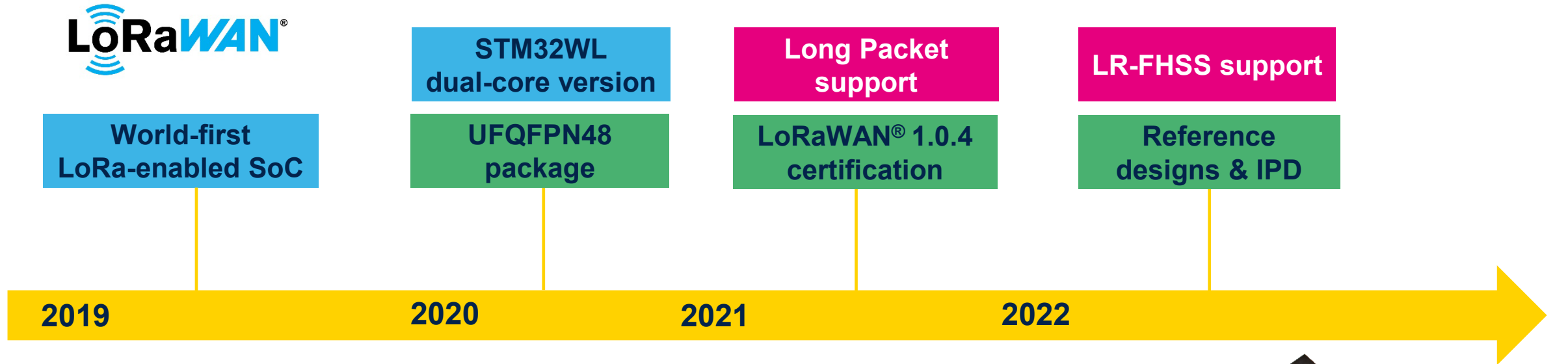


End-to-end ecosystem
(advanced RF testing tool,
C code generation tool...)



No matter what!

The STM32WL ecosystem is growing

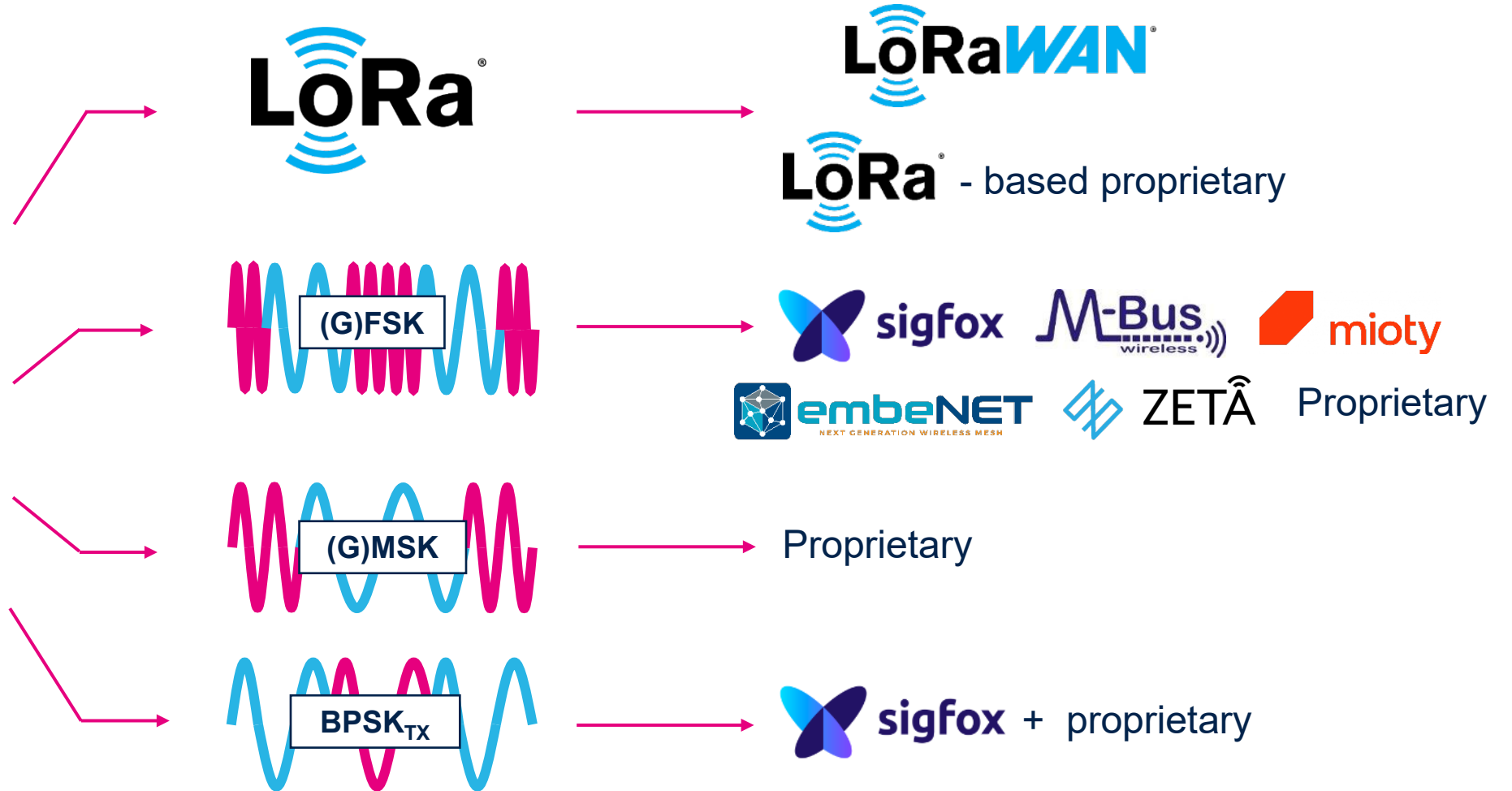


- Integration
- Flexibility
- Simplicity

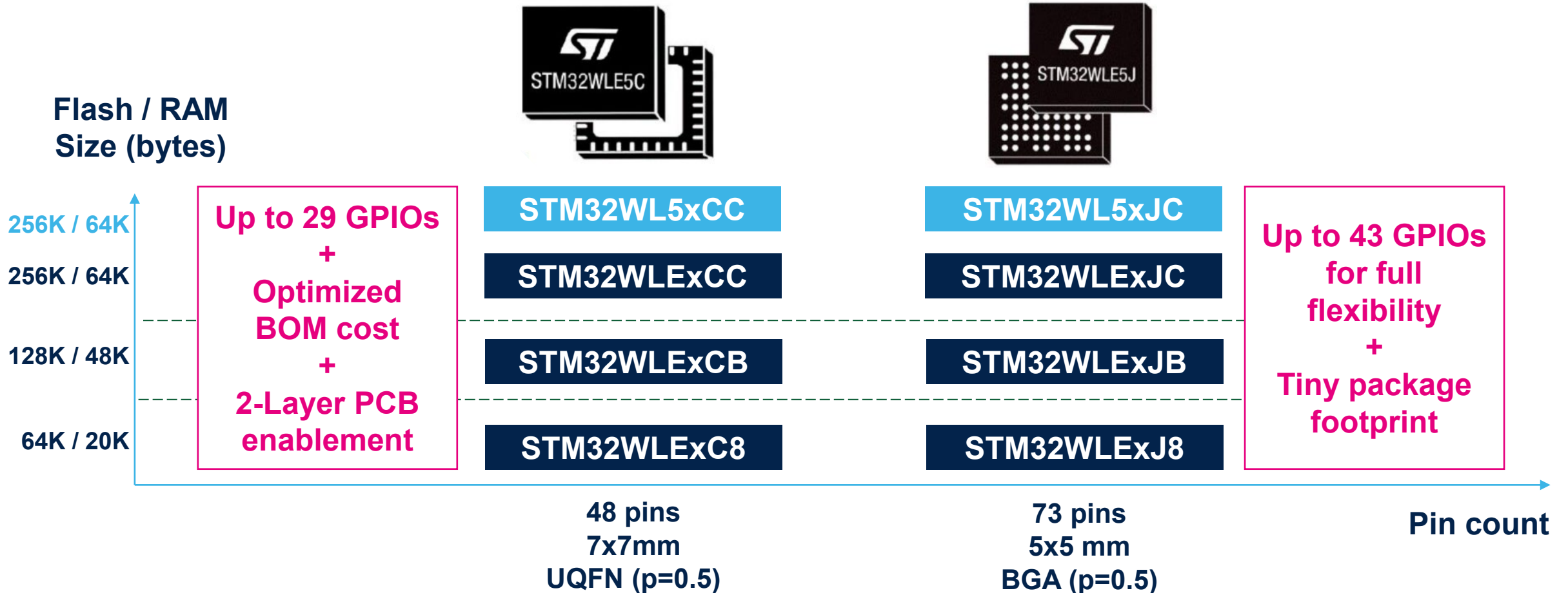
Deep integration for a wide range of applications



4 modulations - many protocols



STM32WL sub-GHz - portfolio



 Dual core

 Single core

Note:

x = 5 all modulations available

x = 4 all modulations available except LoRa

Ideal for multiple applications in the LPWAN market

- Worldwide compatibility **150 to 960 MHz** Linear Range
- Multiprotocol capable
- ST Longevity commitment program: continuous supply for **10 years**

- Up to +22 dBm output power for wide coverage
- **-148 dBm** sensitivity with LoRa: **Robust RF Link**
- **Reduced BOM cost**

- **Unique-IDs** for enhanced traceability
- Down to 390 nA mode with RTC and 32KB of RAM for extended Battery lifetime
- Small form factor with **UFBGA 5x5 package**



Utilities



Smart
Cities & buildings



Logistics



Industrial IoT



Smart Ag



Smart Home



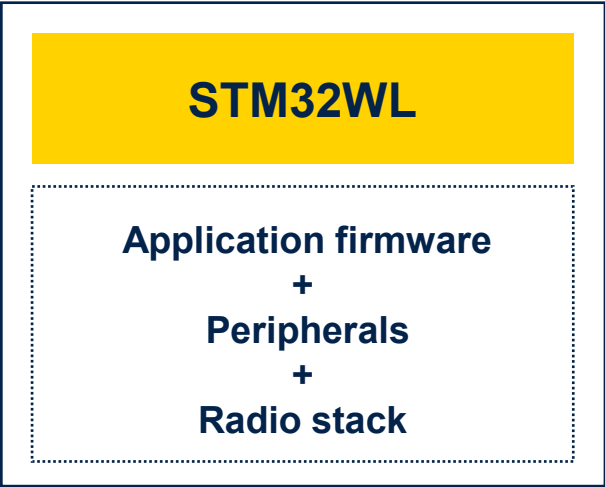
- Up to **105 °C** MCU capable
- **Only 5 µs wake up time** for best latencies
- Only 4.82 mA as LoRa Rx consumption for battery optimization

- Link budget > **160 dB** = Very long ranges
- Excellent battery lifetime: Only 15 mA for LoRa Tx consumption @ 10 dBm
- **PCROP, ECC, TRNG, PKA**, for best design robustness

- Down to 71 µA/MHz in run mode for efficient action
- < 1 µA stop mode with full RAM for **battery life** optimization
- 12-bit ADC & DAC for mixed applicative use cases

A higher level of integration

MCU + radio, a 2-in-1 solution



VS



- SoC solution (**1 single die**)
- **All-in-1** solution - cost saving
- Simplified development helps speeding up time to market
- Mono-core or dual-core version for excellent security



- **2 standalone chips, or dice (SiP)**
- Bigger final PCB (increased cost)
- Wired communication more exposed

STM32WLEx line - a rich feature set

Control Power supply 1.8 to 3.6 V w/ DCDC+ LDO POR/PDR/PVD/BOR Crystal oscillators 32 MHz (Radio + HSE) 32.768 KHz (LSE) Internal RC oscillators 32,768 KHz + 16 MHz + 48 MHz ± 1% acc. over V and T(°C) RTC/AWU/CSS PLL SysTick timer 2 watchdogs (WWDG/IWDG) 43 GPIOs Cyclic redundancy check Voltage scaling (2 modes)	Arm® Cortex®-M4 DSP 48 MHz Nested vector interrupt controller (NVIC) Memory protected unit (MPU) JTAG/SW debug ART Accelerator™ AHB Bus matrix 2x DMA 7 channels Radio LoRa®, (G)FSK, (G)MSK, BPSK +15dBm & +22dBm Power Outputs -148 dBm sensitivity (LoRa) 150 MHz to 960 MHz	Memory Up to 256-Kbyte Flash Up to 64-Kbyte SRAM Boot Lock Boot loader Timers 1 x 32-bit timer 3x 16-bit timers 3x ULP 16-bit timers Analog 1x 12-bit ADC SAR 2.5 Msps 12-bit DAC 2x ULP comparators Temperature sensor Connectivity 2x SPI, 3x I2C 2x USART LIN, smartcard, IrDA, Modem control 1x ULP UART
Security AES 256-bit + TRNG + PCROP Tamper detection		

KEY FEATURES

- Arm® Cortex®-M4 & DSP up to 48 MHz
- Up to 256 Kbytes of flash memory and 64 Kbytes of SRAM
- **sub-GHz radio**
 - Multimodulation: LoRa, (G)FSK, (G)MSK, BPSK
 - 2 embedded power amplifiers:
 - 1 output up to +15 dBm
 - 1 output up to +22 dBm
 - LoRa RX sensitivity: -148 dBm (SF12, BW=10.4kHz)
 - RX: 4.82mA and TX: 15mA (at 10dBm) / 87mA (at 20dBm) [3.3V]
- **Ultra-Low Power consumption**
 - < 71µA/MHz Active mode (3V - RF OFF)
 - 1 µA Stop2 mode with RAM retention
 - 390 nA Standby mode with RTC
 - 31 nA Shutdown mode
- **Peripherals**
 - 3xI²C, 2xUSART, 1xLP-UART, 2xSPI
 - 7x timers + 2x ULP Comparators
- 1.8 to 3.6V voltage range (DC/DC, LDO)
- -40 to up to +105°C temperature range



-> Packages: QFN48, BGA73

STM32WL5x line - a rich feature set

Dual-core and enhanced security

Control	Arm® Cortex®-M4 DSP 48 MHz	Memory
Power supply 1.8 to 3.6 V w/ DCDC+ LDO POR/PDR/PVD/BOR	Nested vector interrupt controller (NVIC)	Up to 256-Kbyte Flash
Crystal oscillators 32 MHz (Radio + HSE) 32.768 KHz (LSE)	Memory protected unit (MPU)	Up to 64-Kbyte SRAM
Internal RC oscillators 32,768 KHz + 16 MHz + 48 MHz ± 1% acc. over V and T(°C)	JTAG/SW debug	CM4 or CM0 Boot Lock
RTC/AWU/CSS	ART Accelerator™	Boot loader
PLL	AHB Bus matrix	Hide protect
SysTick timer	2x DMA 7 channels	
2 watchdogs (WWDG/IWDG)	Radio	Timers
43 GPIOs	LoRa®, (G)FSK, (G)MSK, BPSK	1 x 32-bit timer
Cyclic redundancy check	+15dBm & +22dBm Power Outputs -148 dBm sensitivity (LoRa)	3x 16-bit timers 3x ULP 16-bit timers
Voltage scaling (2 modes)	150 MHz to 960 MHz	Analog
		1x 12-bit ADC SAR 2.5 Msps
		12-bit DAC
		2x ULP comparators
		Temperature sensor
Security	Arm® Cortex®-M0+ 48 MHz	Connectivity
AES 256-bit + TRNG + PCROP	Nested vector interrupt controller (NVIC)	2x SPI, 3x I2C
Tamper detection	Memory protected unit (MPU)	2x USART LIN, smartcard, IrDA, Modem control
Secure Areas	SW debug	1x ULP UART
Secure FW Install		
Debug control		
Boot Selection		
Secure Sub-GHz, MAC Layer, SFI		
Key Management Services		

KEY FEATURES

- Arm® Cortex®-M4 & DSP up to 48 MHz
- Up to 256 Kbytes of Flash and 64 Kbytes of SRAM
- **Arm® Cortex®-M0+ up to 48 MHz**
- **sub-GHz Radio**
 - Multi-modulation: LoRa, (G)FSK, (G)MSK, BPSK
 - 2 embedded power amplifiers:
 - 1 output up to +15 dBm
 - 1 output up to +22 dBm
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- **Ultra-Low Power consumption**
 - < 71µA/MHz Active mode (3V - RF OFF)
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 - 390 nA Standby mode with RTC
 - 31 nA Shutdown mode
- **Peripherals**
 - 3xI²C, 2xUSART, 1xLP-UART, 2xSPI
 - 7x timers + 2x ULP Comparators
- **Advanced security features**
 - 1.8 to 3.6V voltage range (DC/DC, LDO)
 - -40 to up to +105°C temperature range



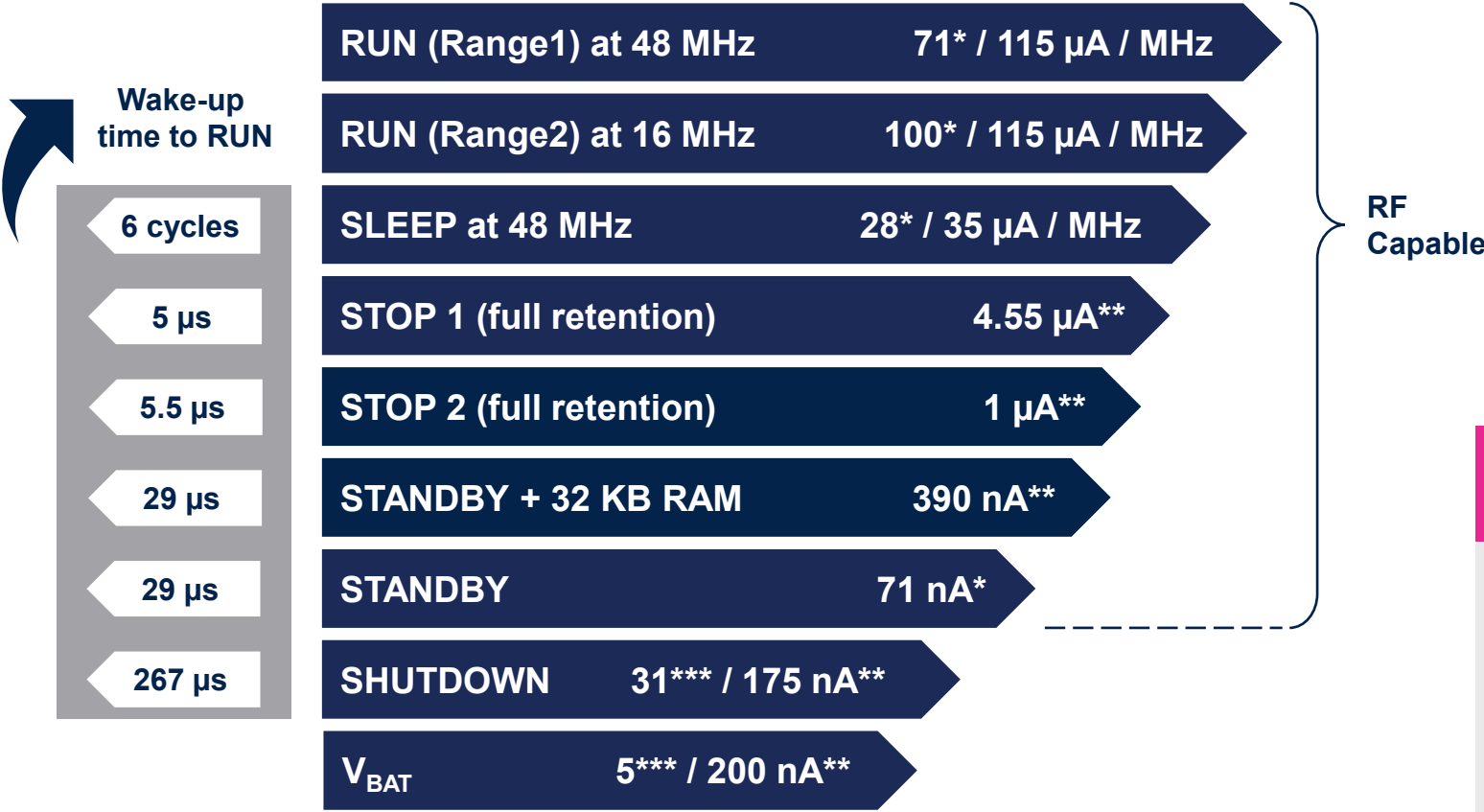
-> Packages: QFN48, BGA73

A flexible power scheme



Flexible power scheme FlexPowerControl

Typ with LDO @ $V_{DD} = 3\text{ V}$ @ $25\text{ }^\circ\text{C}$



* Typical values with SMPS, RF OFF
 ** with RTC on LSE Bypass
 *** All OFF

Benchmark scores

- High efficiency
 → CoreMark score = 162
- Ultralow power platform
 → ULPBbench score \approx 204

Flexible power scheme matching your application needs

LPWAN made easy through ultra-low-power trade-offs

Power mode	Arm® Cortex®-M4 and/or Cortex-M0+	Peripherals	RAM Retention	RF
Run	✓	✓	✓	✓
Sleep	✗	✓	✓	✓
Stop 0	✗	✓	✓	✓
Stop 1	✗	✓	✓	✓
Stop 2	✗	Subset	✓	✓
Standby	✗	✗	✓	✓
Shutdown	✗	✗	✗	✗

Seamless toolbox (I²C, SPI, USART, ADC/DAC, Timers, comparators etc.)

RF available In all power modes

Back-up registers are **always** available

Efficient power management stop mode comparison

Flexible peripherals: power mapping

		STOP0	STOP1	STOP2
Consumption (without real-time clock)		Typ, 25 °C, 3 V, LDO		
		400 µA	4.55 µA	1 µA
Wake up time to 48 MHz	Flash	2.2 µs	5 µs	5.5 µs
	RAM	2.2 µs	5.1 µs	5.5 µs
Wake up clock		≤ 48 MHz		
Regulator		Main or Low-Power regulator		Low-power regulator
Peripherals		All	All	CSS, RTC, 3 tamper pins, 1x LPUART, 1x I ² C, VREFBUF, 2x COMP, 1x LPTIM, Dual-WDG, CRC, EXTI

No impact on wake up time from embedded DCDC

Ultralow power & IoT-ready for worldwide applications

Best LoRa-enabled IP on the market

Transmission		
Parameter	Settings	Value
TX	+10 dBm 868/915 MHz	15 mA DCDC
TX	+20 dBm 868/915 MHz	87 mA DCDC

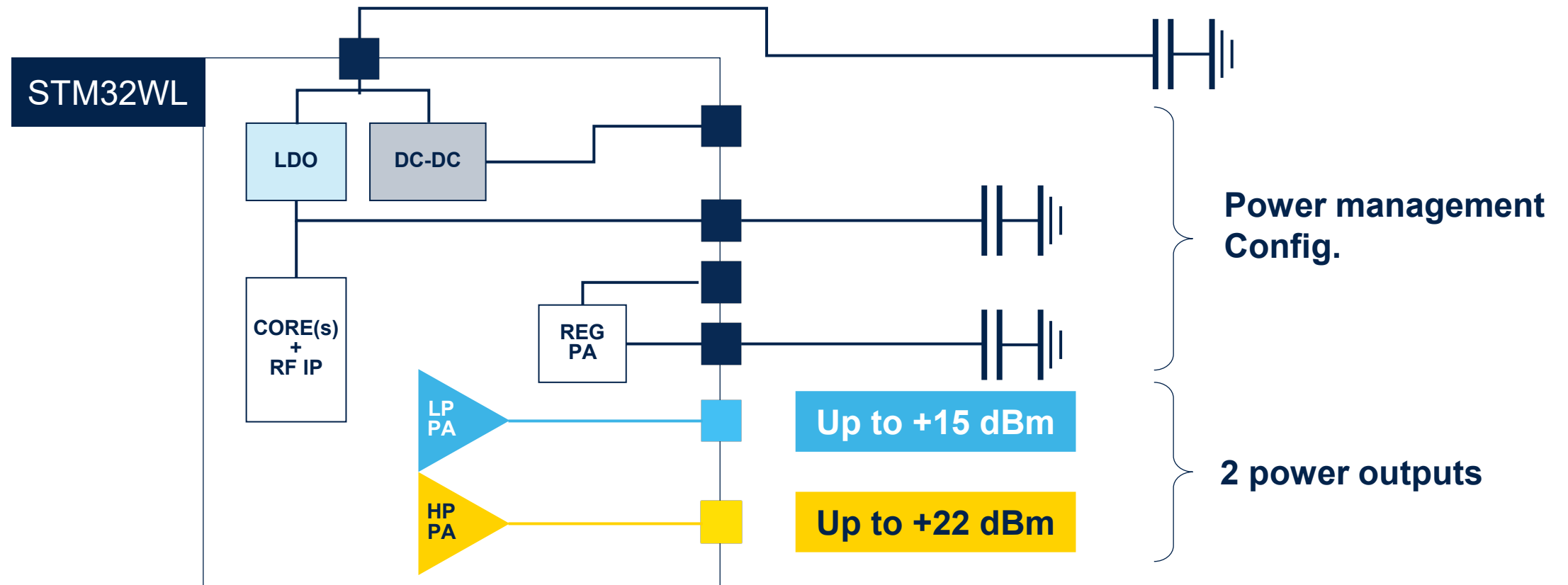


**Worldwide
compatibility**

Reception		
Parameter	Settings	Value
LoRa sensitivity	BW_L = 10.4 kHz SF = 12	-148 dBm
2-FSK Sensitivity	BR_F = 0.6 kb/s FDA = 0.8 kHz BW_F = 4 kHz	-125 dBm
RX	FSK 4.8kb/s buck 100mA max	4.47 mA DCDC 8.18 mA LDO
RX	LoRa® 125 kHz	4.82 mA DCDC 8.9 mA LDO

Flexible power implementation

Tailor STM32WL to the requirements of IoT applications



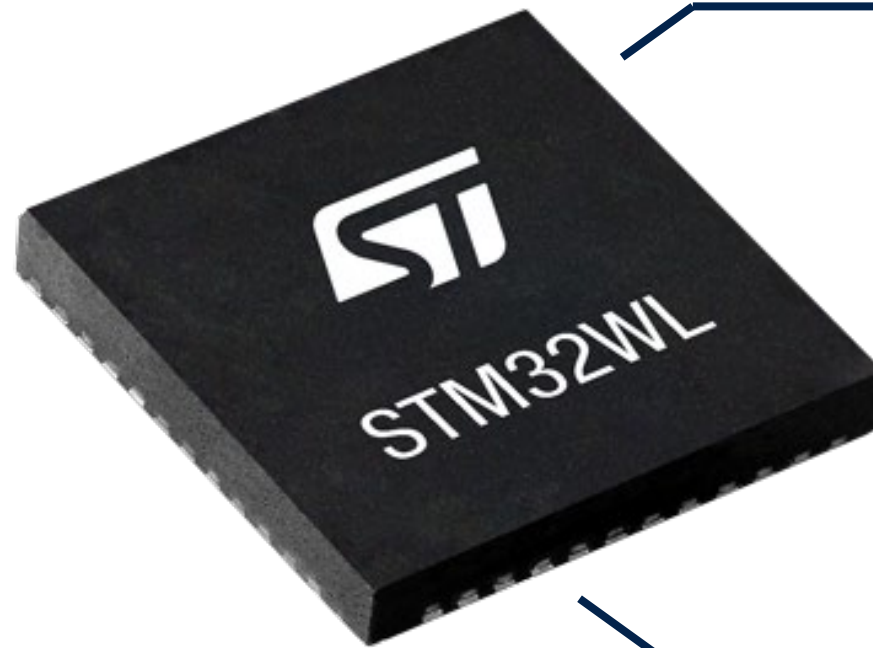
STM32WL: no more TCXO!

Minimize your BOM costs, maximize your revenues

LoRaWAN[®]

AND / OR

sigfox




**No need for TCXOs:
a simple crystal
(XO) is all you need**

Advanced features, security, and stacks




Safety and security

Secure your application with embedded safety & security



Safety

- Back-up clock circuitry
- Supply monitoring
- Dual watchdog
- Flash memory with ECC (address status register)
- SRAM Parity check
- Cyclic Redundancy Check
- Brown-out reset in all modes
- Clock security system
- Backup byte registers



Security

- Tamper detection
- Read & Write protection
- Memory protection unit (MPU)
- Software IP Protection
- True random number generator
- AES and public key accelerator
- Unique IDs (64- and 96-bit)
- Boot-Lock in user flash memory
- **Secure hardware isolation between CM4 / CM0**
- **Boot selection**
- **Secure boot code protection**
- **Debug control**
- **Secure firmware install**
- **Secure Boot Secure Firmware Update***
- **Key Management Services***
- **Crypto Library***

Available on
STM32WL5x dual-core versions

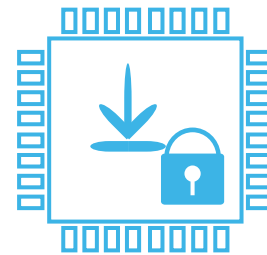
Dual-core security features



Data encryption

Secure Key Management Services

- Store keys in a dedicated memory area
- Secure memory area size is programmable
- Any type of key or secure object can be stored



Secure download

Secure Firmware Install or Update

- Embedded Secure Firmware Install (SFI) to secure manufacturing from untrusted manufacturer
- Customizable In the-field update (SBSFU) to perform extremely secure upgrade of the platform



Firmware IP Protection

Secure Boot (Root of trust)

- Boot from the right secure memory location
- Each application firmware is authenticated before being executed



Authentication

Crypto

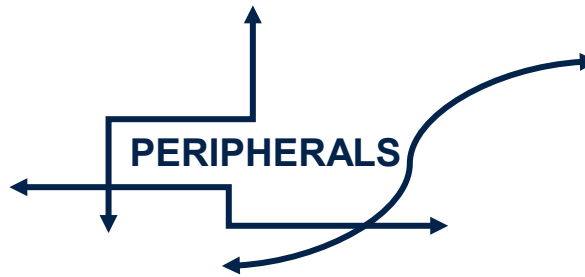
- Embedded HW crypto accelerators for high performances. Supports ECC signature generation and verification
- True Random Generator
- Software Crypto Library to support additionally DES/TDES, ARC4, HASH, Poly, CHACHA, MD5 etc.

STM32WL the most secure sub-GHz SoC

Security in every corner with a dual-core architecture



- Secure System Flash Area (SFI/RSS)
- Memory Privilege watermarking, controlled by Secure Areas for the Flash and SRAM areas + Hide Protected Area (HDPA)
- Cortex-M0+ SRAM execution prevention



- Secure Area-aware configurable peripherals :
 - AES, PKA, TRNG, SPI3
 - DMA/DMAMUX channels
- Security by Option Bytes



- Independent configurable debug access to CM4 and CM0+
- Customer Secure Boot can be protected against debug
- Cortex-M0+ debug:
 - Can be disabled by User Option.
 - Disabled when executing system Flash SFI/RSS services



Configurable Flash Interface

Secure Areas & Interrupt Controllers

Power Controller

Secure boot and chain of trust

Firmware start and execution are always trusted



Reset



Secure Boot



Authentication



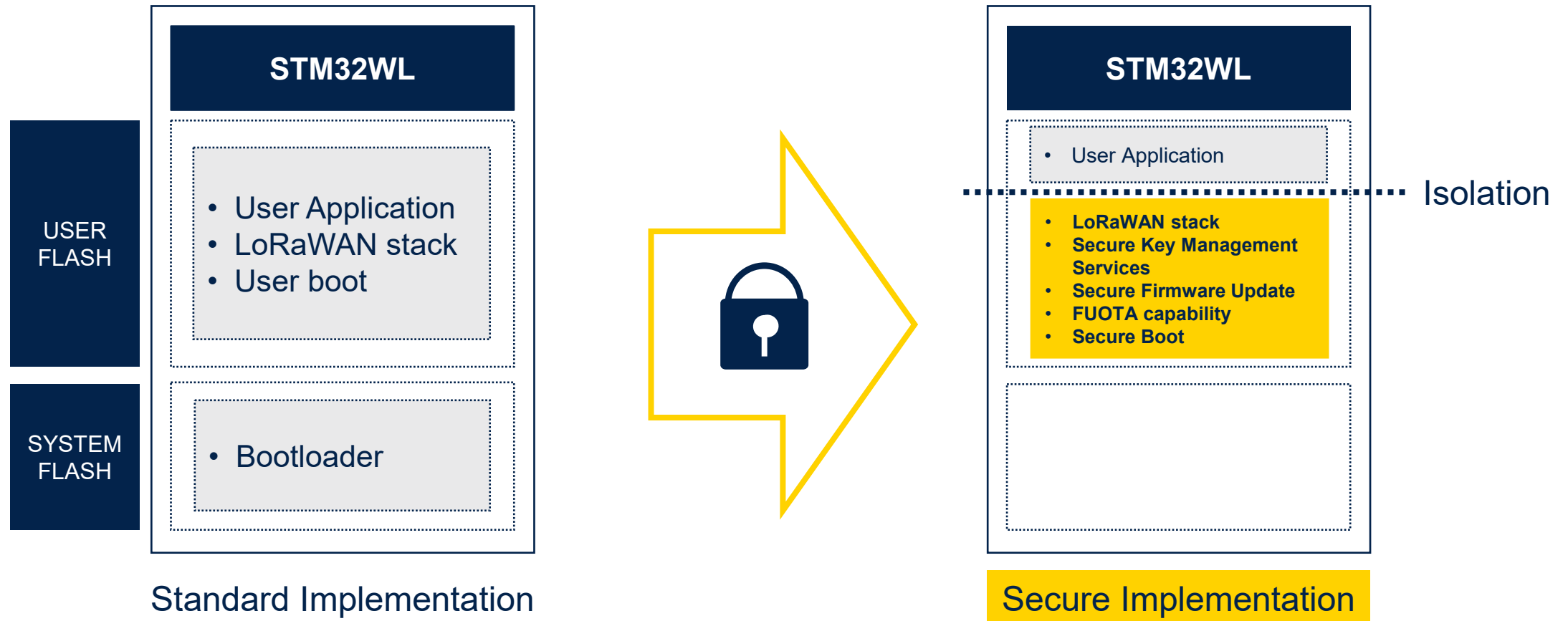
Execution



- A secure Boot, locked and protected against debug, is executed first at reset
- Next steps are authenticated and certified (RF stack & User Application)
- Next execution steps can then be started in a trusted way

Bring more security to your LoRaWAN® apps

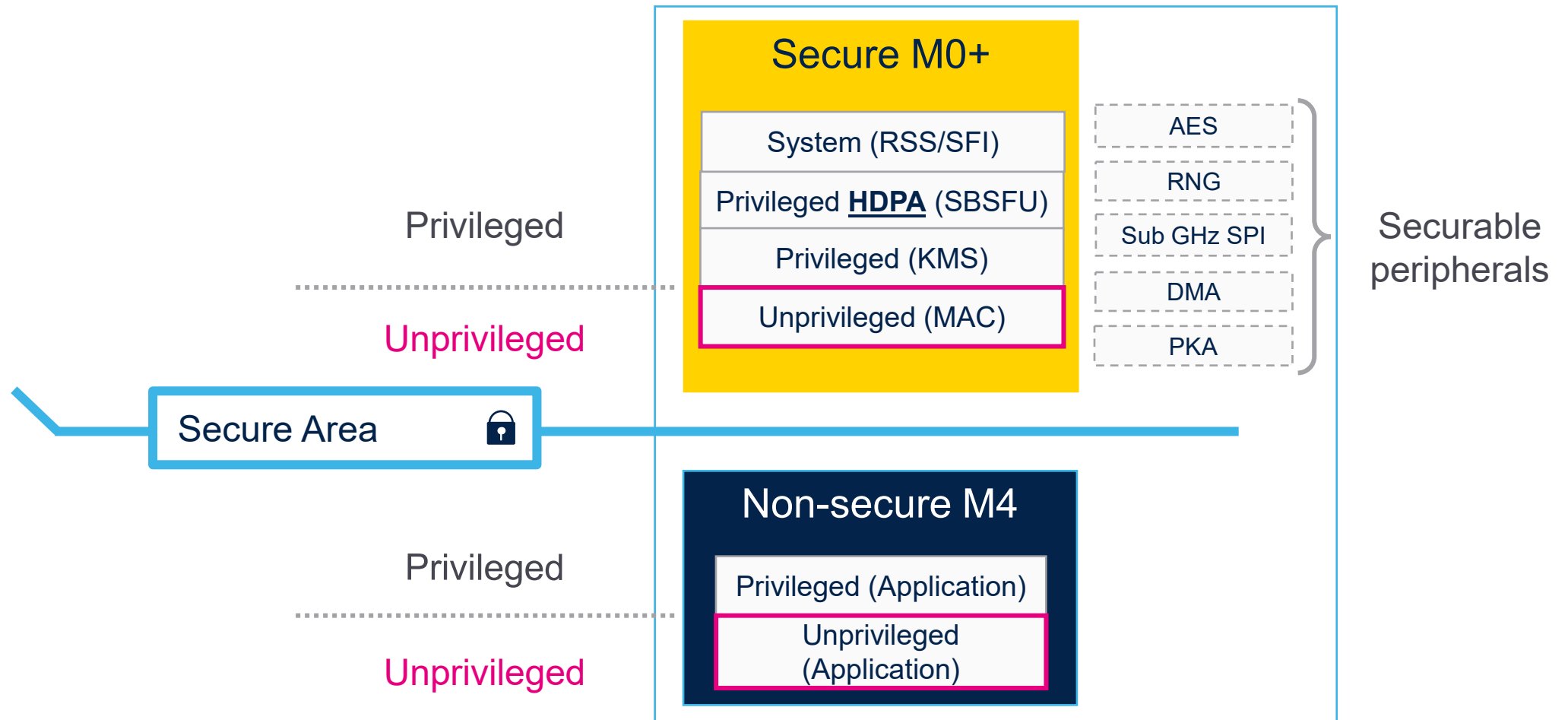
Your implementation, your choice



Security overview

dual-core secure implementation example

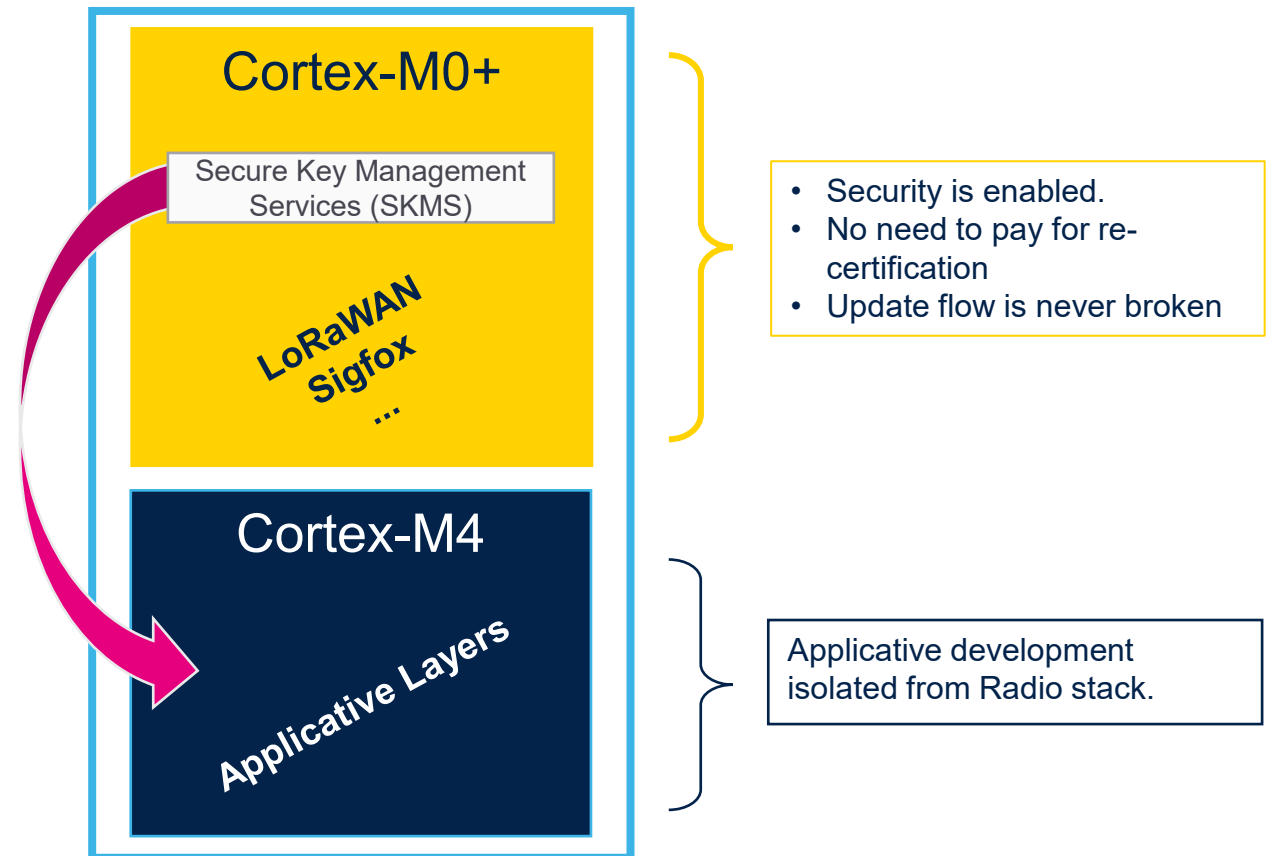
6 security domains for hardware + software isolation



Dual-core firmware isolation example

How to ensure devices are IoT-ready with radio certification in mind

- Cortex-M4 (non-secure)
 - Non-secure / Open debug
 - Intended for Application Code
- Cortex-M0+ (secure)
 - Secure code & data / Closed debug
 - Intended for radio stack isolated from Application
 - Secure FW Upgrade included (with ST keys)
 - Key Management Services for Application side (CM4) (Customers Key)



Memory security & privilege access

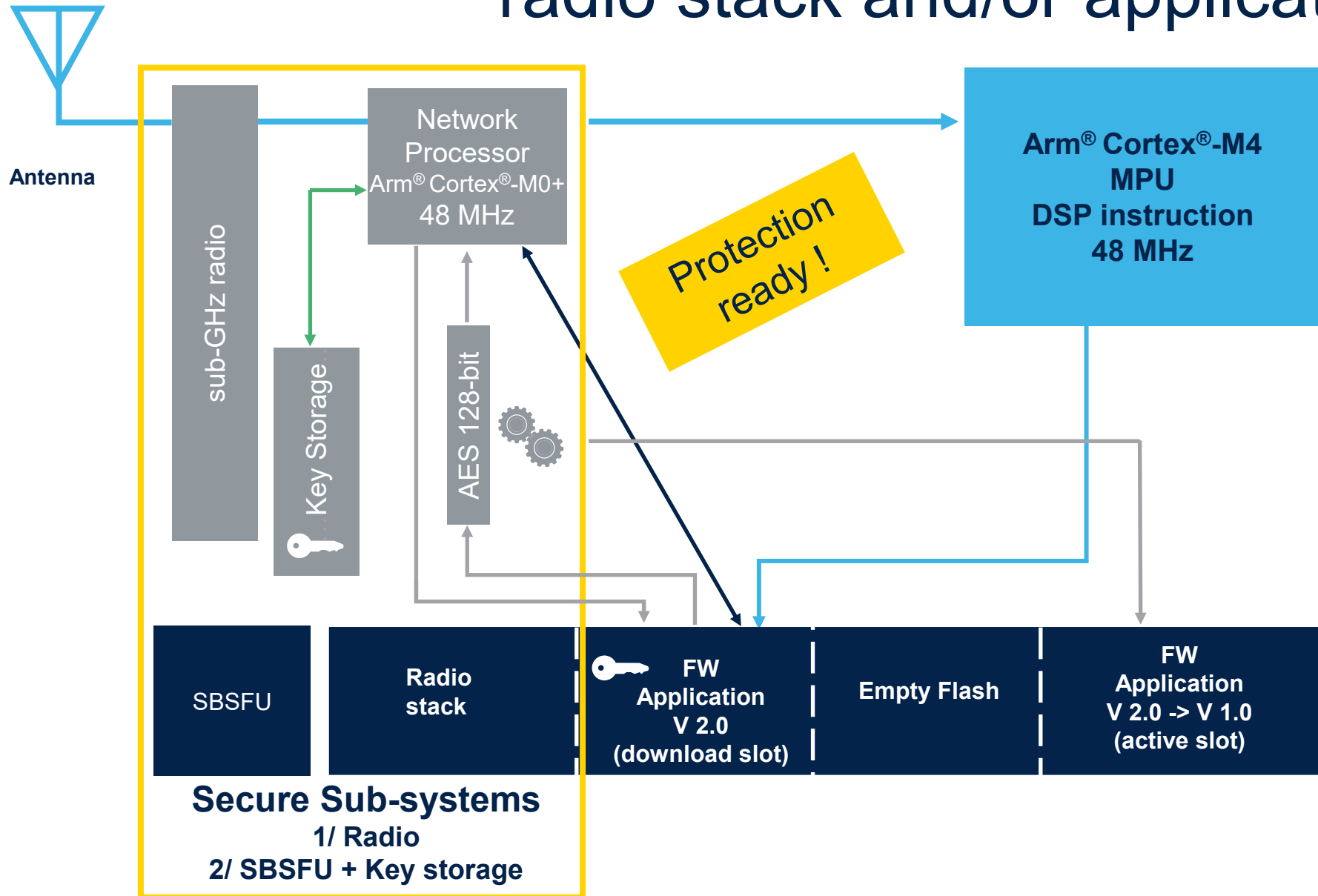
Secure firmware development

Memory Area		Core / DMA		M0+ Hide Protection Secure	M0+ Secure	M0+ UNPRIVILEGED	M4 Non-Secure	M4 Non-Secure UNPRIVILEGED	DMA Secure	DMA Secure UNPRIVILEGED	DMA Non-Secure	DMA Non-Secure UNPRIVILEGED	
Flash	X	Hide Protection Secure	✓	✗	✗	✗	✗	✗	RW	✗	✗	✗	
		SRAM	Secure	✓	✓	✗	✗	✗	RW	✗	✗	✗	
	X	Secure UNPRIVILEGED	✓	✓	✓	✗	✗	✗	RW	R	✗	✗	
		SRAM	Secure UNPRIVILEGED	✓	✓	✓	✗	✗	✗	RW	RW	✗	✗
			Non-Secure	RW	RW	✗	✓	✗	✗	RW	✗	RW	✗
			Non-Secure UNPRIVILEGED	RW	RW	RW	✓	✓	✓	RW	RW	RW	RW

Legend: Secure Non-Secure UNPRIVILEGED Unprivileged execution (privileged otherwise)

IoT protection ready (1/2)

radio stack and/or application FW update



- ① New FW package downloaded
- ② New FW detected
Update is launched
- ③ Authentication signature matches target signature.
In case not, the process is aborted and device resets
- ④ New FW package is decrypted with proprietary Key. FW updates on going.

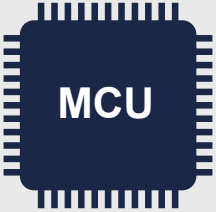

IoT protection ready (2/2)

STM32WL countermeasures against attacks

Advanced

Basic



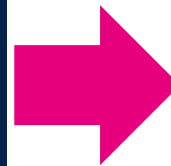
Attacks	Forms of attacks	STM32WL countermeasures
<p>Non-Invasive Attacks</p> 	<ul style="list-style-type: none"> • Environment modification <ul style="list-style-type: none"> • Temperature • Voltage • Clock • ... • Fault injection (glitches...) • Exploit debug features • Side channel, power Analysis... 	<ul style="list-style-type: none"> • Temperature sensor • Power supply integrity monitor • Clock security system • Tamper pads • Watchdog • Memory ECC, Parity check • RTC alarm, Backup registers, SRAM mass erase • JTAG Read out protection • BOOT from Flash only
<p>Software Attacks</p> 	<ul style="list-style-type: none"> • Low Authentication / Encryption • Extract keys • Exploitation of applicative test features • Malware / Virus • Replay, privilege escalation 	<ul style="list-style-type: none"> • Key Storage (KS) • RNG, Crypto accelerator, CRC • Write memory protection (WRP) • Read Out memory protection (RDP) • Memory Protection Unit (MPU) • Secure Areas • Secure Boot (SB) • Secure Firmware Update (SFU) • Proprietary Code Read-Out Protection (PCROP) • 96-bit ID

Security takeaways

2 independent cores for maximum flexibility

Application benefits

- ST Secure Firmware Install (SFI/RSS)
- Secure Boot (SB)
- Secure Firmware Update (SFU)
- Secure Key Management Services (KMS)
- Secure radio MAC layer communication
- Up to 6 Security domains
- Chain of trust

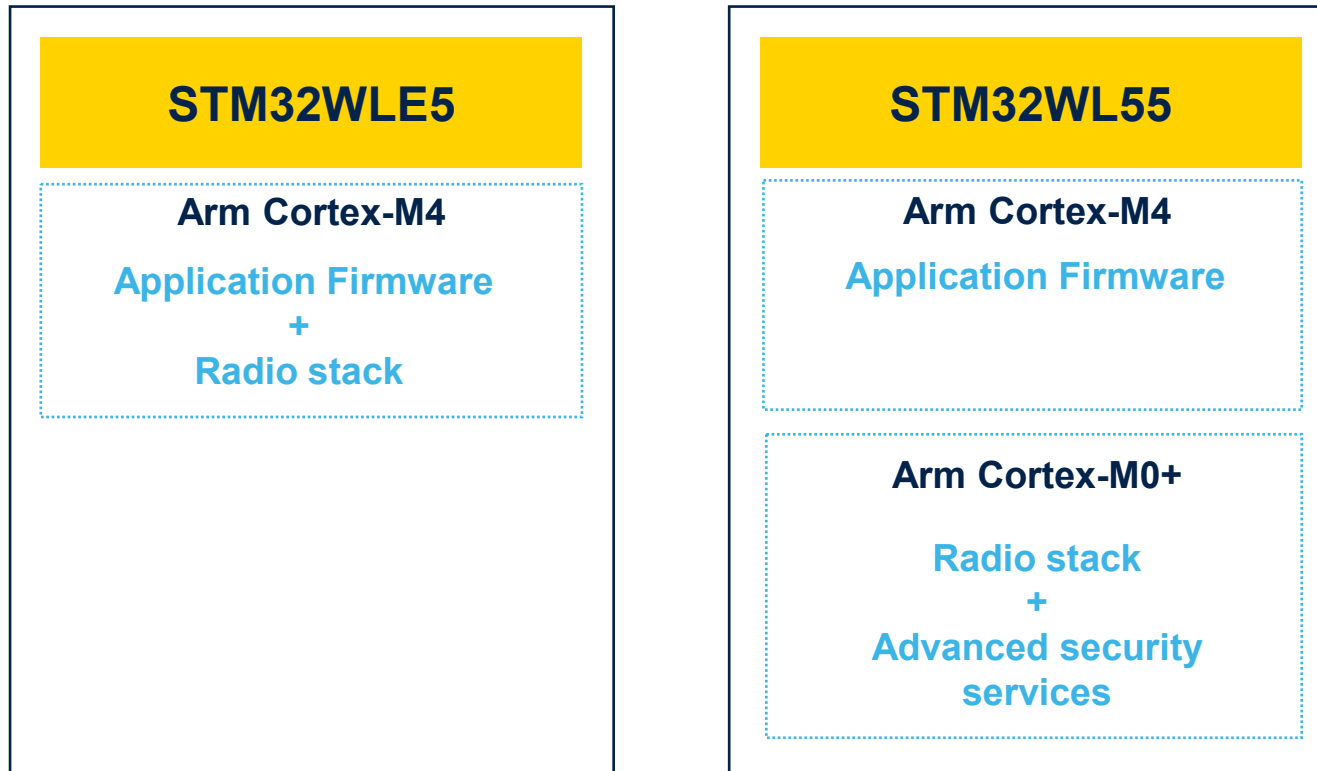


Customer benefits

- Flexible Security implementation
- IP protection
- Non cloneable device
- Trustability of the device, anti-hacking
- Trustable fleet maintenance

LoRaWAN - Chips & stacks delivery model

Open chips, takeaway stacks



Certified LoRaWAN stack

- *Open stack*
- *Available from st.com/STM32CubeWL*

Open platform

Enjoy Sigfox wherever you are

An open SoC for a global network



sigfox

STM32WLE5

Arm Cortex-M4
Application Firmware
+
Radio stack

STM32WL55

Arm Cortex-M4
Application Firmware

Arm Cortex-M0+
Radio stack
+
Advanced security
services

**Certified stack from RC1 to RC7
+ Monarch certified!**

- *Open stack*
- *Available from st.com/STM32CubeWL*

STM32WL and W-MBUS

STM32WL is ideal for smart metering applications

STACKFORCE
embedded.connectivity.solutions

STM32 Partner



Please contact Stackforce Sales Office to get W-MBUS stack for STM32WL

STM32WL – W-MBUS Modes

STM32WL is ideal for smart metering applications



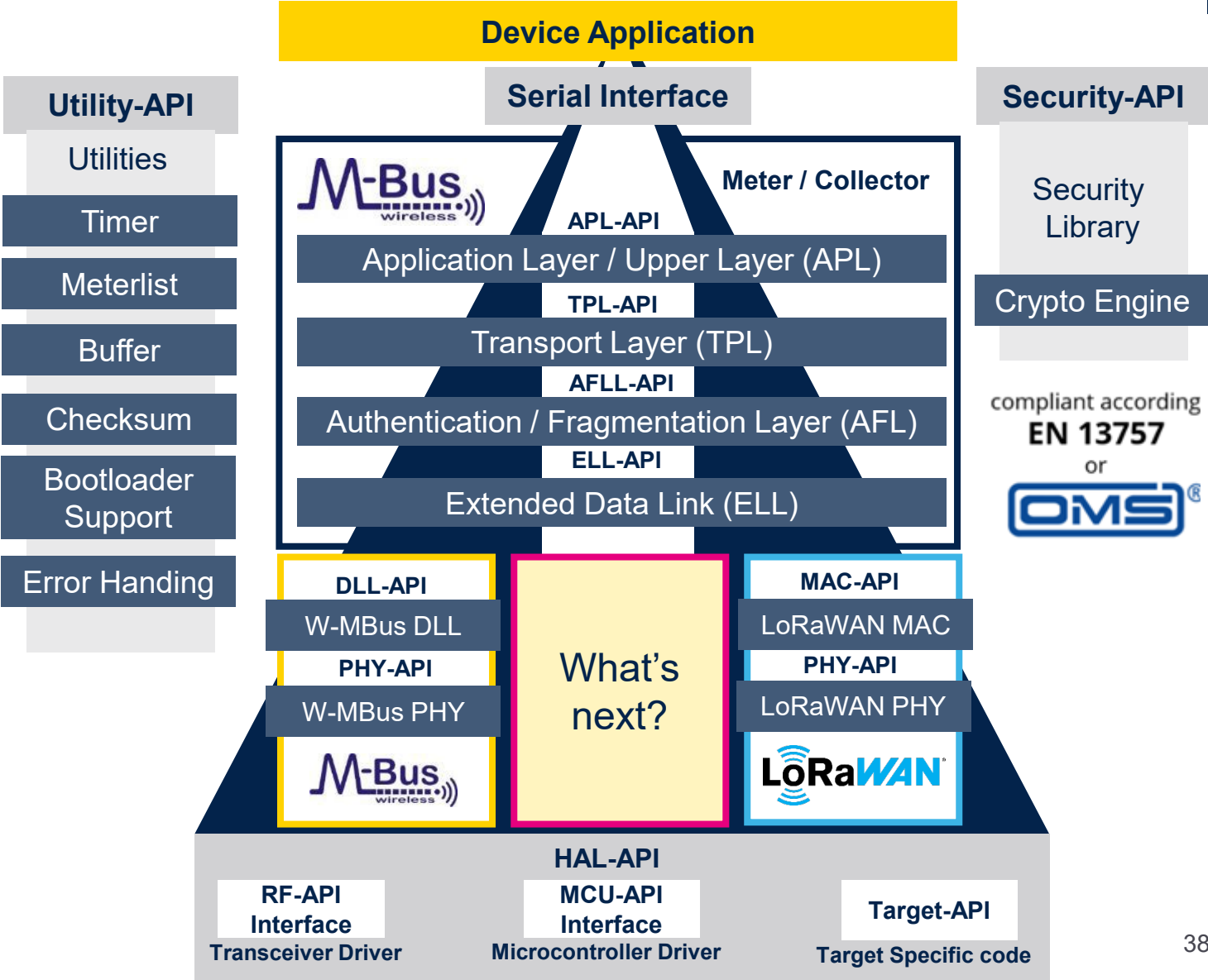
- **Mode S: Stationary** **868 MHz**
 - *Meters send data few times a day*
- **Mode T: Frequent Transmit** **868 MHz**
 - *Meters send data several times a day*
- **Mode C: Compact** **868 MHz**
 - *Higher data rate version of mode T*
- **Mode N: Narrowband** **169 MHz**
 - *Long range, narrow band system*

From W-MBUS to W-MBUS-over-LoRaWAN

STM32WL for smart metering



- W-MBUS MAC and PHY can be replaced by LoRaWAN Mac and PHY
- W-MBUS benefits from LoRaWAN long-range capabilities and flexibility
- Mioty stack offer also available

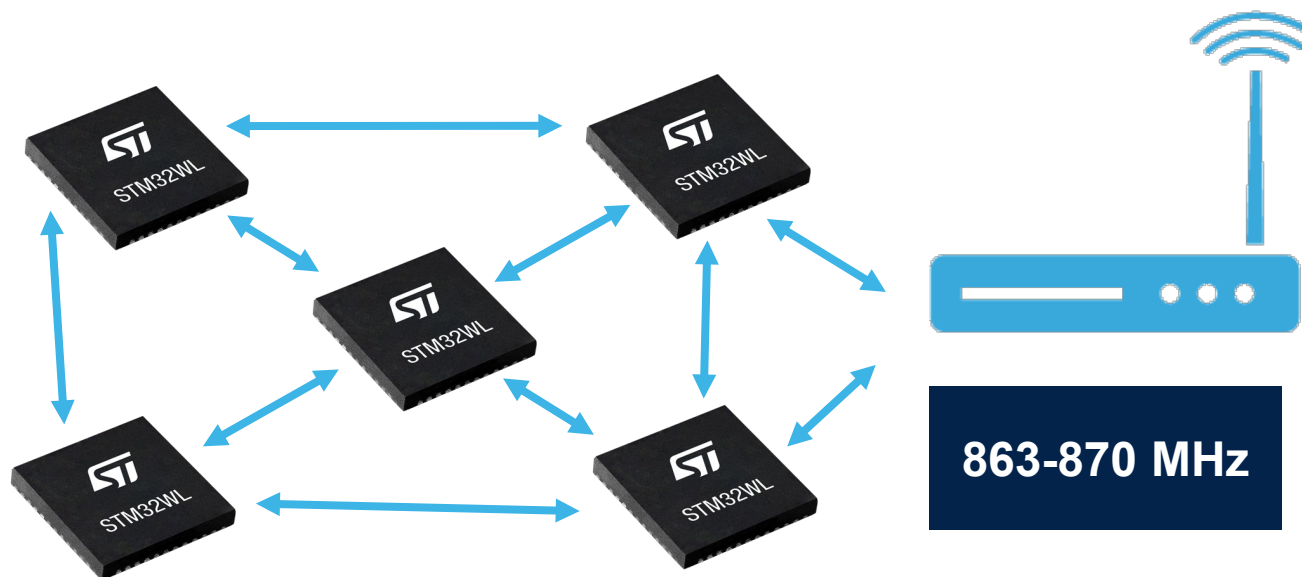


STM32WL and Mesh

Large-scale mesh networking with EmbeTECH



Demo version available for Nucleo boards!



Large scale deployments (1000+ nodes)

Deterministic behavior (simulator available)

Reliable IPv6 /UDP networking

STM32WL and W-MBUS

STM32WL is ideal for smart metering applications



STACKFORCE
embedded.connectivity.solutions

STM32 Partner



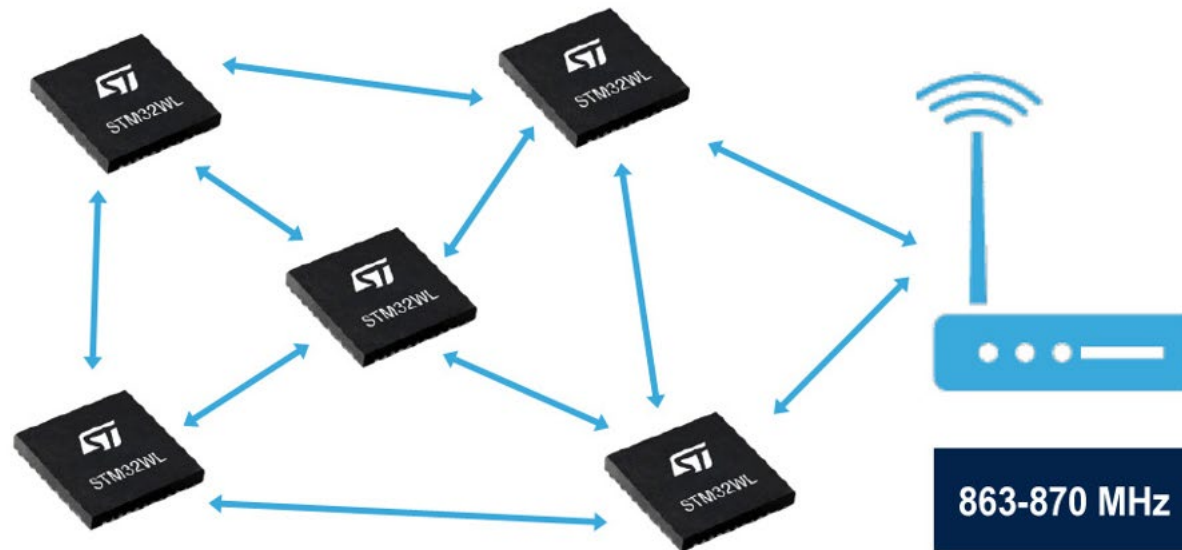
Please contact Stackforce Sales Office to get W-MBUS stack for STM32WL

STM32WL and Mesh by embetech

Large-scale mesh network with



embeNET



**Large scale Deployment
(1000+ nodes)**

**Deterministic behavior
(simulator available)**

**Reliable IPv6/UDP
networking**

Demo version available for Nucleo Boards



*Please contact embetech Sales Office
to get EmbeNET stack for STM32WL
contact@embe.tech*

STM32WL and FUOTA

Firmware Update Over The Air



FUOTA libraries available in STM32CubeWL

Suitable for massive STM32WL fleets updates

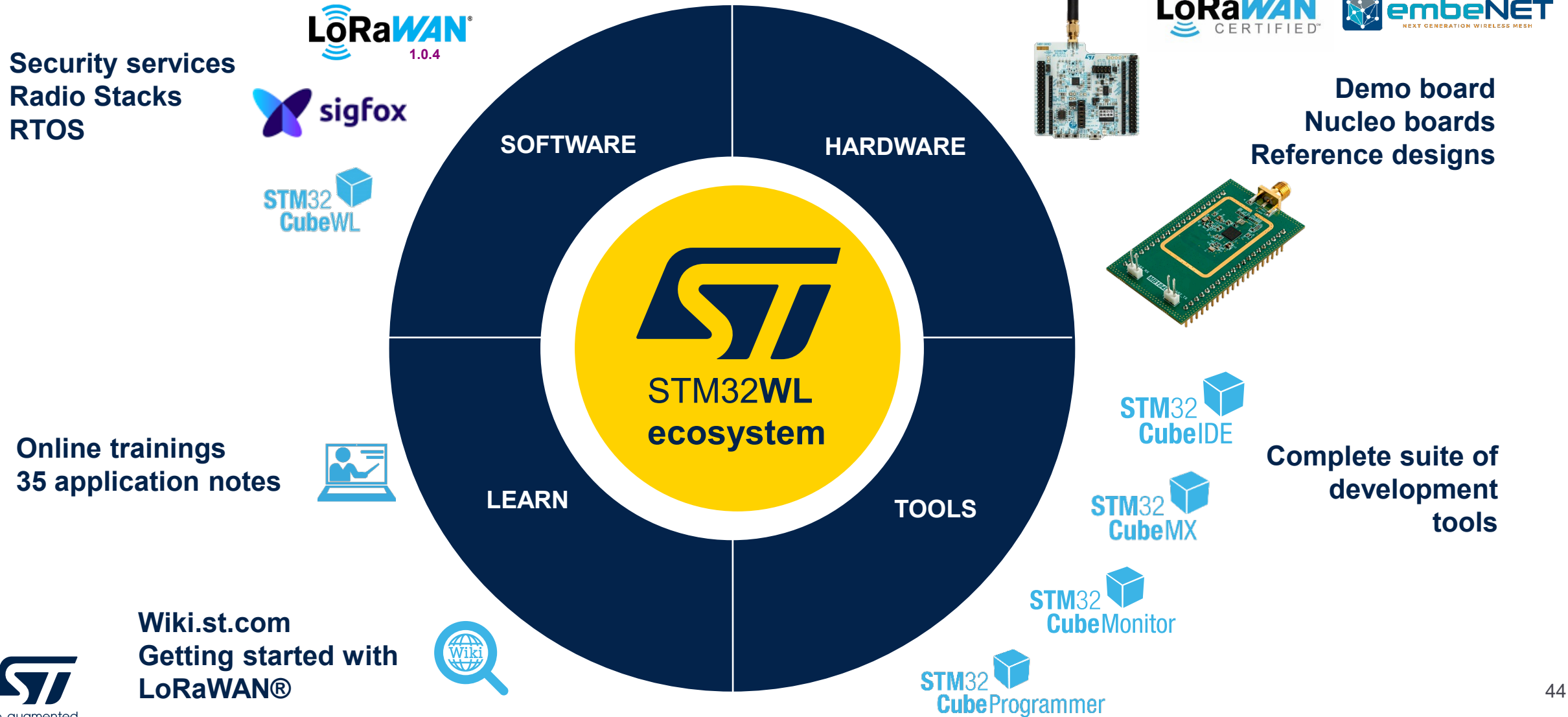
LoRaWAN Network Server agnostic*

Secure Firmware Update

STM32WL ecosystem



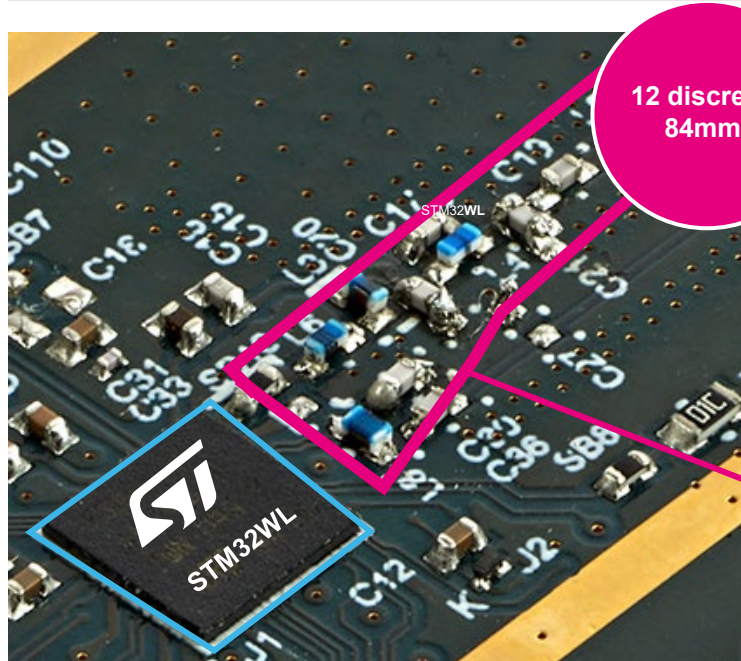
STM32WL reference designs best performance for your country regulation



RF integrated passive device (IPD) for STM32WL

Housed between STM32WL and the antenna,
From discrete to RF IPD

BEFORE



12 discretes
84mm²

Discrete balun, filter
& matching network

AFTER



1 component
3.8mm²

RF IPD balun, filter
& matching network



Wireless MCU

 Wireless MCU

life.augmented

RF IPD for STM32WL

Ready-to-use, between the STM32WL and the antenna

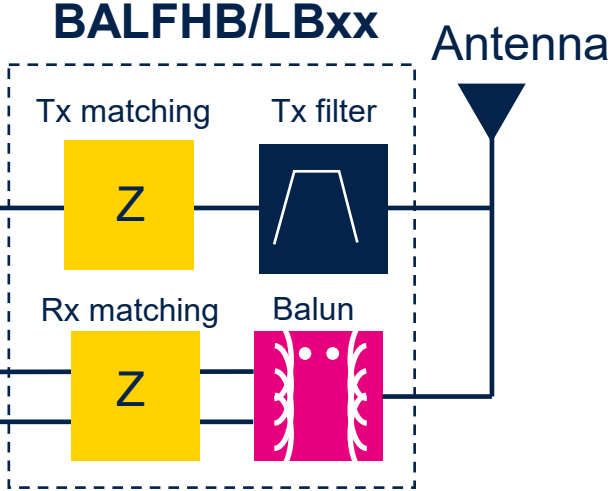
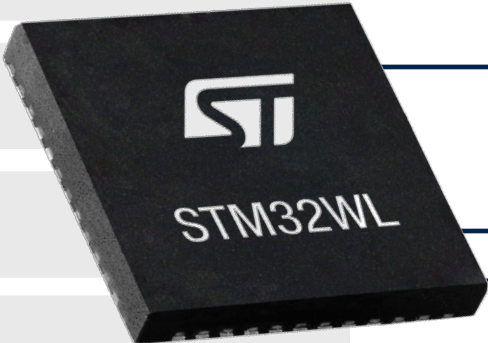
Design simplification

Performance optimization

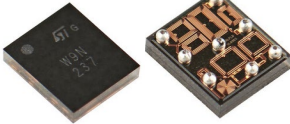
System integration

Reliability improvement

BOM reduction



Tx and Rx matching,
Rx Balun,
Tx Filtering
All in 1.8 x 2.13 mm



RF IPD die

STM32WL IPD tailored for your needs

Pick-up your own IPD and start your wireless design

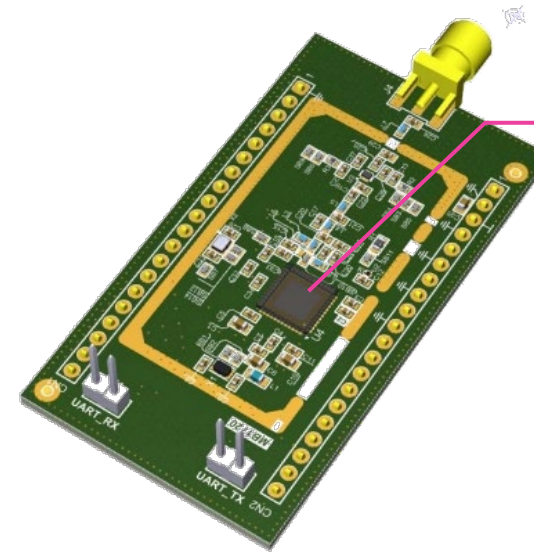
Select your IPD fine-tuned for your application

Power Frequency	22 dBm 864-928 MHz			15 dBm 864-928 MHz		
#PCB Layers	4	4	2	4	4	2
STM32WL BGA	BALFHB-WL-01D3			BALFHB-WL-04D3		
STM32WL QFN		BALFHB-WL-02D3	BALFHB-WL-03D3		BALFHB-WL-05D3	BALFHB-WL-06D3

Power Frequency	17 dBm 470-530 MHz		
#PCB Layers	4	4	2
STM32WL BGA	BALFLB-WL-07D3		
STM32WL QFN		BALFLB-WL-08D3	BALFLB-WL-09D3

STM32WL BGA	STM32WL5xJxlx STM32WLExJxlx
STM32WL QFN	STM32WL5xCxUx STM32WLExCxUx

Download schematics and layout

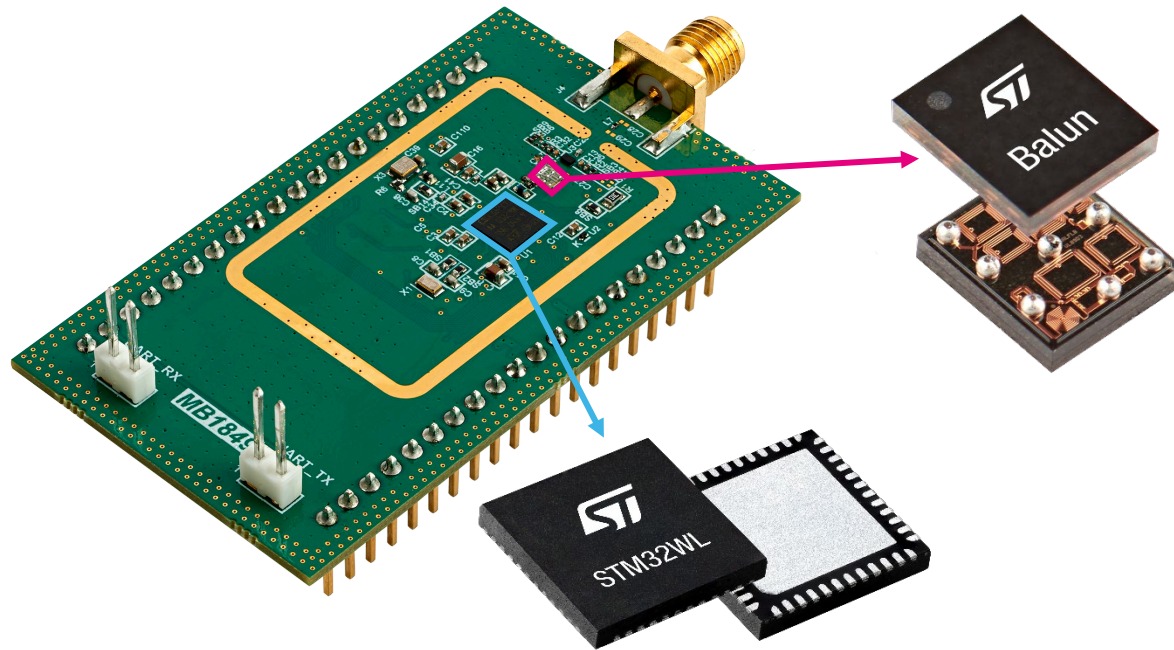


STM32WL REFERENCE DESIGN

- **Fast time to market**
FCC/CE certified open hardware
- **Worldwide support:**
Optimized for frequency regulation
- **Material available:**
Schematics & Layout

STM32WL reference designs

Get ready to start your LoRaWAN® application



Fast time to market

FCC/CE certified open hardware

Worldwide support

- Optimized for frequency regulation

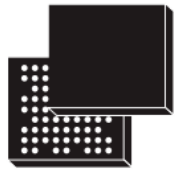
Material available

- Supply and SMPS circuit
- RF matching circuit
- RF filtering circuit
- Discrete and IPD solution

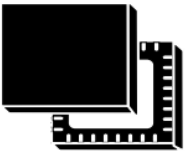


Download free schematics, layout, bill of materials & firmware

STM32WL reference designs best performance for your country regulation



UFBGA73
(5 x 5 mm)



UFQFPN48
(7 x 7 mm)

Frequency & Output Power	[470:530 MHz] 17 dBm	[864:928 MHz] 15 dBm	[864:928 MHz] 22dBm
UFBGA73	STDES-WL5I4SBB		
UFQFPN48	STDES-WL5U4SBB		



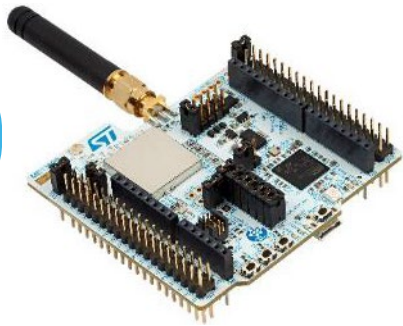
STM32WL reference designs optimized to reduce your BOM cost

Save RX-TX Switch Cost Direct Tie Design	
[433 MHz]/15 dBm	STDES-WL5U4DLB
[864:928 MHz]/15 dBm	
[470:530 MHz]/17 dBm	STDES-WL5U4DHB
[864:928 MHz]/22 dBm	

Save PCB cost: 2-LAYER PCB Design	
[470:530 MHz]/17 dBm	STDES-WL5U2SBB
[864:928 MHz]/15 dBm	
[864:928 MHz]/22 dBm	
[864:928 MHz]/22 dBm	

STM32WL – ecosystem overview

Fully integrated into the rich and market-proven STM32 ecosystem



STM32 Nucleo-64

Flexible prototyping

Dev tools

STM32CubeMX
STM32CubeWL
STM32CubeMonitor
STM32CubeProg
STM32CubeIDE + Partners IDEs

Stacks

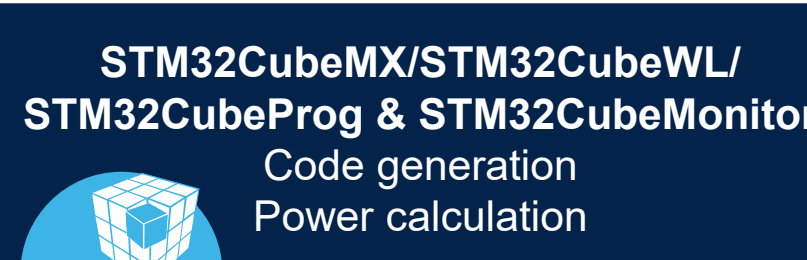

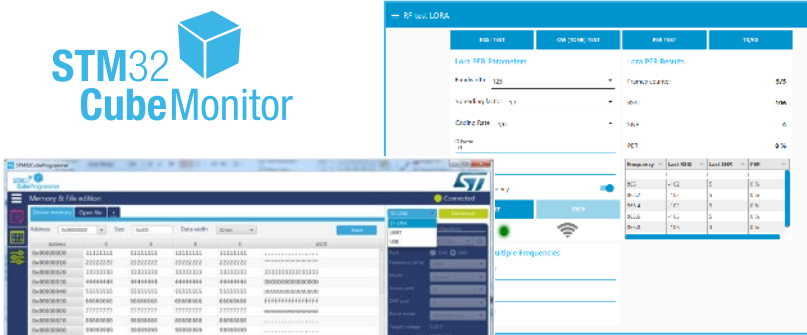
LoRaWAN (ST)
Sigfox (ST)
Wireless-MBUS / Mioty (Stackforce)
ZETA (Zifisense)
EmbeNET (embetech)

Prototyping made as easy as 1,2,3



NUCLEO-WL55JC

**Hardware Evaluation Tool
Nucleo-64 board**



**STM32CubeMX/STM32CubeWL/
STM32CubeProg & STM32CubeMonitor**

Code generation
Power calculation

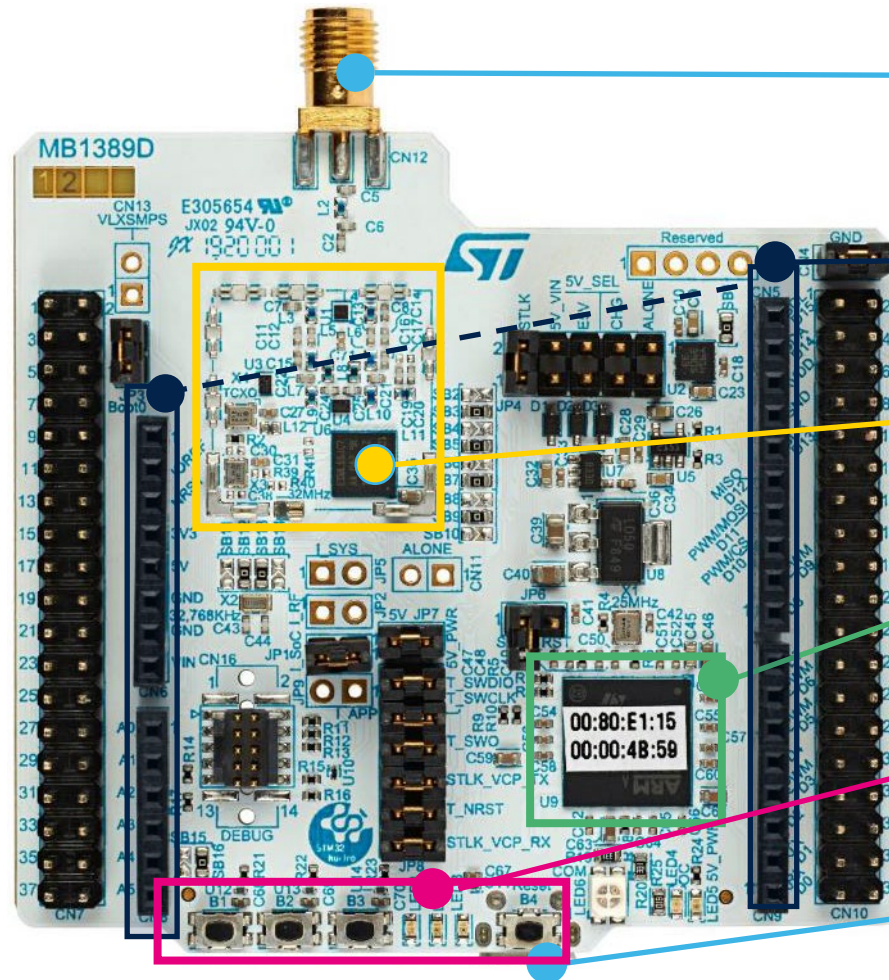
The STM32WL Nucleo-64 at a glance

NUCLEO-WL55JC1

868/915/923 MHz

NUCLEO-WL55JC2

433/470 MHz



SMA Antenna connector

Arduino™ extension connectors :
easy access to add-ons

STM32WL
(under a metallic shield)

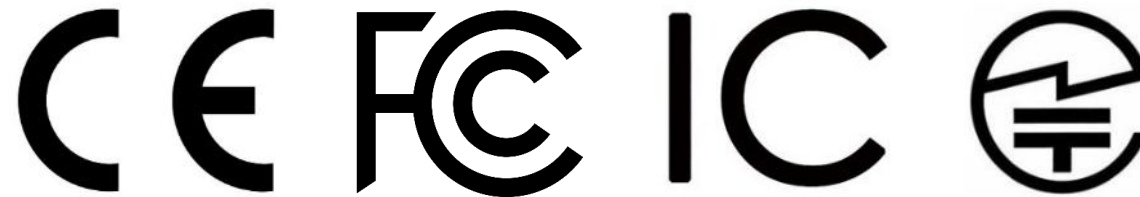
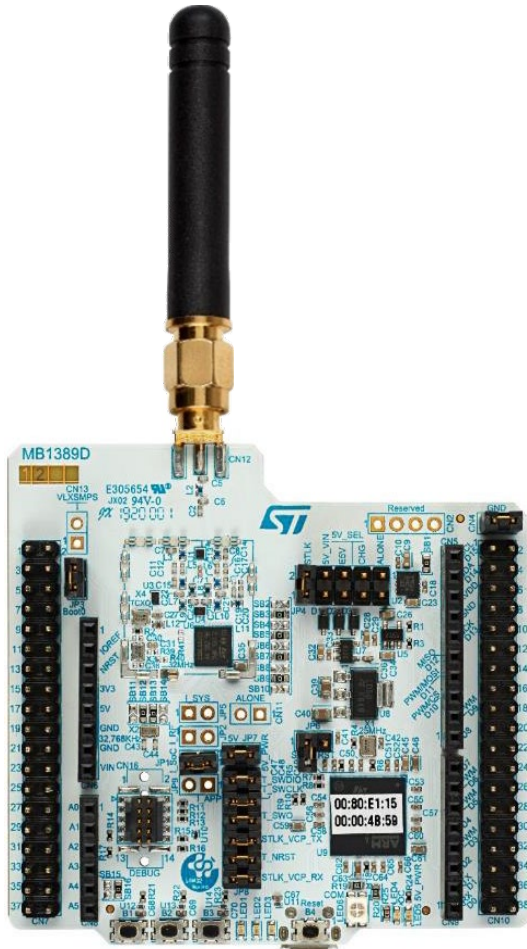
Integrated ST-LINK/V3:
mass storage device flash programming

4 push buttons, 3 color LEDs,
Jumper settings

Flexible board power supply :
through USB or external source

STM32WL - certifications overview

Protocol and commercial certifications

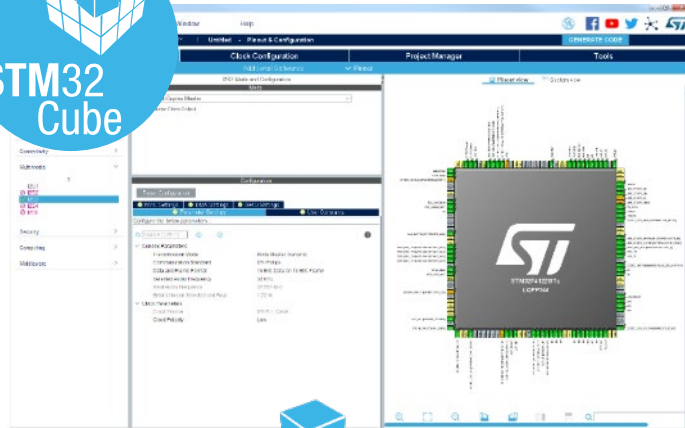


Software development tools

A complete flow, from configuration to monitoring

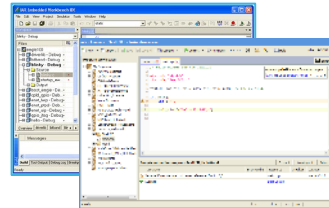


STM32
Cube



STM32
CubeMX

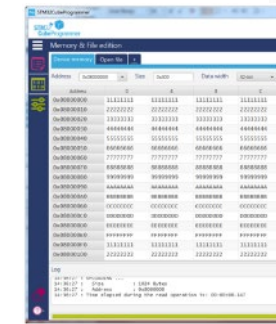
FREE
IDE's



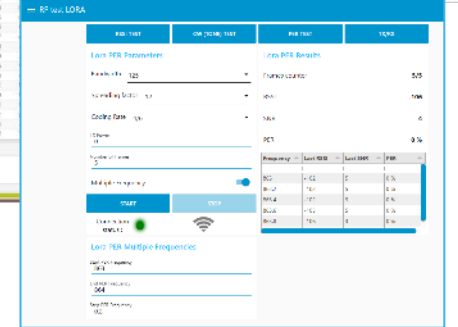
STM32
CubeIDE

More to come after mass market launch

STM32
CubeMonitor



STM32
CubeProgrammer



STM32CubeMX, GUI Builders
Configure & Generate Code

ST and Partner IDEs
Compile and Debug

STM32CubeProg/Monitor
Monitor, Program & Utilities


STM32CubeMonitor

- Wireless features of STM32WL55
 - Multi-Modulation commands
 - sub-GHz RF tests
 - Send Protocols commands
 - Perform LoRaWAN/Sigfox tests

- Suitable for STM32 Nucleo, or custom boards
- USB or UART to Virtual Com Port

The screenshot displays the STM32CubeMonitor interface with several key sections:

- RF test LORA:** A control panel with tabs for RSSI TEST, CW (TONE) TEST, PER TEST, and TX/RX. It includes Lora PER Parameters (Bandwidth: 125, Spreading factor: 12, Coding Rate: 4/5, TX power: 0, Number of frames: 5) and Lora PER Results (Frames counter, RSSI, SNR, PER). A table shows Lora PER Multiple Frequencies with columns for Frequency, Last RSSI, Last SNR, and PER.
- Sensor List:** A table with columns for BU1, Packets (Received, Missed), Signal quality (RSSI, SNR), and Measurements (Temp, Voltage). It shows data for three sensors.
- Serial log:** A window displaying AT commands and responses, such as AT+TCNFR=5660000004124,6,0,1:16250002,3.
- Sensor Data:** Three panels for Sensor 0, Sensor 1, and Sensor 2, each showing a 'Missed Packet' gauge and a 'Temperature °C' line graph.

STM32 
CubeMonitor



Key takeaway: end-to-end ecosystem



Software Tools

STM32
CubeMX

STM32
CubeIDE

1. Configuration

STM32
CubeIDE



arm KEIL

2. Development

STM32
CubeIDE

STM32
CubeProgrammer

3. Programming

STM32
CubeMonitor

4. Monitoring

Embedded Software



STM32
CubeWL

STM32Cube MCU Package



LoRaWAN

sigfox

STM32Cube Expansions &
Function Packs

STM32
CubeExpansion



Save on your application cost

Integrated functionalities helps you drop the BOM down

Optimization of the silicon cost

- Deep integration factor
- System-on-chip avoids to use a second radio
- Less external components
- Single 32 MHz crystal for CPU & embedded radio
- 32 kHz master clock output available
- Possibility to use a 32 MHz crystal (XO) instead of a temperature compensated crystal (TCXO)
- 2-layer PCB enablement with QFN package



Free ecosystem

- LoRaWAN[®] stack
- Sigfox stack
- STM32CubeMX
- STM32CubeMonitor
- STM32CubeProg

STM32 rolling longevity commitment

Longevity commitment is renewed every year



Starting in 2021

- **STM32F1** (launched in **2007**)
- **STM32L1** (launched in **2009**)
- **STM32F2** (launched in **2010**)
- ...
- **STM32WB** (launched in **2018**)
- **STM32G0** (launched in **2018**)
- **STM32G4** (launched in **2019**)
- **STM32WL** (launched in **2020**)

22 years of commitment

20 years of commitment

19 years of commitment

11 years of commitment

11 years of commitment

10 years of commitment

10 years of commitment

Releasing your creativity



[/STM32](#)



[@ST_World](#)



[community.st.com](#)



[www.st.com/STM32WL](#)



[wiki.st.com/stm32mcu](#)



[github.com/STMicroelectronics](#)



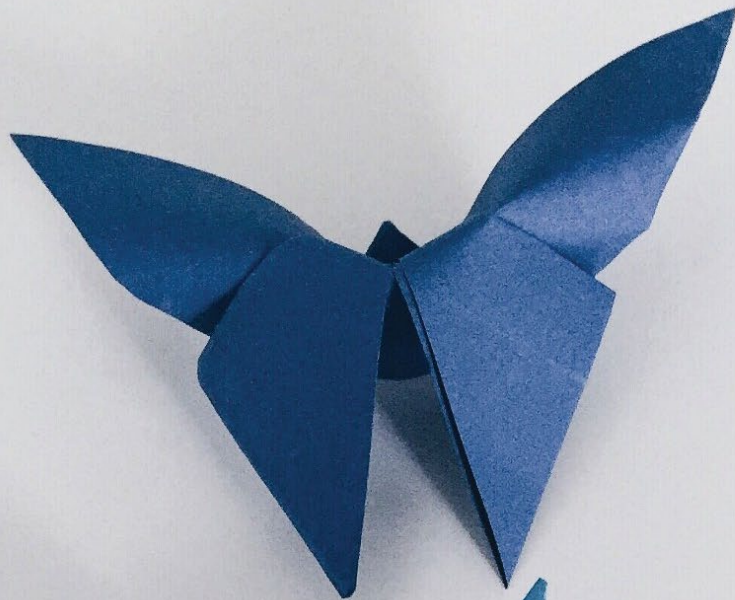
[STM32 Wireless – Video Playlist](#)



[STM32WL blog article](#)



[STM32WL Online Training](#)



Our technology starts with You



Find out more at www.st.com/STM32WL

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life.augmented