CLASE INTRODUCTORIA

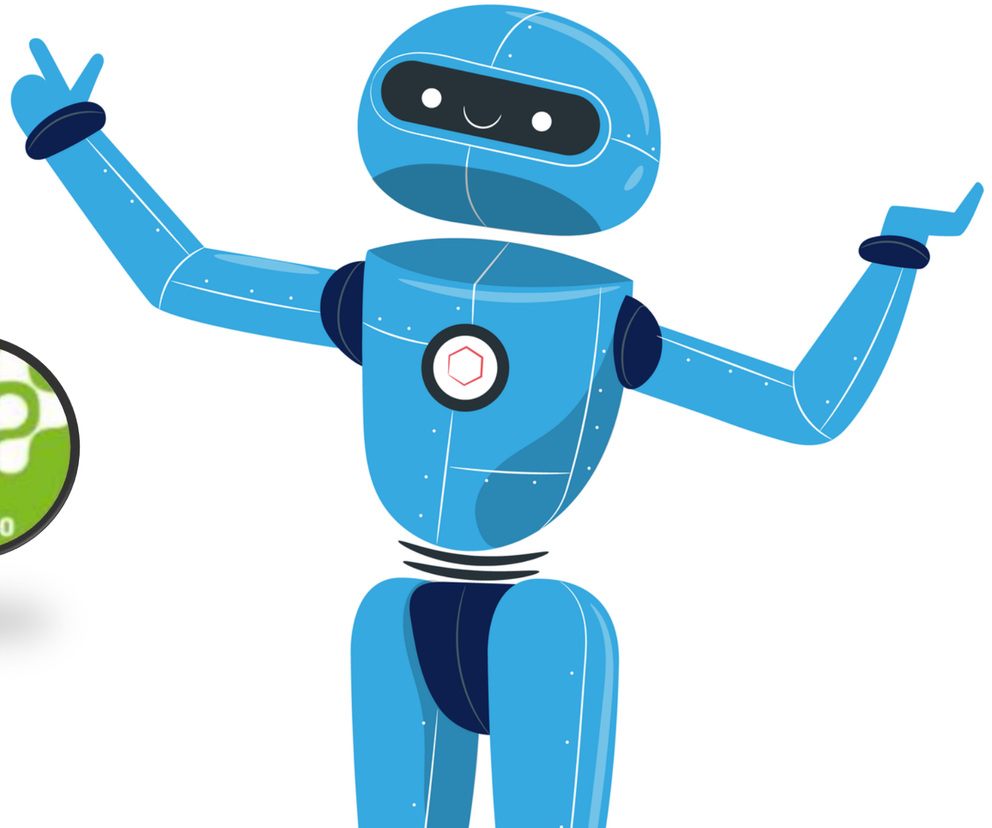
MICROCONTROLADORES

ARM

life.augmented

STM32 L4

STM32 Nucleo



TEXAS INSTRUMENTS

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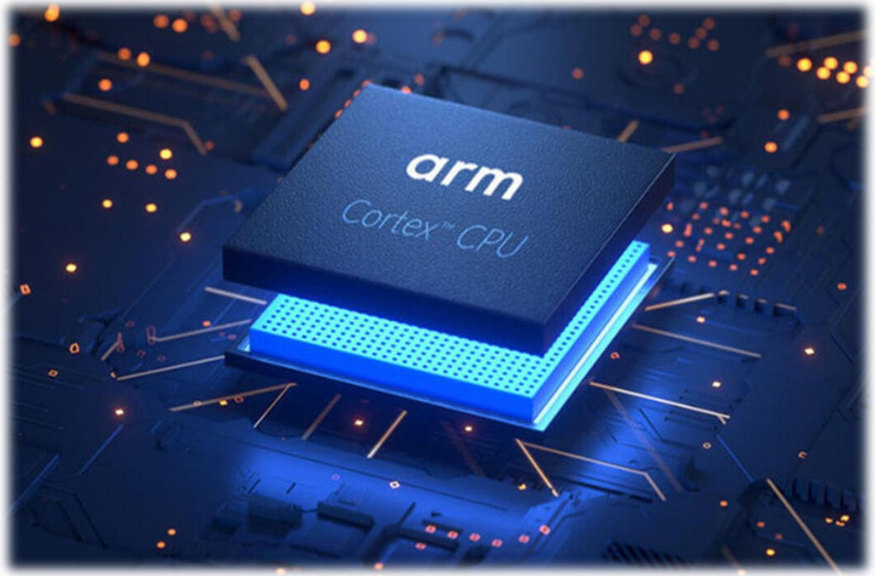
¿QUE ES ARM?

ARM Holdings

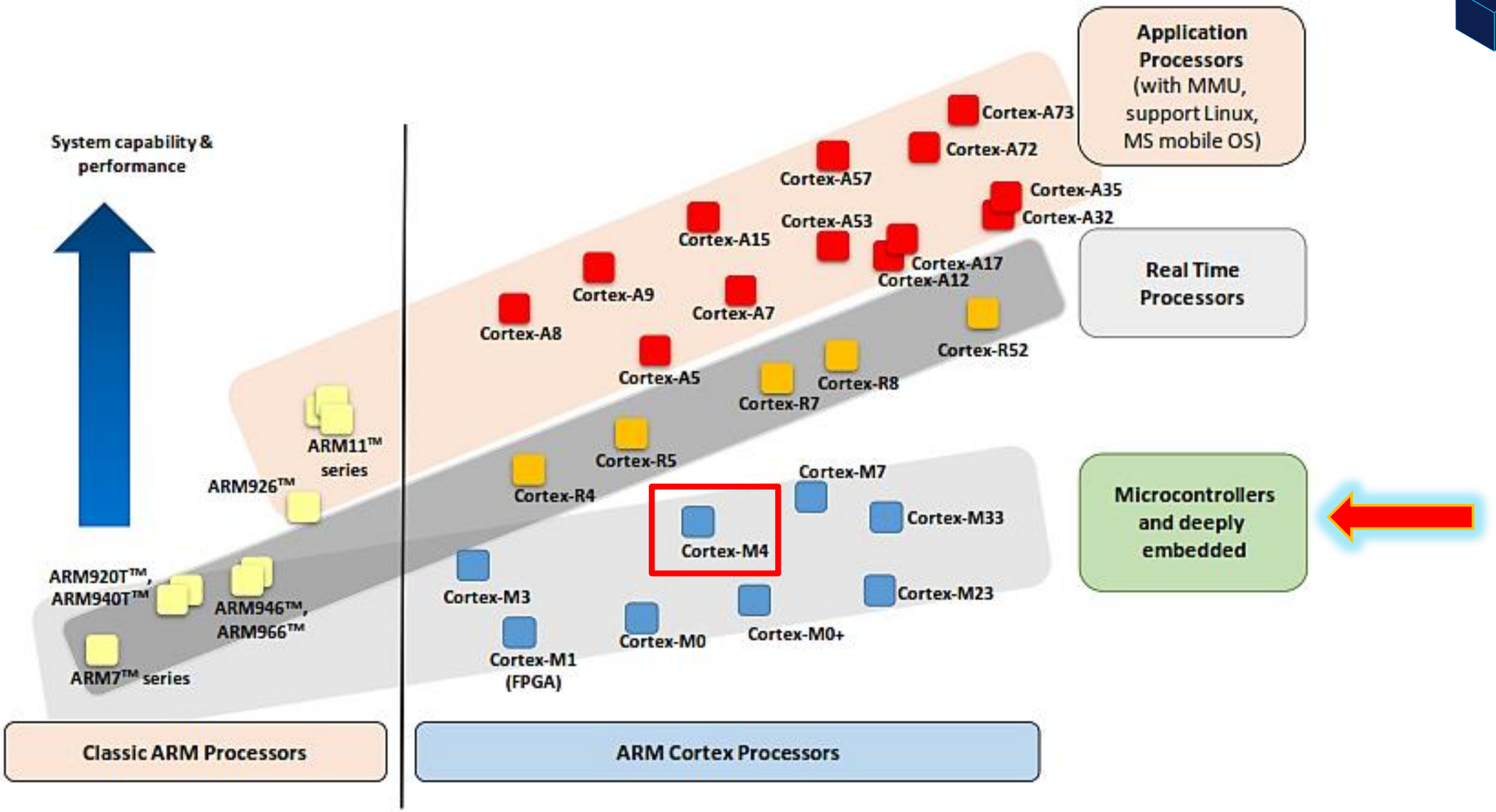


PROCESADOR ARM

arm

MICRO-
CONTRO-
LADORES
ARM

LA FAMILIA DE PROCESADORES ARM



arm
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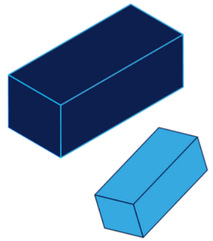
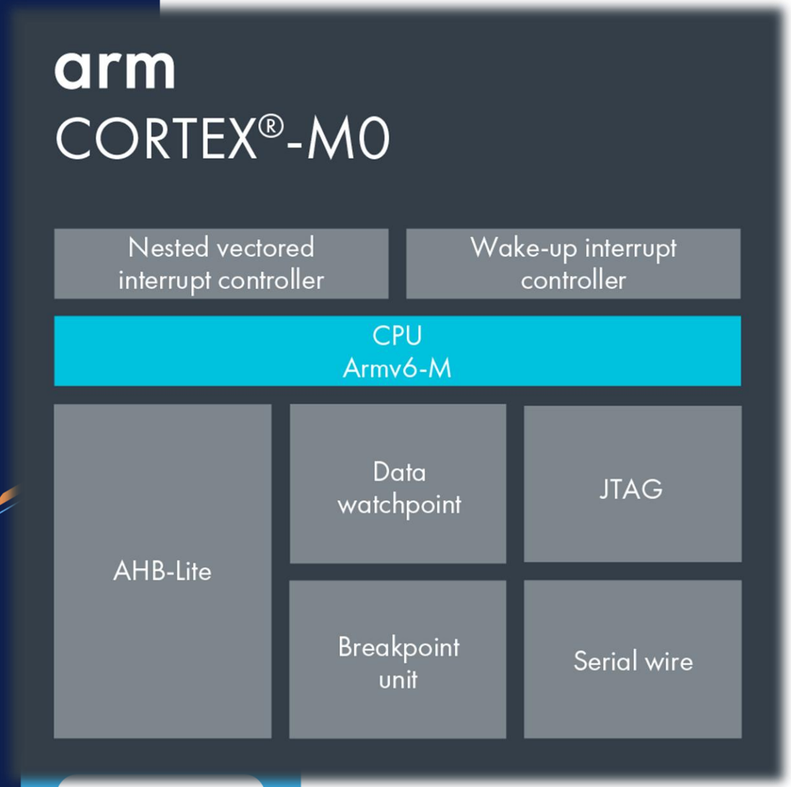
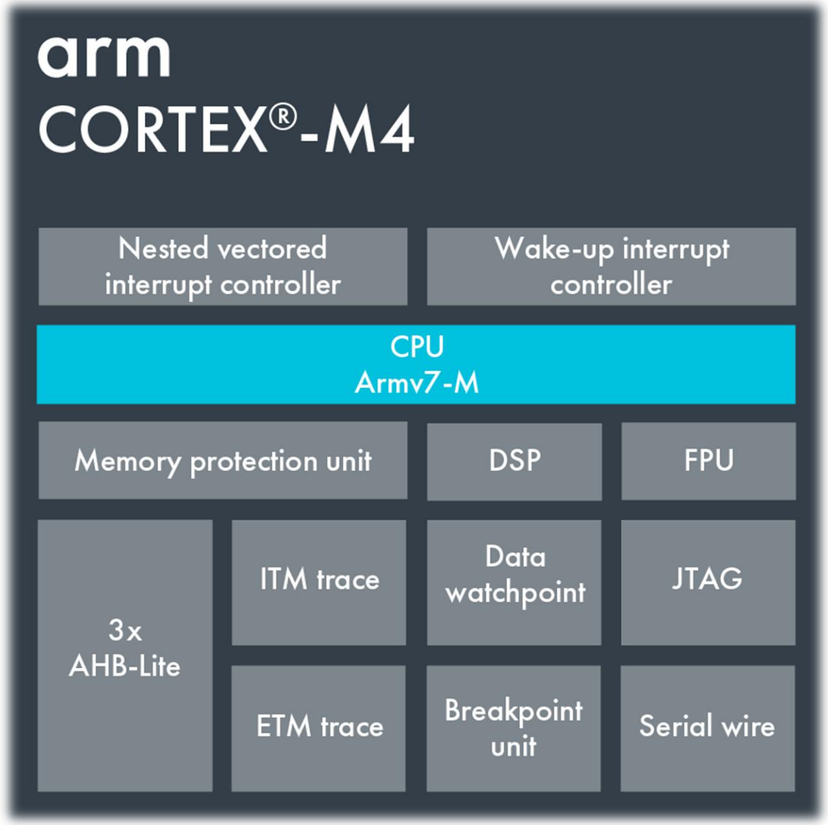
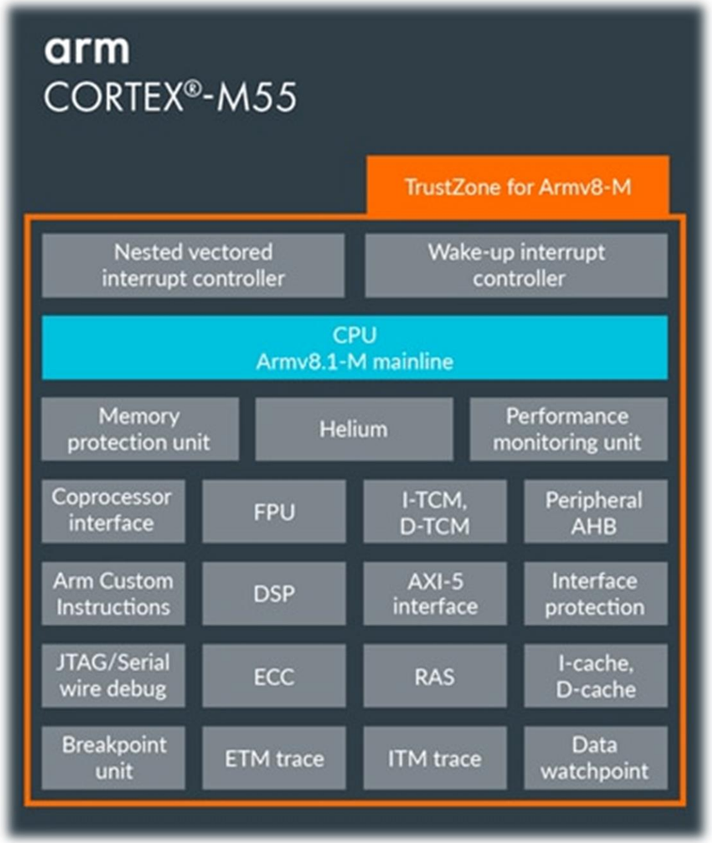
UMAKER | CENTRO DE CAPACITACIÓN DE DESARROLLO TECNOLÓGICO

LA FAMILIA DE PROCESADORES ARM









arm

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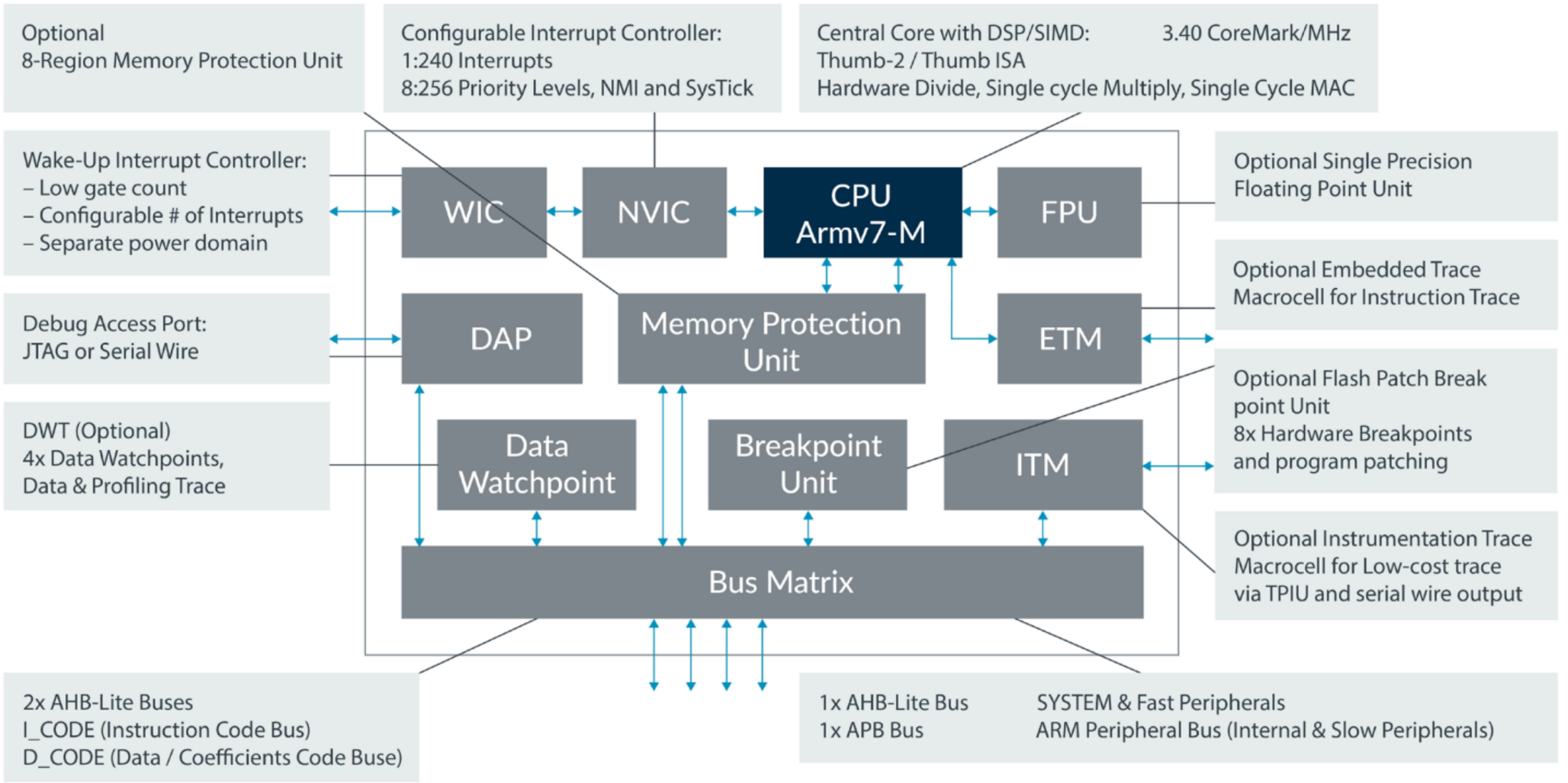
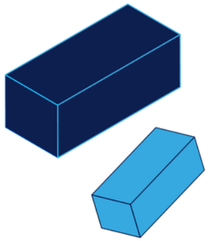
CORTEX M4

Block Diagram

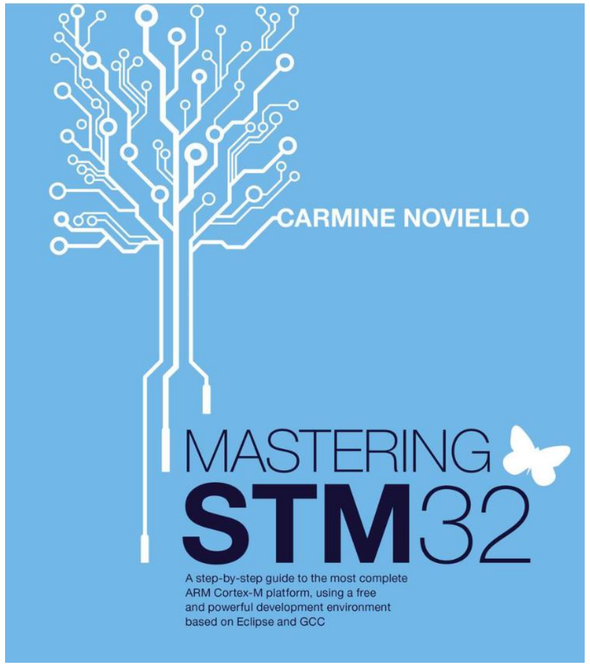


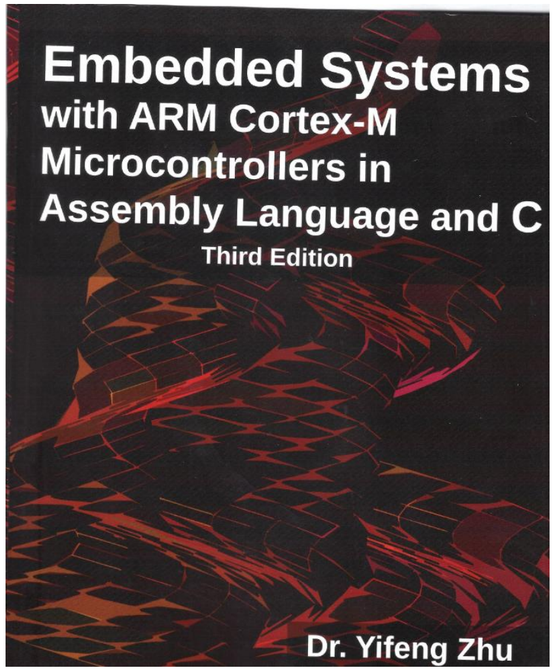
ESPECIFICACIONES DE LA ARQUITECTURA	
Instruction set	• La función de cada instrucción. • Cómo se representa esa instrucción en la memoria (su codificación).
Register set	• Cuántos registros hay. • El tamaño de los registros. • La función de los registros. • Su estado inicial.
Exception model	• Los diferentes niveles de privilegio. • Los tipos de excepciones. • Qué sucede al aceptar o regresar de una excepción.
Memory model	• Cómo se ordenan los accesos a la memoria. • Cómo se comportan las cachés, cuándo y cómo el software debe realizar un mantenimiento explícito.
Debug, trace, and profiling	• Cómo se establecen y activan los puntos de interrupción. • Qué información se puede capturar con las herramientas de rastreo y en qué formato.

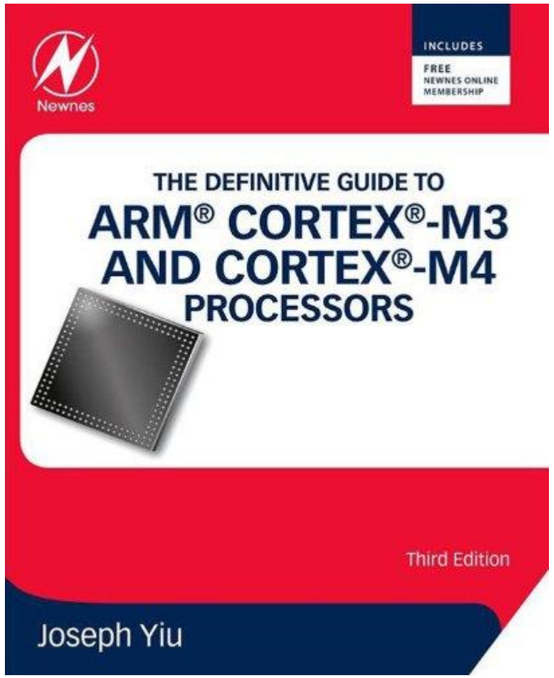


PROCESADOR CORTEX - M

REFERENCIAS







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STM32

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DE DESARROLLO TECNOLÓGICO

STMicroelectronics

life.augmented

Software

STM32 Cube

STM32 CubeMX

STM32 CubeProgrammer

STM32 CubeIDE

STM32 CubeMonitor

Hardware

NUCLEO-L412KB
NUCLOE-F401RE

STM32 Nucleo	Discovery kits	Evaluation boards
Flexible prototyping	Key feature prototyping	Full feature evaluation

Customer support

FAE - Worldwide Customer Support

community.st.com

MOOC

Partner Program

life.augmented

new

wiki.st.com/stm32mpu
wiki.st.com/stm32mcu

github.com/STMicroelectronics

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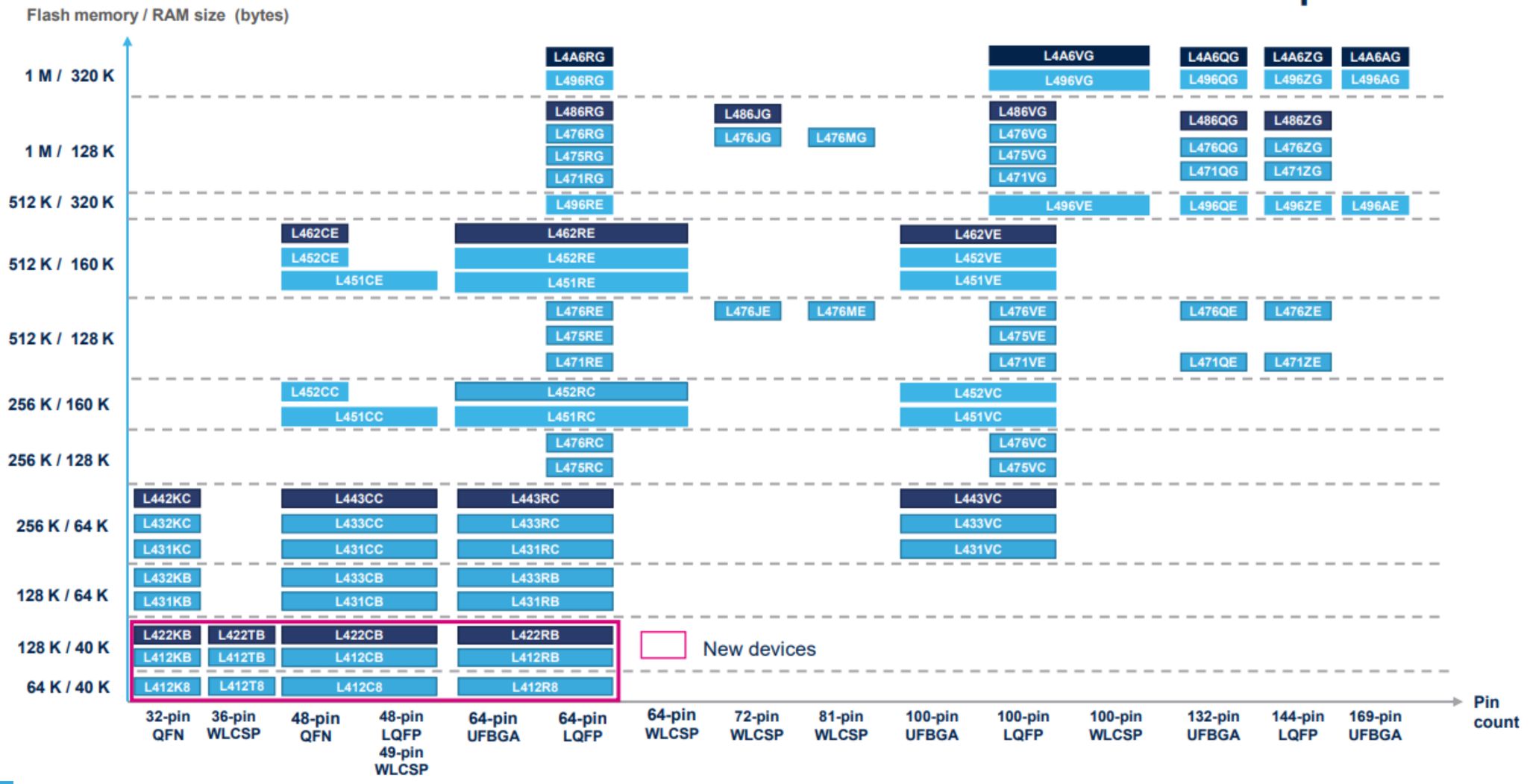
STM32 SERIES

STM32L4 portfolio



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STM32F4 MCU Series
32-bit Arm® Cortex®-M4 – Up to 180 MHz

- ART Accelerator™
- SDIO
- USART, SPI, I²C
- I²S + audio PLL
- 16 and 32-bit timers
- 12-bit ADC (0.41 µs)
- True Random Number Generator
- Batch Acquisition Mode
- Low voltage 1.7 to 3.6 V
- Temperature:
- -40 °C to 125 °C

Product lines	F_{CPU} (MHz)	Flash (Kbytes)	RAM (KB)	Ethernet I/F IEEE 1588	2x CAN	Camera I/F	SDRAM I/F	Dual Quad-SPI	SAI	SPDIF RX	Chrom-ART Graphic Accelerator™	TFT LCD Controller	MIPI DSI
Advanced lines													
STM32F469[2]	180	512 K to 2056 K	384	•	•	•	•	•	•		•	•	•
STM32F429[2]	180	512 K to 2056 K	256	•	•	•	•		•		•	•	
STM32F427[2]	180	1024 K to 2056 K	256	•	•	•	•		•		•		
Foundation lines													
STM32F446	180	256 K to 512 K	128		•	•	•	•	•	•			
STM32F407[2]	168	512 K to 1024 K	192	•	•	•							
STM32F405[2]	168	512 K to 1024 K	192		•								

Product lines	F_{CPU} (MHz)	Flash (Kbytes)	RAM (KB)	RUN current (µA/MHz)	STOP current (µA)	Small package (mm)	FSMC (NOR/ PSRAM/LCD support	QSPI	DFSDM	DAC	TRNG	DMA Batch Aquisition Mode	USB 2.0 OTG FS
Access lines													
STM32F401	84	128 K to 512 K	up to 96	Down to 128	Down to 10	Down to 3x3							•
STM32F410	100	64 K to 128 K	32	Down to 89	Down to 6	Down to 2.553x 2.579				•	•	BAM	-
STM32F411	100	256 K to 512 K	128	Down to 100	Down to 12	Down to 3.034x 3.22						BAM	•
STM32F412	100	512 K to 1024 K	256	Down to 112	Down to 18	Down to 3.653x 3.651	•	•	•		•	BAM	• +LPM[1]
STM32F413[2]	100	1024 K to 1536 K	320	Down to 115	Down to 18	Down to 3.951x 4.039	•	•	•	•	•	BAM	• +LPM[1]

Notes:
1. Link Power Management
2. The same devices are also found with embedded HW AES encryption (128-/256-bit)

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STM32 SERIES

NUCLEO-F401

HARDWARE TOOLS

STM32 Nucleo boards

Flexible prototyping

Discovery kits

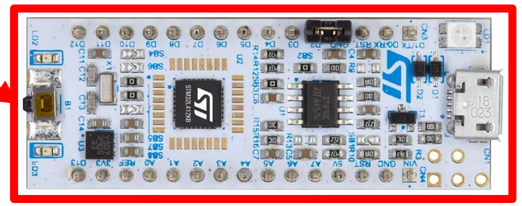
Key feature prototyping

Evaluation board

Full feature evaluation

SOFTWARE TOOLS

STM32
CubeMX



NUCLEO-L412KB

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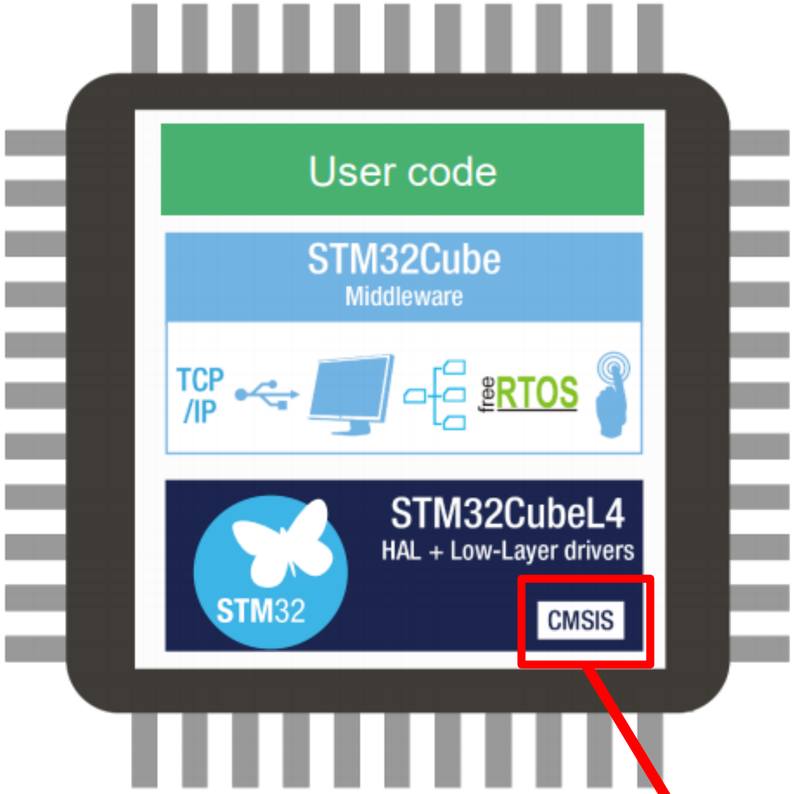
STM32 SERIES



EMBEDDED SOFTWARE

- Open-source TCP/IP stack (lwIP)
- USB Host and Device library from ST **Qualified HAL firmware**
- STemWin graphical stack library from ST and SEGGER
- Open-source FAT file system (FatFs)
- Open-source real-time OS (FreeRTOS)
- Touch-sensing library
- Dozens of examples

- STM32L4 Hardware Abstraction Layer (HAL) portable APIs
- **High-performance, light-weight low-layer (LL) APIs**
- High coverage for most STM32 peripherals
- Production-ready and fully qualified
- Dozens of usage examples
- Open-source BSD license

CMSIS

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Debug support

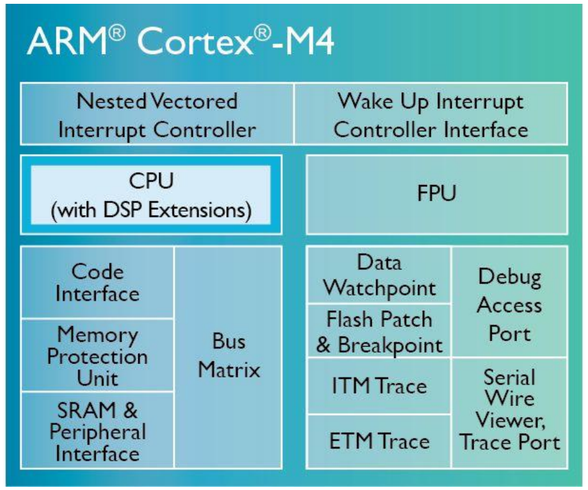
- STM32L4 provides on-chip debug support
  - MCU programming
  - Application debugging
  - Code analysis

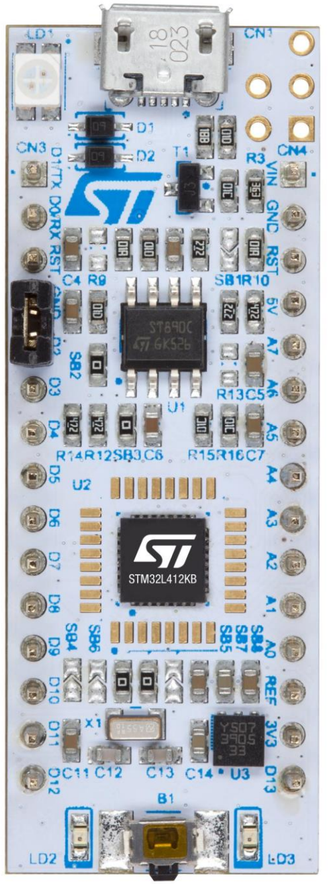
Application benefits

- Basic debugging features
- Advanced features (Embedded Trace Macrocell) to quickly identify malfunctioning code
- Coverage and profiling features

STM32 SERIES

SMT32 NUCLEO-32 BOARDS





NUCLEO-L412KB

- STLINK-V2
- LED DE USUARIO → PB3
- RESET BUTTON
- PINES COMPATIBLES CON ARDUINO NANO

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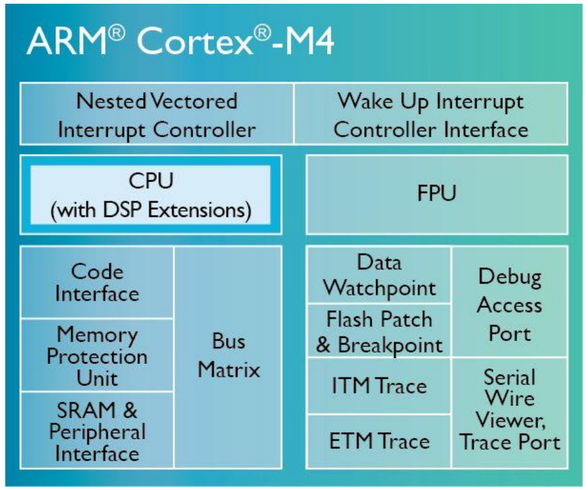
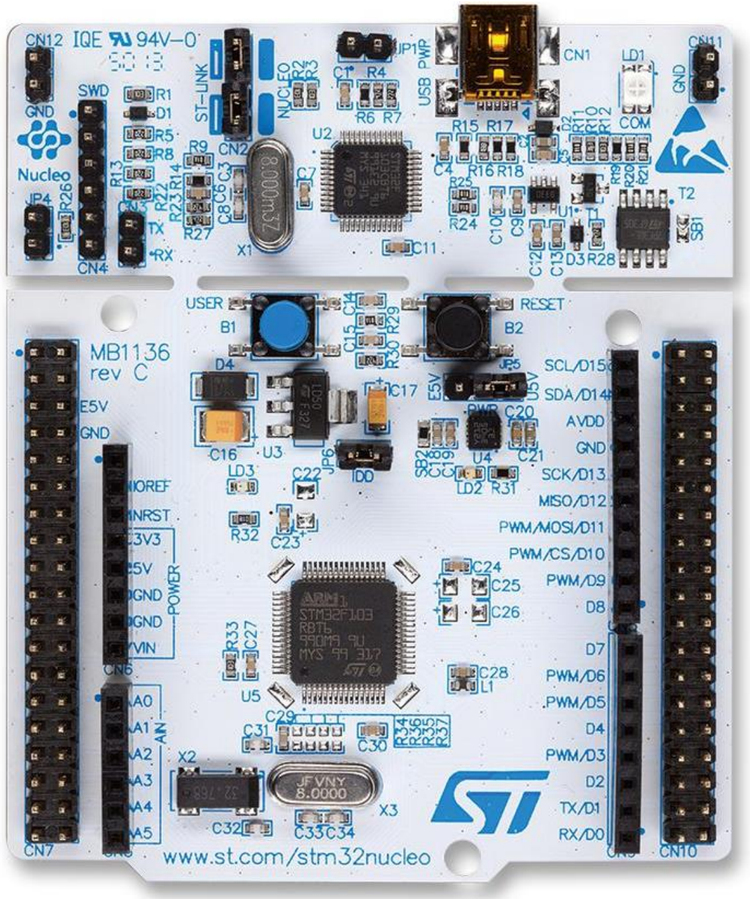
STM32 SERIES



SMT32 NUCLEO-64 BOARDS



NUCLEO-F401RE

- STLINK-V2
- LED DE USUARIO → PA5
- PUSH BUTTON -> PC13
- RESET BUTTON
- PINES COMPATIBLES CON ARDUINO UNO

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