



STM32MP2 series

**The second-generation of microprocessors
enabling secure, advanced edge AI in Industry 4.0**





STM32 MPU portfolio by application segment

STM32MP1 series

STM32MP2 series

Industrial
communication
processors

STM32MP133

Cortex®-A7 up to 1GHz
FDCAN, 2x Eth

STM32MP153

2x Cortex®-A7 + Cortex®-M4
FDCAN

STM32MP257

Dual Cortex®-A35 + Cortex®-M33
3x Eth/TSN (2+1 switch), 3x FDCAN

Analytics
and edge
machine
vision

STM32MP215

Cortex®-A35 + Cortex®-M33
RGB LCD, MIPI CSI2

STM32MP235

Dual Cortex®-A35 + Cortex®-M33
H.264 Dec 3D GPU AI / NN LVDS/DSI

STM32MP255

Dual Cortex®-A35 + Cortex®-M33
H.264 - 3D GPU - AI / NN - LVDS/DSI

General-
purpose
processors

STM32MP135

Cortex®-A7 up to 1GHz
FDCAN, 2x Eth, Display, Camera

STM32MP157

2x Cortex®-A7 + Cortex®-M4
FDCAN, 3D GPU, DSI

STM32MP131

Cortex®-A7 up to 1GHz
Eth

STM32MP151

Cortex®-A7 + Cortex®-M4

STM32MP215

Cortex®-A35 + Cortex®-M33
2x Eth, 2x FDCAN, RGB LCD, CSI2

STM32MP213

Cortex®-A35 + Cortex®-M33
2x Ethernet, 2x FDCAN

STM32MP211

Cortex®-A35 + Cortex®-M33
1x Ethernet

STM32MP235

Dual Cortex®-A35 + Cortex®-M33
2x Ethernet, 2x FDCAN
H.264 Dec 3D GPU AI / NN LVDS/DSI

STM32MP233

Dual Cortex®-A35 + Cortex®-M33
2x Ethernet, 2x FDCAN

STM32MP231

Cortex®-A35 + Cortex®-M33
1x Ethernet

STM32MP257

Dual Cortex®-A35 + Cortex®-M33
3x Ethernet (2+1 switch) - 3x FDCAN
H.264 - 3D GPU - AI / NN - LVDS/DSI

STM32MP253

Dual Cortex®-A35 + Cortex®-M33
2x Ethernet, 3x FDCAN

STM32MP251

Cortex®-A35 + Cortex®-M33
1x Ethernet

NEW

STM32MP2 microprocessor series



Robustness for complex industrial applications



Rich interfaces supporting the growth of connected applications



64-bit MPU with advanced compute capabilities



Strong security

Designed for highly connected applications



Industrial & factory automation



- Gateways
- PLCs
- HMIs
- Metering
- Bar code reader

- Anomaly detection
- Pose estimation
- People / object detection
- Face recognition
- Character recognition

Smart homes



- Gateways
- HMIs
- Whitegoods
- Door bell

- People / object detection
- Face recognition
- Voice recognition

- Secure boot
- Firmware & data encryption
- Context isolation

Smart city and infrastructure



- Power grid
- EV charging
- Metering
- HMIs

- Traffic management
- Energy management
- Vehicle / pedestrian recognition & tracking
- People & object detection



Robustness for complex industrial applications



Industrial qualification combining both:

- 100% operation time for 10 years
- Junction temperature: - 40°C to 125°C

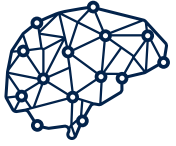
10-year longevity commitment renewed every year

Flexible resource allocation between cores

- Dual or single Arm® Cortex®-A35 up to 1.5 GHz
- Arm® Cortex®-M33 up to 400 MHz
- Arm® Cortex®-M0+ up to 200 MHz

Advanced security for Industry 4.0





64-bit MPU with advanced edge AI capabilities

Edge AI accelerators



- NPU accelerator: **up to 1.35 TOPS**
- Flexible ecosystem to run AI on CPU, GPU, or NPU

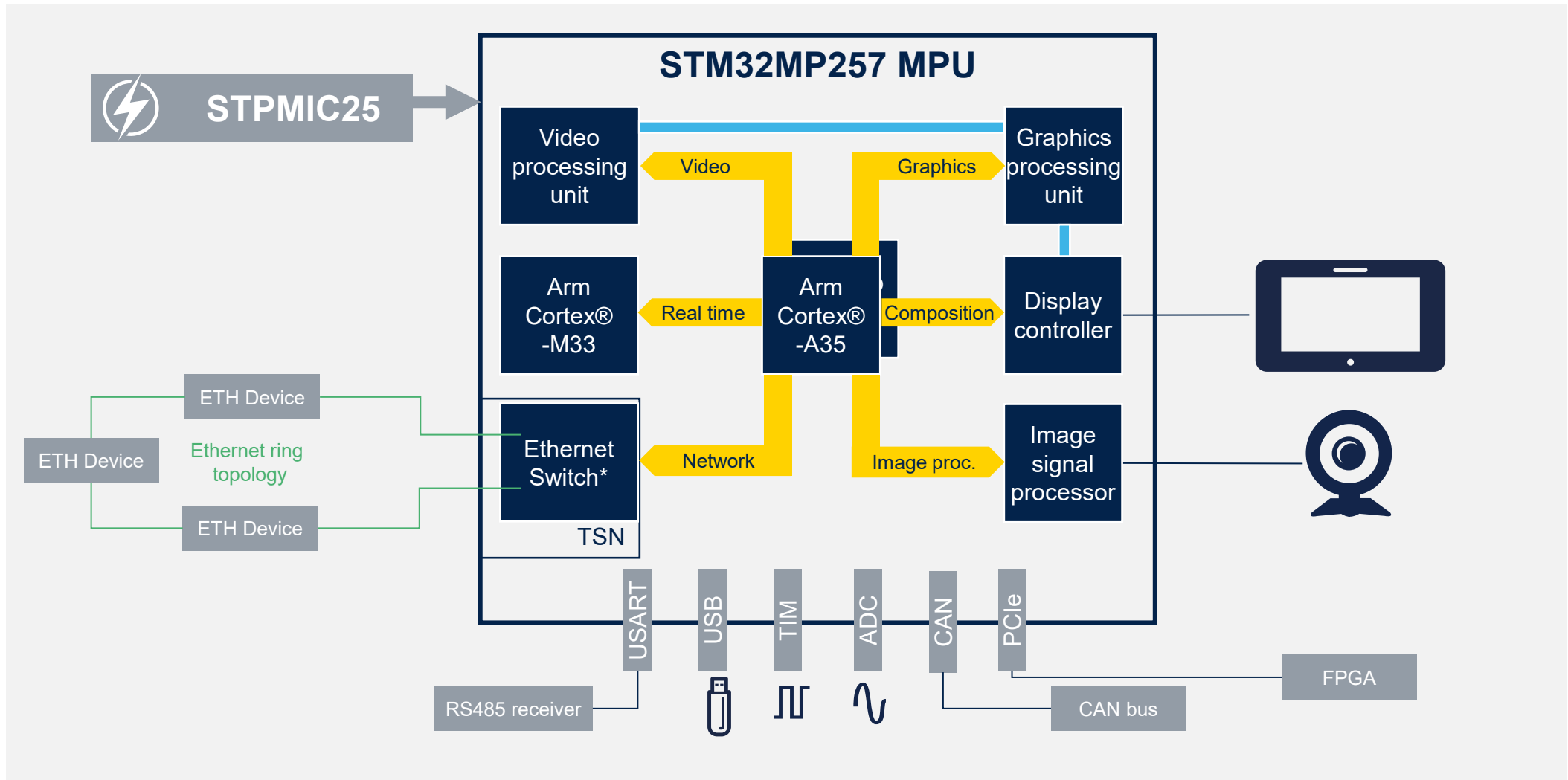
Multimedia capabilities for high-end use cases



- 3D GPU supports up to 1080p resolution
- Full HD video pipe with RGB, LVDS & DSI outputs
- MIPI CSI-2 camera interface with ISP



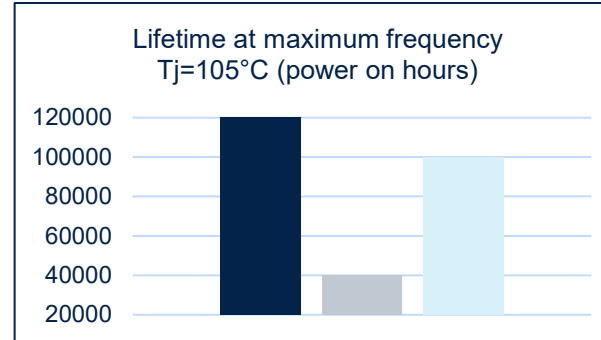
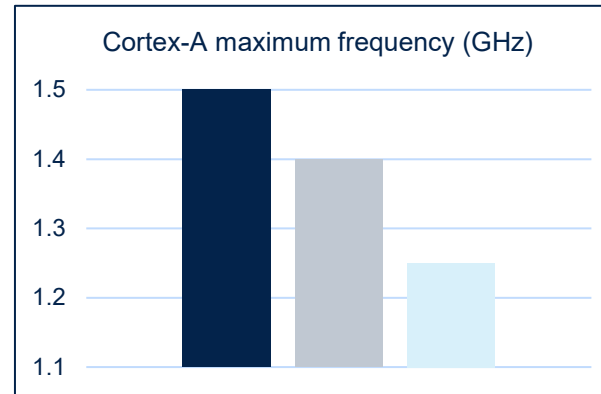
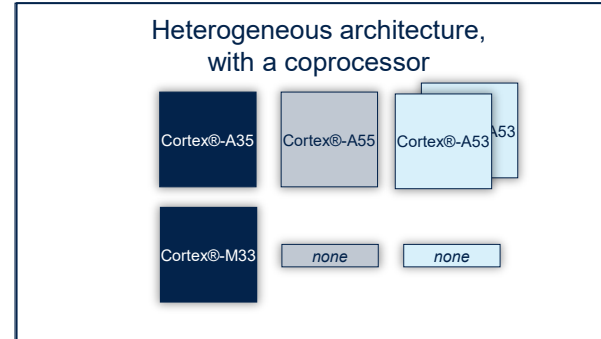
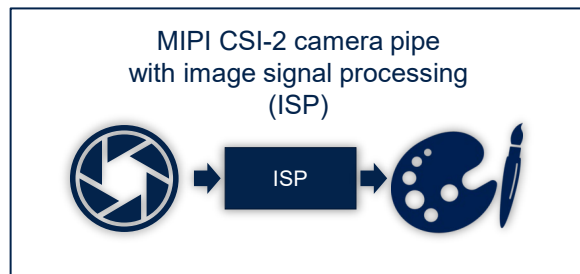
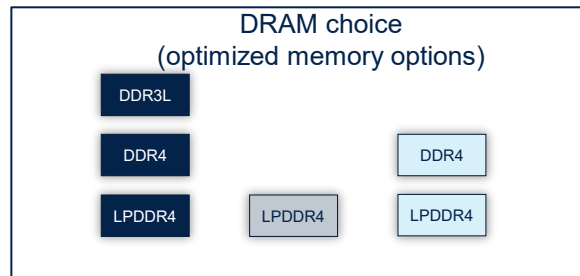
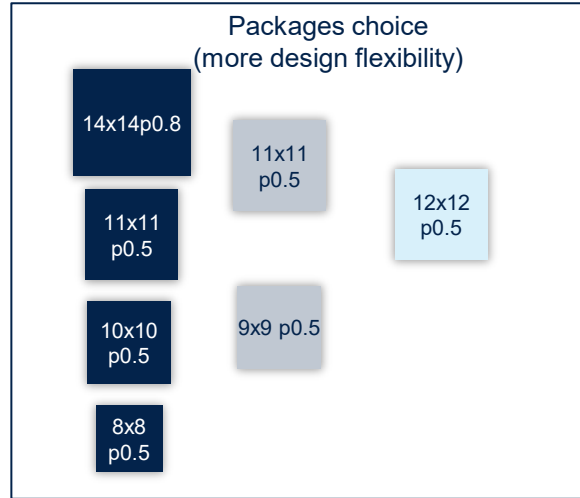
STM32MP257: your next industrial HMI gateway



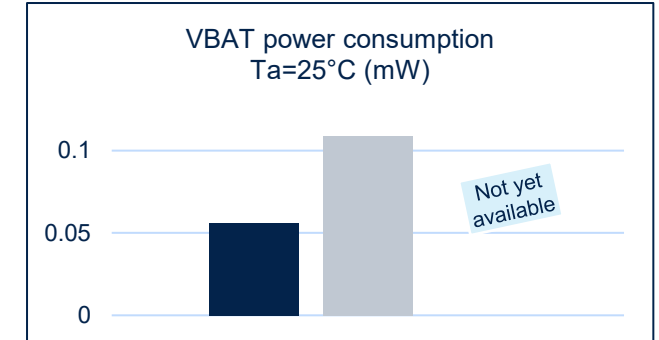
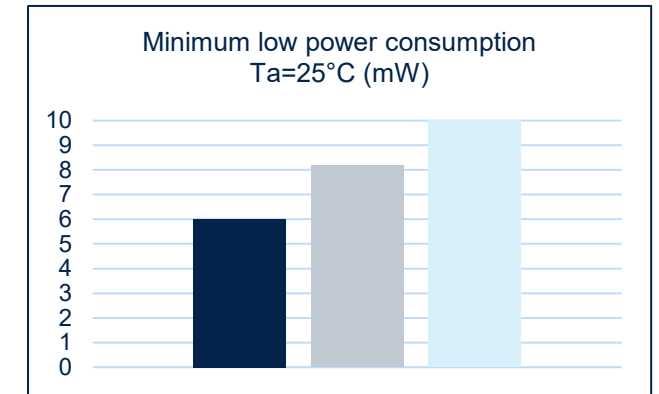
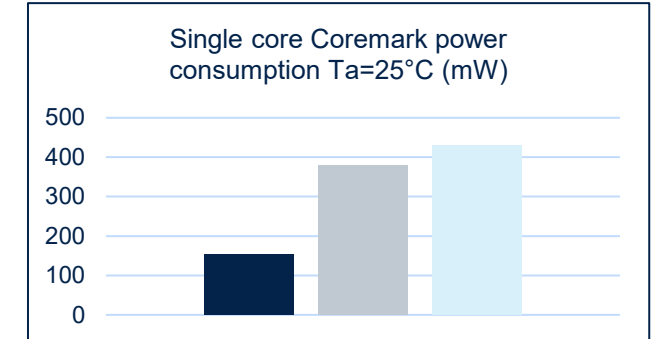
STM32MP215: benchmarking performance and efficiency against competition



■ STM32MP215
■ Competitor 1
■ Competitor 2



The higher the better



The lower the better

Secure your application





Enhanced security



SESIP3*
Up to PSA certified Level 3*



TrustZone® on Cortex®-A & Cortex®-M: secure boot, secure firmware updates and cryptographic operations

Secure provisioning ecosystem

Edge confidential computing with resource isolation

**target certifications*

STM32MP2 security overview

Supporting all security functions of IoT, industrial & payment applications

Memory protections	Cryptography	Exhaustive security ecosystem
OTP, RDP, MMU DRAM encryption Secure debug Active tamper & monitoring	SCA protected AES, PKA SHA1,2,3, TRNG, HUK Secure Secret Provisioning	
Lifecycle	Isolation	
ROMed Secure boot Key revocation 2 boot stages	Resources isolation framework TrustZone® Securable peripherals	
		Trusted execution with OP-TEE
		Trusted firmware for Cortex® A – TF-A
		Immutable Root of Trust
		STM32Cube integration for MPU
		Wide qualified partner solutions

State-of-the-art security assurance level



psacertified™
level three

Target certification
Level 1 for STM32MP1
Level 3 for STM32MP2

Enhance your application security with STM32MP21x



Strong security for regulatory compliance

Resource isolation framework

Cortex®-M33 as trusted boot device (M33-TD)

Enhance your application security with STM32MP21x

Navigate new EU security regulations with STM32MP21 solutions

- ✓ Build devices for the long term
- ✓ Protect users and data
- ✓ Avoid risks and penalties

How STM32MP21 ensures compliance:

- ✓ Cryptographic accelerators: AES-128/192/256, SAES with SCA, PKA with DPA protection
- ✓ 5-year maintenance in OpenSTLinux ecosystem to meet regulations requirements
- ✓ SESIP and PSA Certified target certifications
- ✓ STM32Trust framework (TF-M, TF-A, OPTEE)

Strong security for regulatory compliance

Resource isolation framework

Cortex®-M33 as trusted boot device (M33-TD)

Enhance your application security with STM32MP21x

Isolate and manage access to hardware resources (peripherals, memory regions, and communication interfaces)

- ✓ Prevent unauthorized access to critical hardware resources
- ✓ Limit the impact of software bugs to isolated domains
- ✓ Support multi-tenant systems
- ✓ Facilitate compliance with security standards
- ✓ Optimize resources without compromising security
- ✓ Reduce complexity and debugging efforts

Strong security for regulatory compliance

Resource isolation framework

Cortex®-M33 as trusted boot device (M33-TD)

Enhance your application security with STM32MP21x

Leverage the Cortex®-M33 core as a trusted domain (TD) boot processor now available in OpenSTLinux distribution

- ✓ Increase security by isolating critical secure boot functions on a dedicated core
- ✓ Keep secure services on the Cortex®-M33 isolated trusted domain
- ✓ Strengthen the protection of secure boot applications against attacks

Strong security for regulatory compliance

Resource isolation framework

Cortex®-M33 as trusted boot device (M33-TD)

STM32MP2 for 64-bit applications





STM32MP2 series for 64-bit applications

Product lines	Cortex®-A35 Processor(s)		Cortex®-M33 Co-processor	Cortex®-M0+ Co-processor	AI NPU	GPU LVDS/DSI	FDCAN	Ethernet	Video Hardware accelerator	PCIe Gen2 / USB3
STM32MP257	2	Up to 1.5GHz	400 MHz	200 MHz	•	•	3	3	H.264 enc/dec	•
STM32MP255	2	Up to 1.5GHz	400 MHz	200 MHz	•	•	3	2	H.264 enc/dec	•
STM32MP253	2	Up to 1.5GHz	400 MHz	200 MHz			3	2		•
STM32MP251	1	Up to 1.5GHz	400 MHz	200 MHz				1		•
STM32MP235	2	Up to 1.5GHz	400 MHz		•	•	2	2	H.264 dec	
STM32MP233	2	Up to 1.5GHz	400 MHz				2	2		
STM32MP231	1	Up to 1.5GHz	400 MHz					1		
STM32MP215	1	Up to 1.5GHz	300 MHz				2	2		
STM32MP213	1	Up to 1.5GHz	300 MHz				2	2		
STM32MP211	1	Up to 1.5GHz	300 MHz					1		



Security options
available for all
STM32MP2 MPUs



A scalable offering

STM32MP25x

STM32MP257

A35 A35 M33 M0+

STM32MP255

A35 A35 M33 M0+

STM32MP253

A35 A35 M33 M0+

STM32MP251

A35 M33 M0+

STM32MP23x

STM32MP235

A35 A35 M33

STM32MP233

A35 A35 M33

STM32MP231

A35 M33

STM32MP21x

NEW

STM32MP215

A35 M33

STM32MP213

A35 M33

STM32MP211

A35 M33

- TFBGA436 18x18mm p0.8 - 172 GPIOs – 4 layers PTH PCB, 32-bit DDR

Pin-to-pin compatibility

- TFBGA361 16x16mm p0.8 144 GPIOs – 4 layers PTH PCB
- VFBGA424 14x14mm p0.5 - 144 GPIOs – 4 layers PTH PCB, 32-bit DDR

Pin-to-pin compatibility

- VFBGA361 10x10mm p0.5 - 144 GPIOs – 6 layers HDI PCB

- TFBGA289 14x14mm p0.8 123 GPIOs – 4 layers PTH PCB
- VFBGA273 11x11mm p0.5 123 GPIOs – 4 layers PTH PCB
- VFBGA225 8x8mm p0.5 98 GPIOs – 6 layers HDI PCB

123 GPIOs



One STM32 MPU ecosystem

STPMIC2x: highly integrated PMIC for STM32MP2x

STPMIC25



STPMIC25

- QFN: 6.5x6.5 mm pitch 0.4
- 7 Buck DC/DC converters
- 8 LDOs + 1 DDR reference voltage LDO
- Provides power supplies to STM32MP2 as well as to DRAM, flash and other application peripherals (USB, display, etc.)
- Better power efficiency (Buck vs. LDO)

Available now

MP25



MP23



MP21



STPMIC2L



STPMIC2L

NEW

- QFN: 5x5 mm pitch 0.4
- 3 Buck DC/DC converters
- 7 LDOs
- Provides power supplies to STM32MP2 as well as to DRAM, and flash

Available now

MP25



MP23



MP21



STM32MP257 block diagram

Dual Arm® Cortex®-A35 up to 1.5GHz
L1 32KB I-Cache / 32KB D-Cache
512KB L2 cache
NEON SIMD MPE
TrustZone®

Arm® Cortex®-M33 400MHz
16kB I-cache
16kB D-Cache
FPU / MPU / NVIC
TrustZone®

Memory
DDR4 4GB
LPDDR4 2GB
DDR3L 1GB
Shared RAM 640KB including 128KB Retention RAM
Backup RAM 8KB / Boot ROM / OTP fuse 12KB

System
Power Supply Regulators
Crystal & Internal oscillators
Watchdogs (I & W)
Cyclic Redundancy Check (CRC)
96-bit unique ID
Up to 172 GPIOs

Connectivity
2x 1Gbps ETH w/ TSN switch
1x 1Gbps ETH/TSN port
PCIe Gen2, 1 lane
USB2.0 Host/Dev HS or USB3.0 DRD
USB2.0 Host HS + HS PHY
USB Type-C connector support
3x SDIO3.0 / SD 3 / eMMC 5.1
2x Octo SPI, 8x SPI
16-bit SLC NAND, 8-bit-ECC
3x FDCAN / TTCAN
8x I ² C, 4x I ³ C, 3x I ² S
5x UART, 4x USART

Audio & Analog
SPDIF Rx 4 inputs
4x SAI
MDF 8 channels / 8 filters
3x 12-bit ADC 5 MSPS
Temperature sensor

Multimedia
AI / NN HW acceleration: up to 1.35 TOPS
3D GPU: OpenGL ES3.1 / Vulkan 1.3 / OpenCL3.0
1080p60 H.264, VP8 Video Enc/ Dec
LVDS Display 8 lanes with PHY
DSI Display 4 lanes with PHY
24b RGB Disp. 1080p @ 60fps
Camera I/F MIPI CSI-2, 2 lanes
Camera I/F 16-bit Parallel
ISP (Camera Pipeline)

Timers
3x 16-bit motor control PWM sync AC timers
2x adv. ctrl + 10x 16-bit timers
4x 32-bit timers
5x 16-bit LP timers

Security
Resource Isolation Framework (RIF)
Octo SPI OTF Decryption
DRAM OTF Encryption/Dec
DES, TDES, AES-256 with SCA
SHA-256/512, SHA-3, HMAC
PKA ECC/RSA with SCA
Secure RTC
Analog true RNG
16x Tamper pins
T°, V, F and 32KHz detection

Processing

Industrial connectivity

Edge AI and multimedia

Enhanced security

STM32MP235 block diagram

Dual Arm® Cortex®-A35 up to 1.5GHz

L1 32KB I-Cache / 32KB D-Cache
512KB L2 cache
TrustZone®

Arm® Cortex®-M33 400MHz

16kB I-cache
16kB D-Cache
FPU / MPU / NVIC
TrustZone®

Memory

DDR4 4GB
LPDDR4 4GB
DDR3L 4GB
Shared RAM 640KB including
128KB Retention RAM
Backup RAM 8KB / Boot ROM /
OTP fuse 12KB

System

Power Supply Regulators
Crystal & Internal oscillators
Watchdogs (I & W)
Cyclic Redundancy Check (CRC)
96-bit unique ID
Up to 144 GPIOs

Connectivity

2x 1Gbps ETH/TSN port
USB2.0 Host/Dev HS PHY
USB2.0 Host HS + PHY
USB Type-C connector support
3x SDIO4.0 / SD 6.0 / eMMC 5.1
2x Octo SPI, 6x SPI
16-bit SLC NAND, 8-bit-ECC
2x FDCAN / TTCAN
4x I²C, 3x I³C, 3x I²S
3x UART, 4x USART

Audio & Analog

SPDIF Rx 4 inputs
4x SAI
MDF 4 channels / 4 filters
3x 12-bit ADC 5 MSPS
Temperature sensor

Multimedia

AI / NN HW acceleration: up to 0.6
TOPS
3D GPU: OpenGL ES3.1 / Vulkan
1.3 / OpenCL3.0
1080p60 H.264, VP8 Video Dec
LVDS Display 4 lanes with PHY
DSI Display 4 lanes with PHY
24b RGB Disp. 1080p @ 60fps
Camera I/F MIPI CSI-2, 2 lanes
Camera I/F 16-bit Parallel
ISP (Camera Pipeline)

Timers

2x adv. ctrl + 10x 16-bit timers
4x 32-bit timers
5x 16-bit LP timers

Security

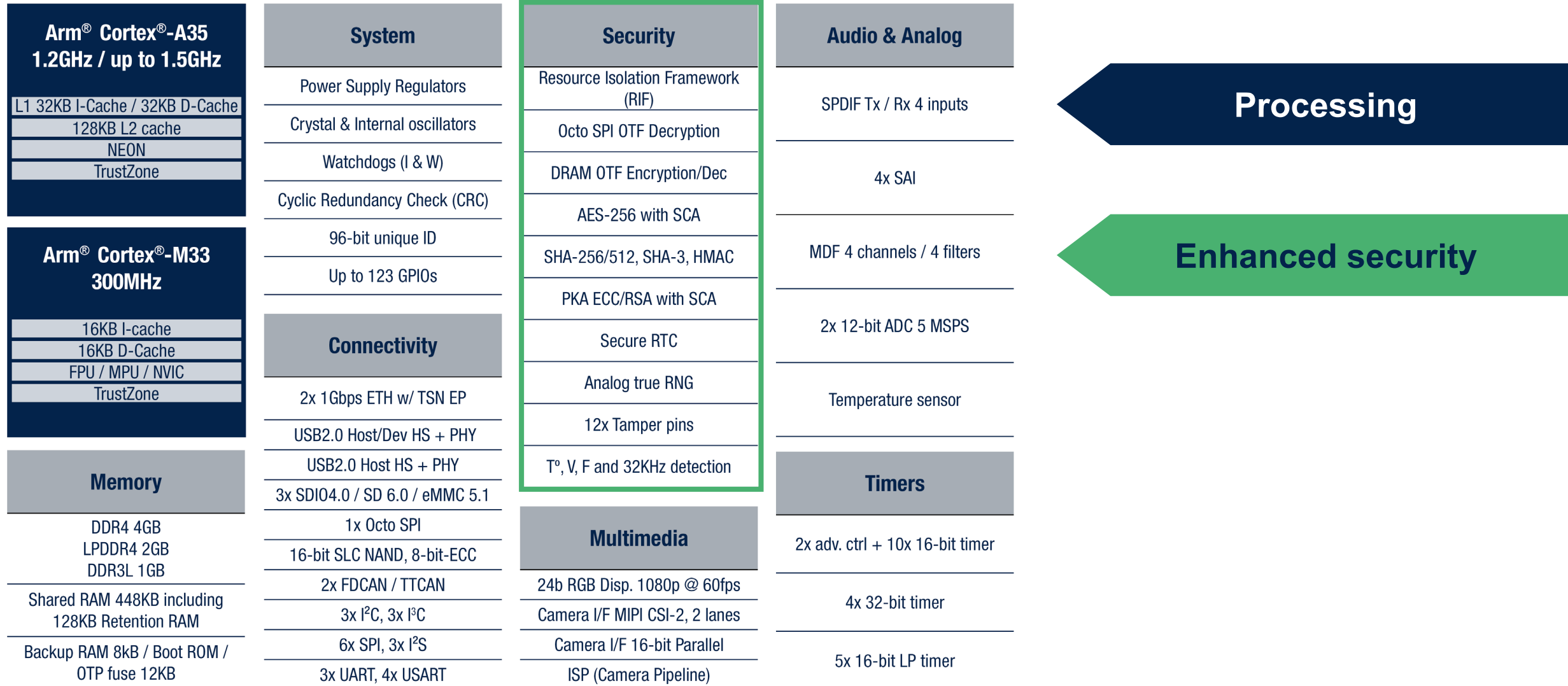
Resource Isolation Framework
(RIF)
Octo SPI OTF Decryption
DRAM OTF Encryption/Dec
AES-256 with SCA
SHA-256/512, SHA-3, HMAC
PKA ECC/RSA with SCA
Secure RTC
Analog true RNG
12x Tamper pins
T°, V, F and 32KHz detection

Processing

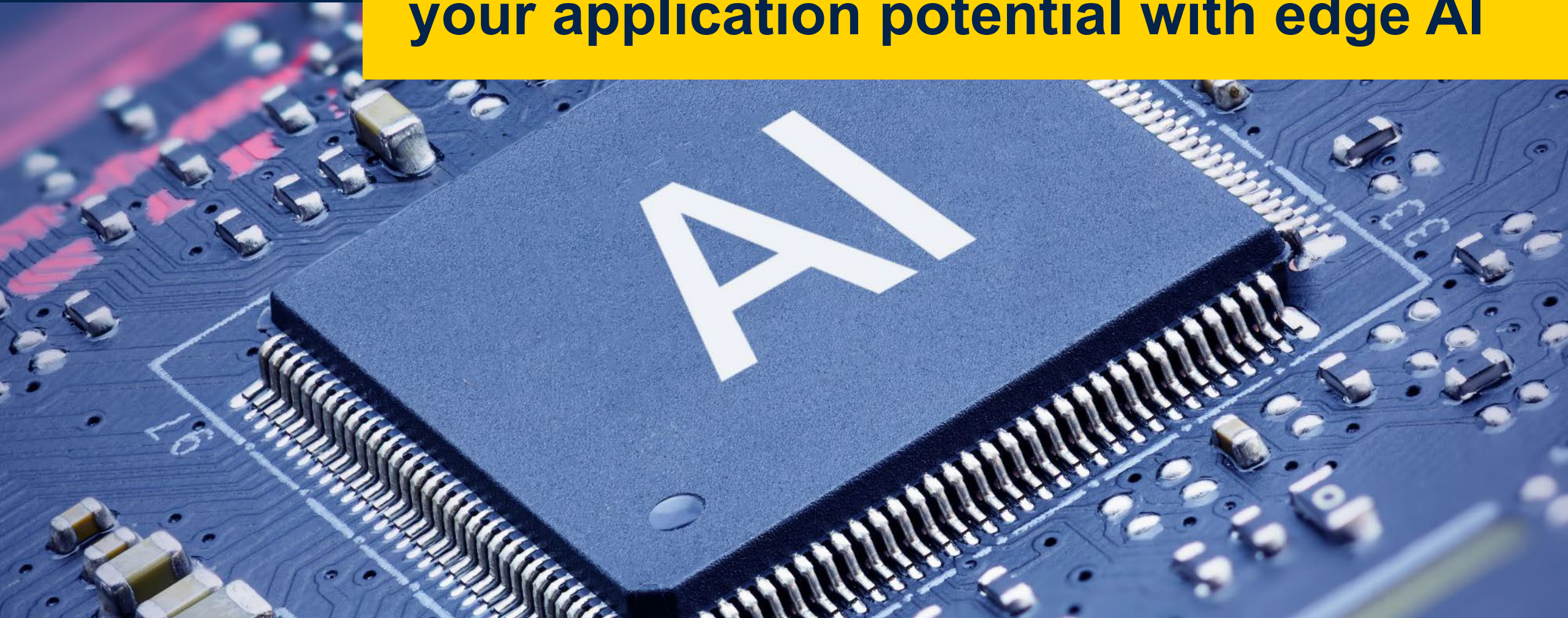
Enhanced security

Multimedia

STM32MP215 block diagram



**Neural processing unit (NPU) to unlock
your application potential with edge AI**

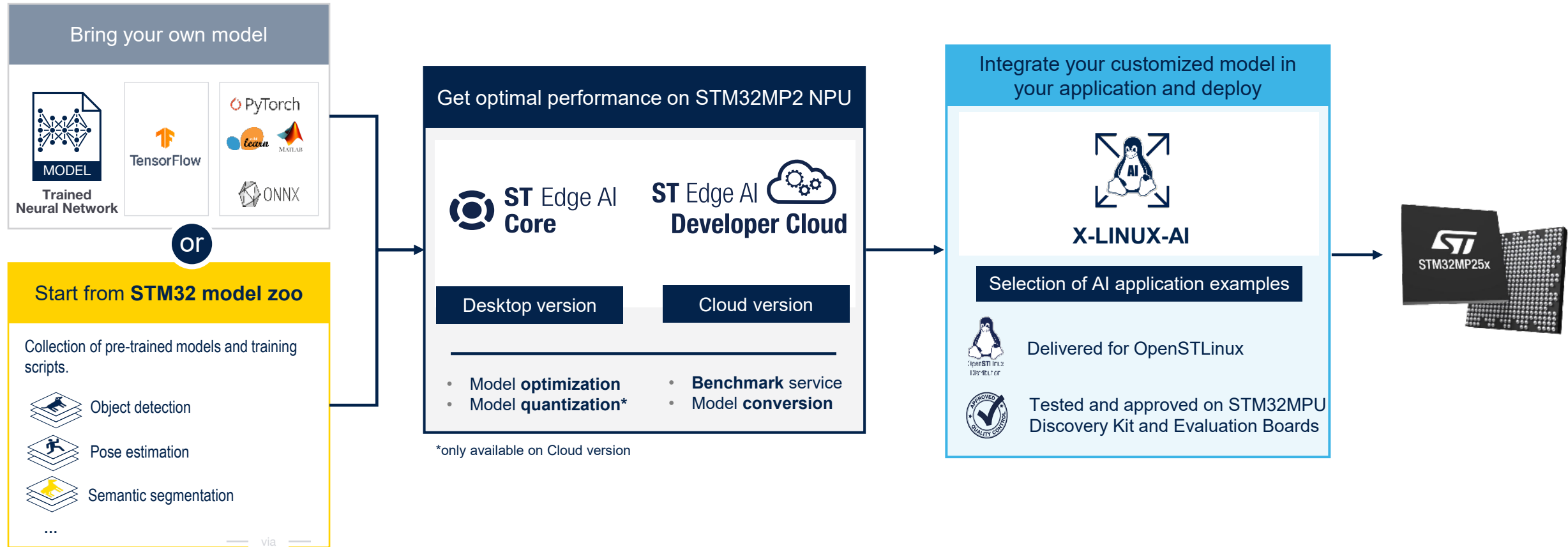


Seamlessly integrate AI in your STM32MP2 projects

1. Train

2. Benchmark and optimize

3. Create your apps and deploy



STM32 model zoo

A collection of application-oriented models optimized for STM32

Pose estimation



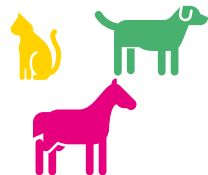
Human pose estimation

Image classification



Computer vision

Semantic segmentation



Computer vision

Object detection



Computer vision



Hosted on Github



Model training scripts

- Scripts to train models with your own dataset
- Generate and validate your model

Model optimization and benchmark

MPU Offline compiler

Desktop version



- ✓ Model **optimization**
- ✓ **Benchmark** on local MP2 board
- ✓ Model **conversion**

Cloud version



- ✓ Model **optimization**
- ✓ Model **quantization**
- ✓ **Benchmark** on remote board farm
- ✓ Model **conversion**



Supported AI models



Supported AI formats

- INT8 Quantized per tensor (NPU)
- INT8 Quantized per channel (GPU)
- Dynamic Fixed Point 16b (GPU)

AI execution engines

- NPU (preferred)
- GPU
- CPU



X-LINUX-AI



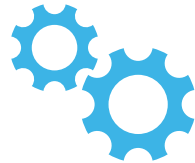
All-in-one solution

All needed packages to bring AI to the edge



AI frameworks and Apps

- AI frameworks to execute Neural Network models
- Selection of AI application examples
- AI model benchmark application tools for STM32 MPU



Tooling framework

- Python3, Gstreamer, OpenCV to quickly develop applications



STM32 MPU agnostic

Compatible with all STM32 MPU series



OpenSTLinux Distribution

Delivered for OpenSTLinux



Tested and approved on STM32MPU discovery kit and evaluation boards

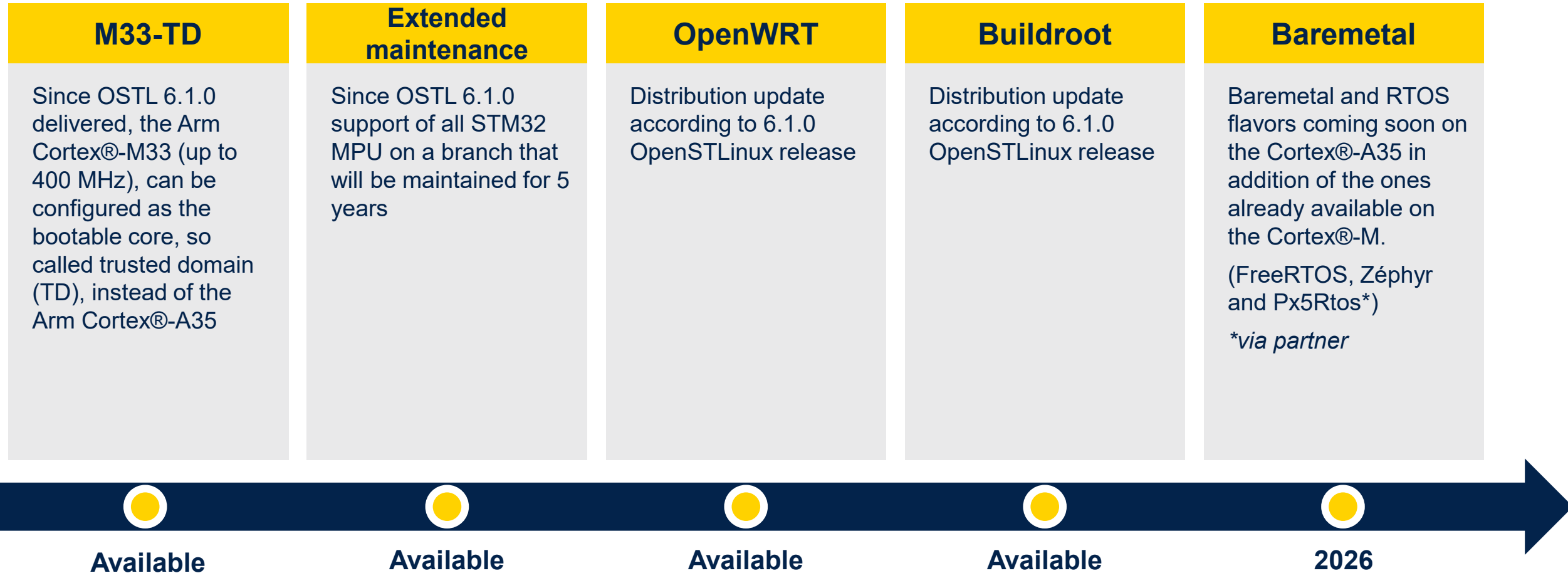




**Reduce development time & cost with
our STM32 ecosystem**



STM32 MPU embedded software: what's new?



M33-TD: direct boot on Cortex®-M

Use of the Cortex®-M33 core as the Trusted Domain boot processor

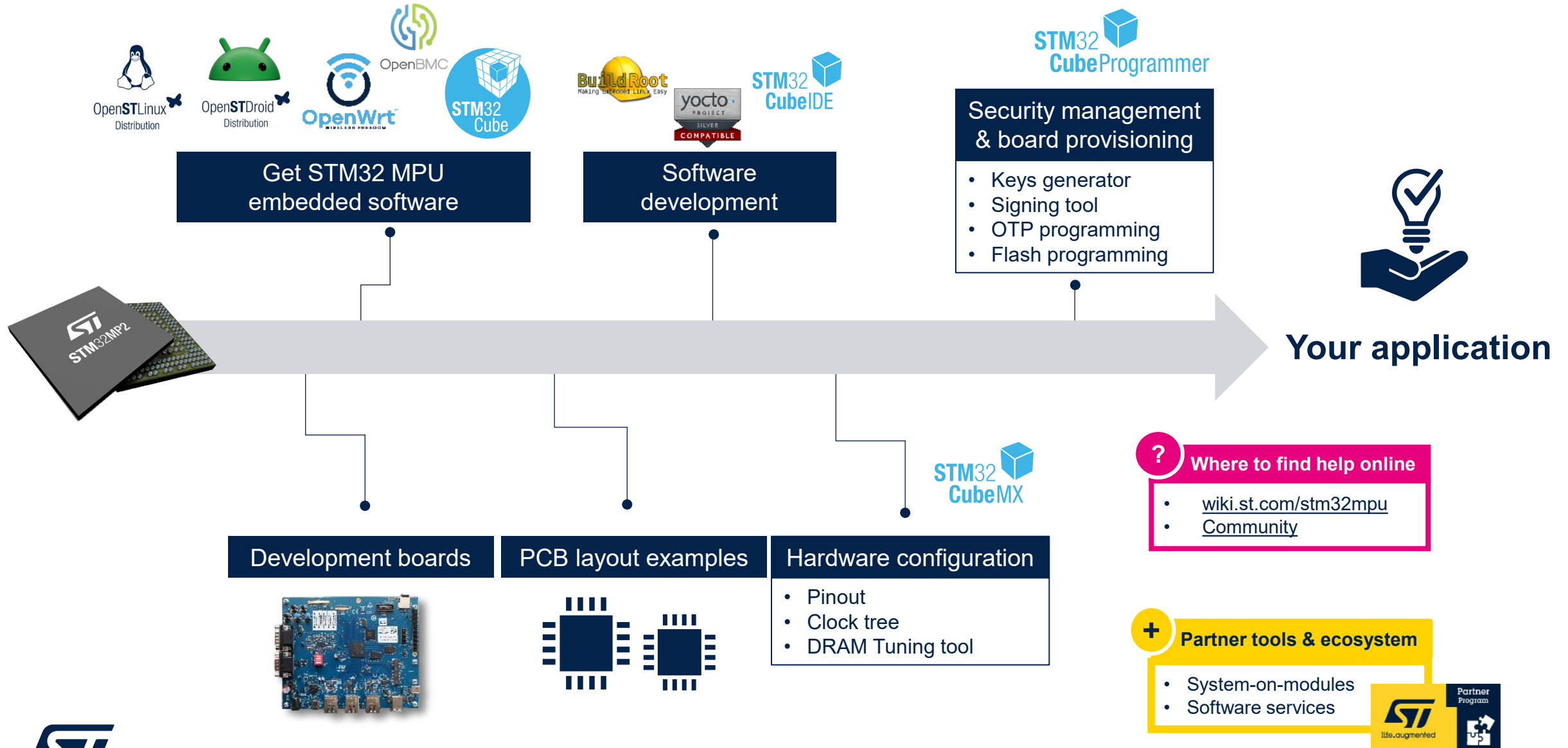
Define your needs

- ✓ You want to support Cortex®-A35 independent reboot?
- ✓ Need safety?
- ✓ Need quick processing while waking up from low power modes?
- ✓ Need early services launch?
- ✓ Want dual Flash for isolated boot codes?

Benefits

- ✓ Owns security and system configurations by default
- ✓ Fast Cortex®-M boot and low power exit, independent of Cortex®-A
- ✓ Safety on Cortex®-M, allowing Cortex®-A independent reboot
- ✓ Isolated secure and system island:
 - Secure services,
 - System: clock, regulator, low power, DDR
- ✓ Dual boot: dedicated external mass storages per Cortex®-M/A

Accelerate your time to market

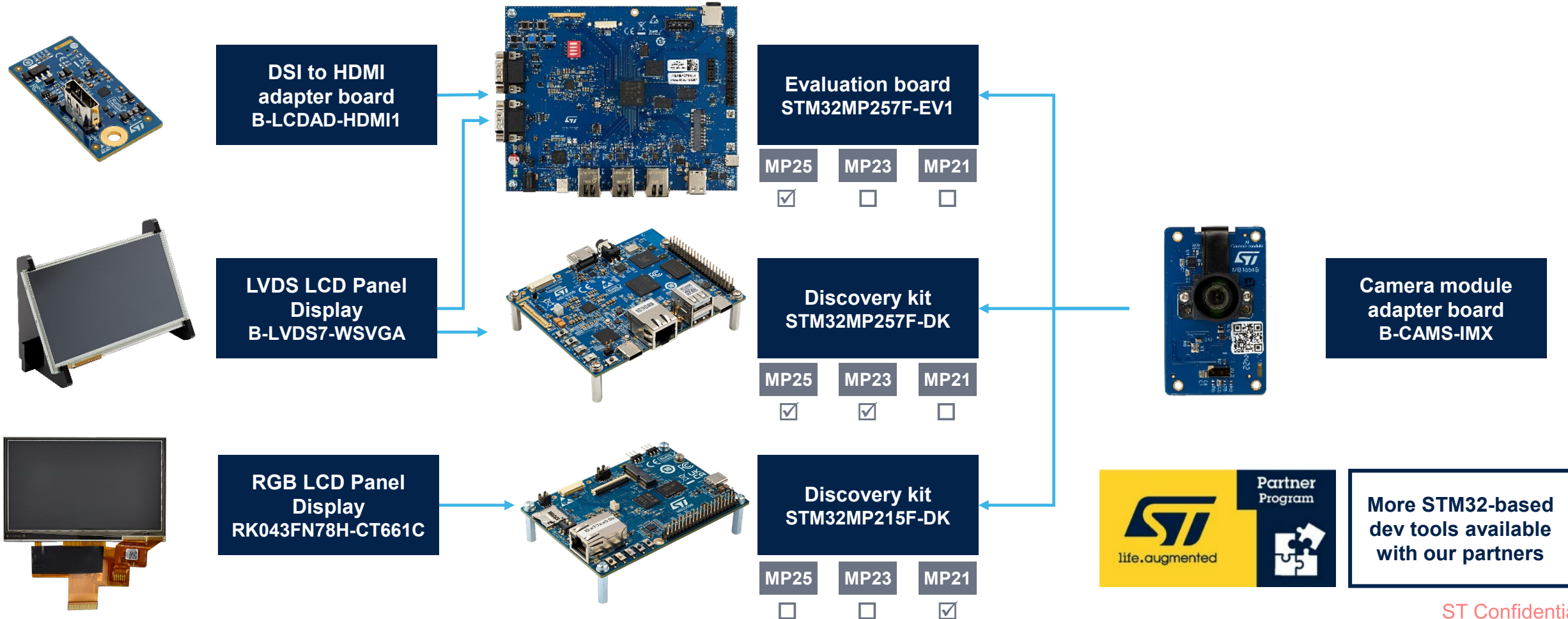


OpenSTDroid Distribution: available only for STM32MP25x product lines



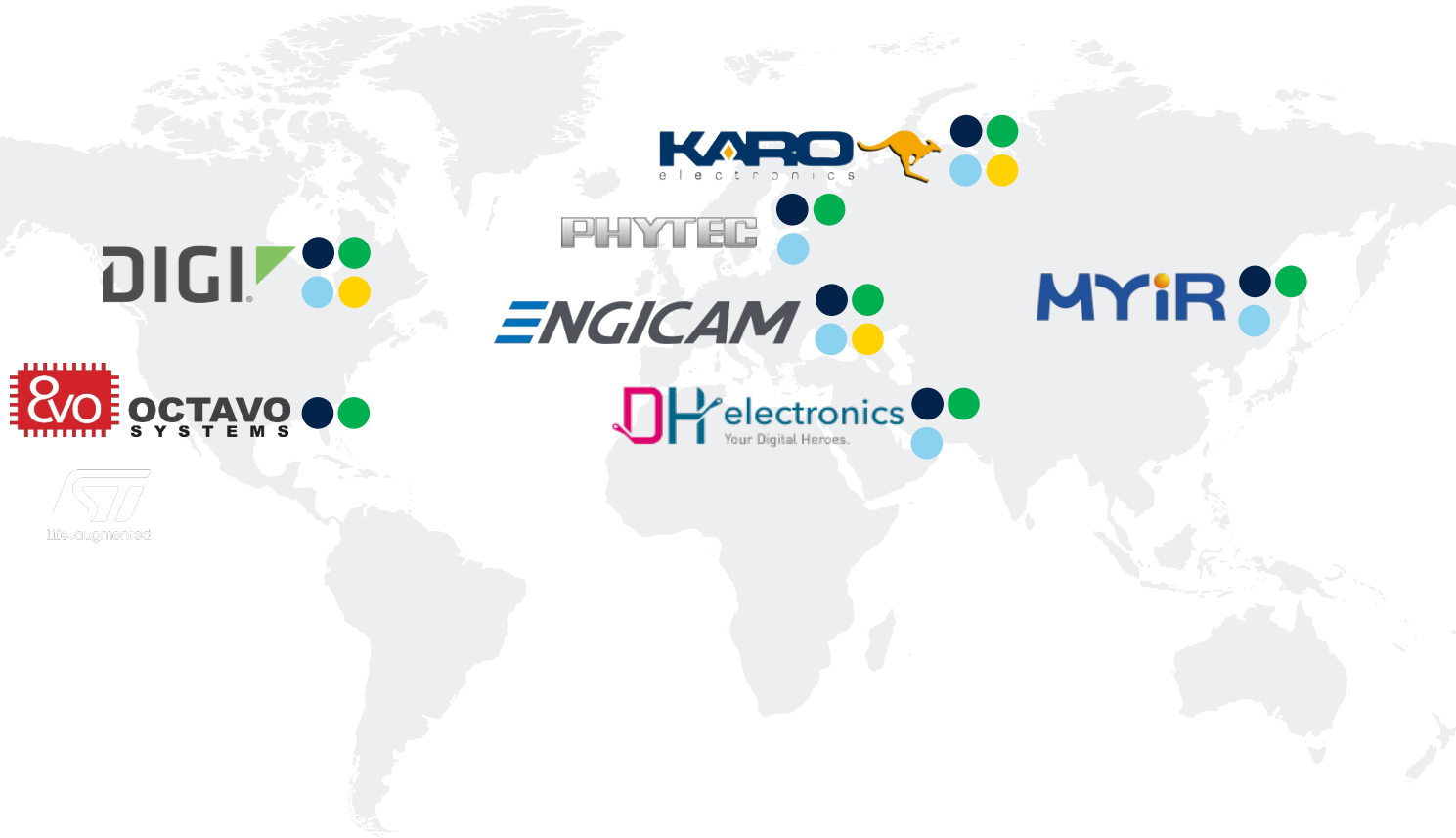
Development tools for the STM32MP2 series

Speed-up evaluation, prototyping, and design



System-on-modules, system-in-packages from selected partners

- STM32MP15
- STM32MP13
- STM32MP25
- STM32MP23



Complete hardware and software solution

Simplify design & save development time

Industrial grade and ready to go in production

Additional flavors of software & hardware

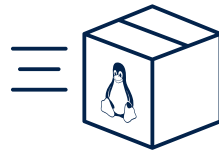
Add layer of customer support



[STM32MPU](#) [SOM on st.com](#)

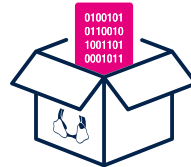
STM32 MPU embedded software

Same Linux software for STM32MP2 series for easy project migration



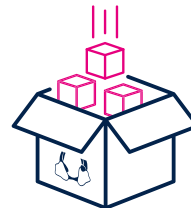
STM32MP2 Starter package

To quickly and easily start with any STM32MP2 microprocessor device



STM32MP2 Developer package

To add your own code on top of the STM32MP2 Embedded Software distribution



STM32MP2 Distribution package

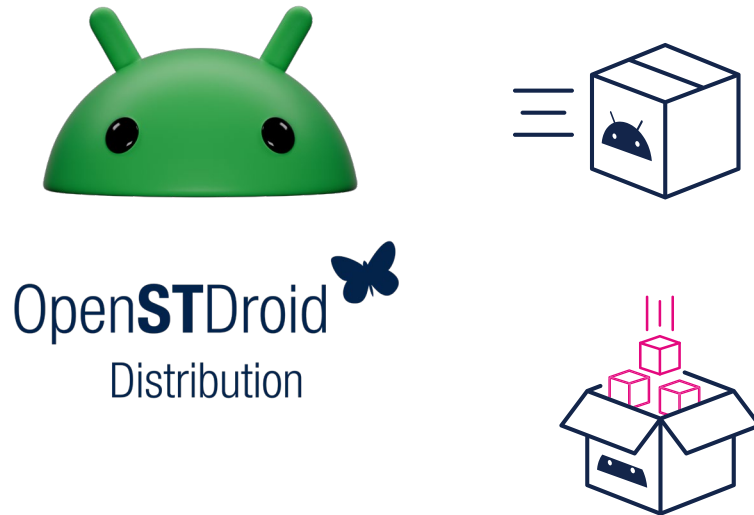
To create your own Linux[®] distribution as well as your own Starter and Developer packages

Discover now



STM32 MPU embedded software

STM32 MPU distribution for Android™



STM32MP2 Starter package

Provides the software image for the STM32MPU embedded software distribution. Including the OpenSTdroid distribution binaries, and the partition layout required to flash the device with STM32CubeProgrammer.

STM32MP2 Distribution package

Includes Android application frameworks, the OpenSTLinux BSP (Linux kernel, U-Boot, TF-A, OP-TEE) and a toolset to tune the system for your needs, and to handle the built image.

[Discover now](#)



STM32 MPU embedded software

Accelerate your time to market using expansion packages

 X-LINUX-ACM	   X-LINUX-IOT	 X-LINUX-SPN1
   X-LINUX-AI	   X-LINUX-MEMS	   X-LINUX-TPM
   X-LINUX-AWS	  X-LINUX-MSP01	 X-LINUX-TSNSWCH
   X-LINUX-AZURE	   X-LINUX-NFC	 X-LINUX-WW4
   X-LINUX-EVG1	 X-LINUX-PREDMNT	  STM32-ISP-IQTune
   X-LINUX-GNSS	  X-LINUX-QT	
 X-LINUX-IGWWSN1	   X-LINUX-RBT1	
   X-LINUX-IGTW1	  X-LINUX-RT	

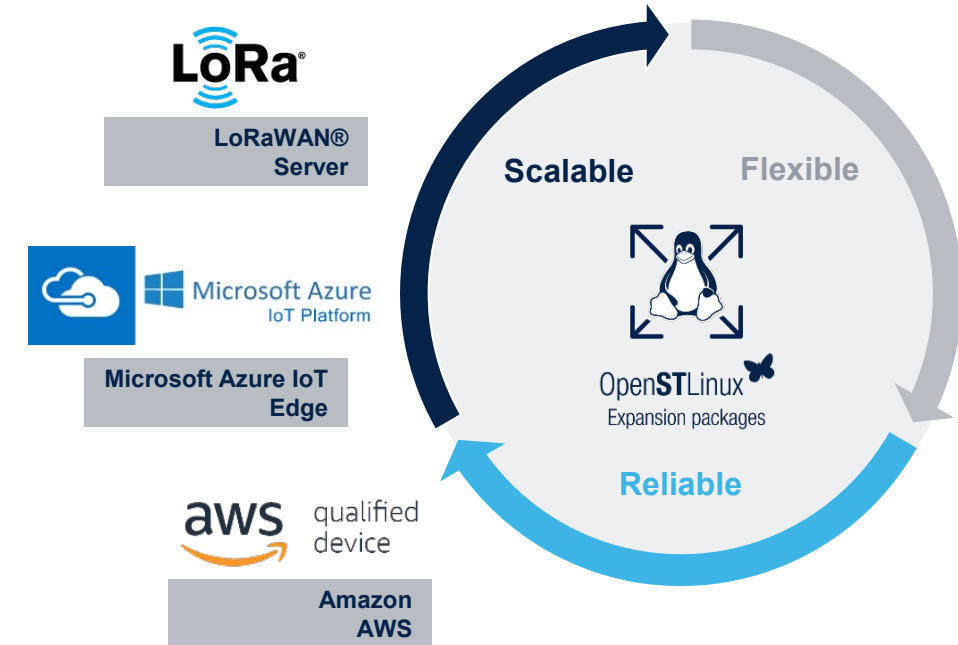
STM32 MPU OpenSTLinux Expansion Packages

Available

Planned

-  STM32MP15
-  STM32MP13

-  STM32MP25
-  STM32MP23



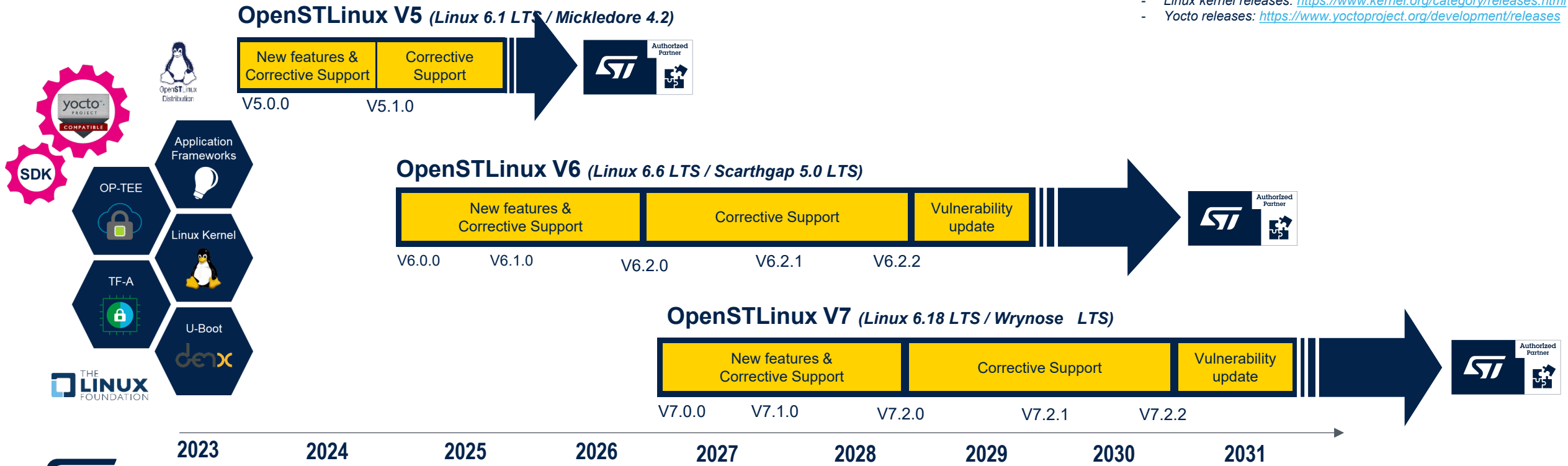


OpenSTLinux long-term support releases and support scheme

Extended maintenance to 5 years

2 versions in parallel with 5-year support by ST

References:
- Linux kernel releases: <https://www.kernel.org/category/releases.html>
- Yocto releases: <https://www.yoctoproject.org/development/releases>



Software development tools

STM32Cube provides the same tools across the STM32MP2 series for greater ease of use

STM32 
CubeMX

STM32 
CubeIDE

STM32 
CubeProgrammer

STM32CubeMX

STM32CubeMX enhanced for MPU

- Device Tree configuration
- Device Tree generation
- DRAM interface tuning tool

IDEs Compile and debug

Multicore solutions

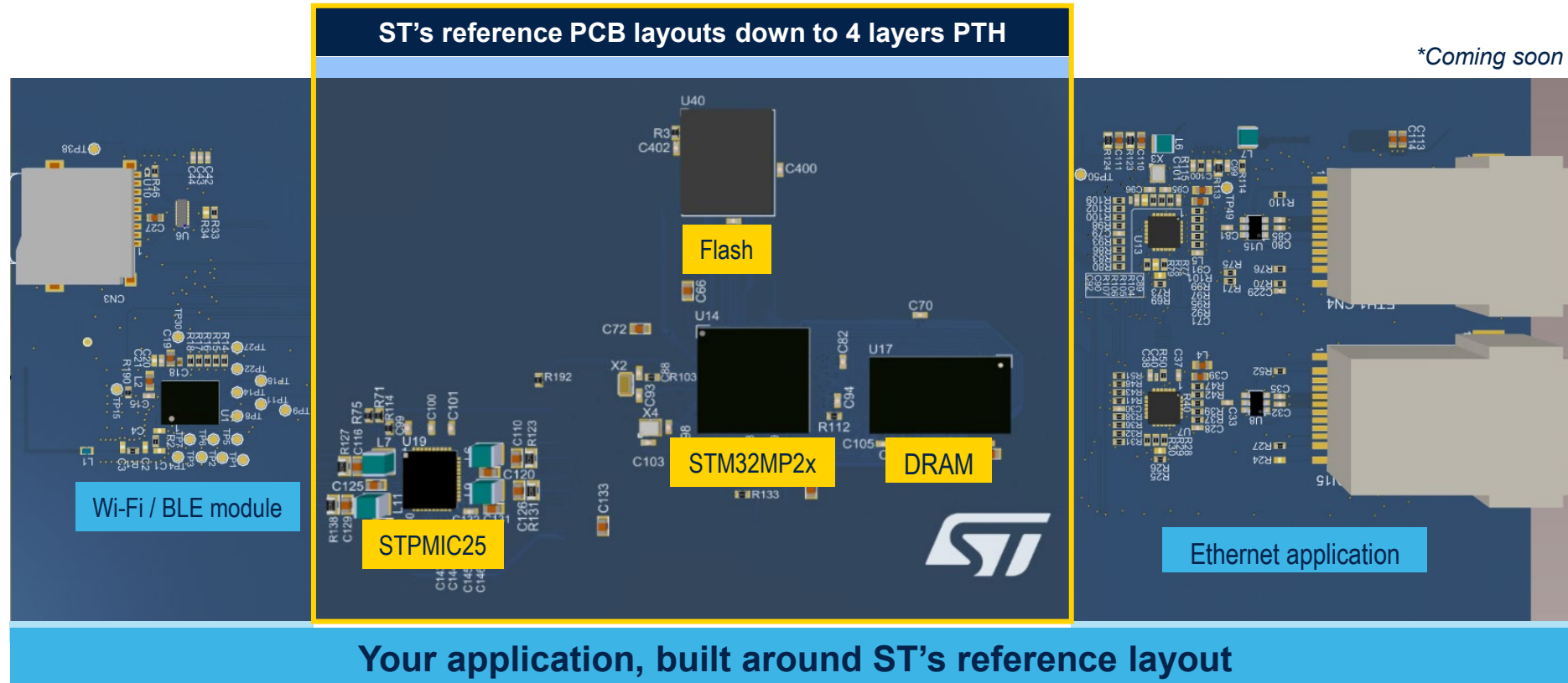
- Free STM32CubeIDE
- OpenSTLinux Developer package support
- Import DRAM tuning project

STM32 programming tool

STM32CubeProgrammer

- Flash, DRAM and/or system memory
- OTP programming
- Signing & key generation tools

Plug & play solution for STM32MP2 series for project reuse



PCB layout examples*
based on Altium projects
provide you with a modular
approach to build your
designs

- All different BGAs packages, STPMIC25, Flash and different DRAM types (DDR3L, DDR4 & LPDDR4)
- Signal integrity and power integrity checks completed
- Developers can reuse the layouts and add their own interfaces linked to their end projects

Speed up your development

Enhance stability, reliability, and simplify your design process with validated DRAM on the STM32 MPU portfolio



Performance optimization

Reduced development costs

Regulatory and quality assurance

Get the list here



Speed up your development

Enhance stability, reliability, and simplify your design process with validated DRAM on the STM32 MPU portfolio

STM32MP1 and STM32MP2 series support LPDDR4, DDR4, and DDR3L

- ✓ Up to 1066 MHz clock speed with STM32MP2
- ✓ Up to 1 GB (16-bit) & 2 GB (32-bit) densities with STM32MP2
- ✓ Optimized power efficiency and density
- ✓ Steady supply chain for long-term availability

Performance optimization

Reduced development costs

Regulatory and quality assurance

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Multiples libraries to run on STM32MP2



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Find out more at www.st.com/STM32MP2

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