



STM32 MPUs for human machine interfaces

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Product Marketing

STMicroelectronics



The STM32 portfolio



Five product categories



Wireless
MCU

Short- and long-range connectivity




Ultra-low-power
MCU

32-bit general-purpose microcontrollers: from 75 to 5,072 CoreMark score



Mainstream
MCU

High-performance
MCU



Embedded
MPU

32- and 64-bit microprocessors



Enabling edge AI solutions



Scalable security



[MPU portfolio](#)
[MCU portfolio](#)



STM32 MPU portfolio

STM32MP1 series

STM32MP2 series

Industrial communication processors

STM32MP133

Cortex-A7 up to 1GHz
CAN FD, 2x Eth

STM32MP153

2x Cortex-A7 + Cortex-M4
CAN FD

STM32MP257

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

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
CAN FD, 2x Eth, Display, Camera

STM32MP157

2x Cortex-A7 + Cortex-M4
CAN FD, 3D GPU, DSI

STM32MP215

Cortex-A35 + Cortex-M33
2x Eth, 2x CAN FD, RGB LCD, CSI2

STM32MP235

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

STM32MP257

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

STM32MP131

Cortex-A7 up to 1GHz
Eth

STM32MP151

Cortex-A7 + Cortex-M4
Eth

STM32MP213

Cortex-A35 + Cortex-M33
2x Ethernet, 2x CAN FD

STM32MP233

Dual Cortex-A35 + Cortex-M33
2x Ethernet, 2x CAN FD

STM32MP253

Dual Cortex-A35 + Cortex-M33
2x Ethernet, 3x CAN FD

STM32MP211

Cortex-A35 + Cortex-M33
1x Ethernet

STM32MP231

Cortex-A35 + Cortex-M33
1x Ethernet

STM32MP251

Cortex-A35 + Cortex-M33
1x Ethernet

NEW

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

Arm® Cortex®-A35
1.2GHz / up to 1.5GHz

L1 32KB I-Cache / 32KB D-Cache
128KB L2 cache
NEON
TrustZone

Arm® Cortex®-M33
300MHz

16KB I-cache
16KB D-Cache
FPU / MPU / NVIC
TrustZone

Memory

DDR4 4GB
LPDDR4 2GB
DDR3L 1GB

Shared RAM 448KB 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 123 GPIOs

Connectivity

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

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

Multimedia

24b RGB Disp. 1080p @ 60fps
Camera I/F MIPI CSI-2, 2 lanes
Camera I/F 16-bit Parallel
ISP (Camera Pipeline)

Audio & Analog

SPDIF Tx / Rx 4 inputs
4x SAI
MDF 4 channels / 4 filters
2x 12-bit ADC 5 MSPS
Temperature sensor

Timers

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

Processing

Enhanced security

STM32MP2 full series lineup

STM32MP257

3x Ethernet (2+1 switch) - 3x CAN FD
H.264 - 3D GPU - AI / NN - LVDS/DSI

A35
A35
M33
M0+

STM32MP255

2x Ethernet - 3x CAN FD
H.264 - 3D GPU - AI / NN - LVDS/DSI

A35
A35
M33
M0+

STM32MP235

2x Ethernet - 2x CAN FD
H.264 Dec - 3D GPU - AI / NN - LVDS/DSI

A35
A35
M33

STM32MP215

2x Ethernet - 2x CAN FD
RGB LCD - MIPI CSI2

A35
M33

STM32MP253

2x Ethernet - 3x CAN FD

A35
A35
M33
M0+

STM32MP233

2x Ethernet - 2x CAN FD

A35
A35
M33

STM32MP213

2x Ethernet - 2x CAN FD

A35
M33

STM32MP251

1x Ethernet

A35
M33
M0+

STM32MP231

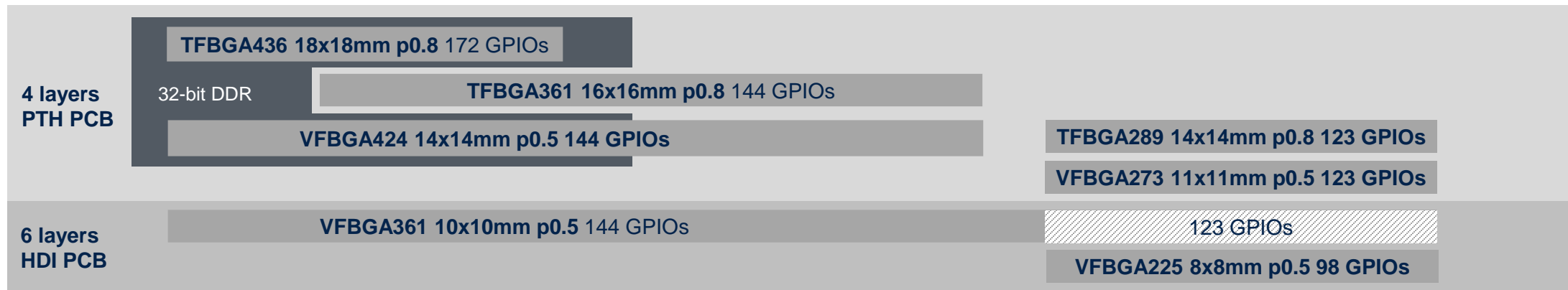
1x Ethernet

A35
M33

STM32MP211

1x Ethernet

A35
M33



Pin-to-pin compatible packages and same ecosystem!



STPMIC2x: highly integrated PMIC for STM32MP2x

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



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

Sampling now, production in Q4'25





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

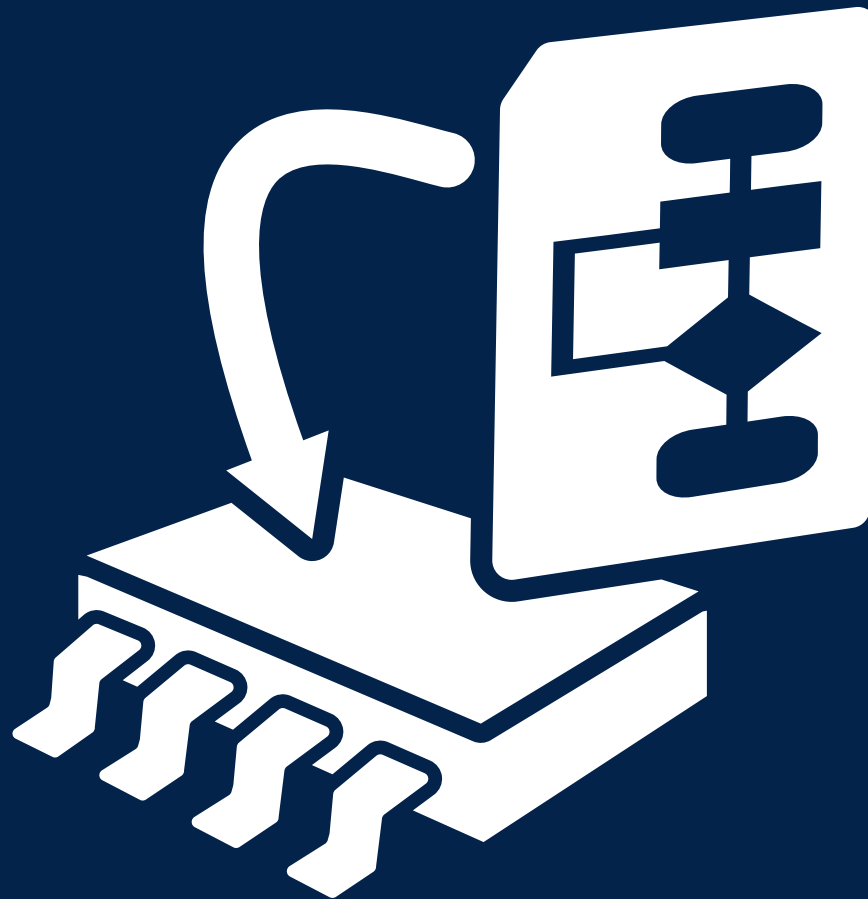
Flexible resource allocation between cores

- Dual or Single Arm® Cortex®-A35 up to 1.5 GHz
- Arm® Cortex®-M33 up to 400 MHz






Advanced security for Industry 4.0



STM32MP2x embedded software



STM32MP2x embedded software details

STM32 MPU embedded software for Cortex-A	android  with AOSP	 OpenSTLinux	 Buildroot <small>Making Embedded Linux Easy</small> ST partner	 OpenWrt <small>OPEN SOURCE FREEDOM</small> ST partner	 Bare metal
Supported by	<input checked="" type="checkbox"/> STM32MP2x with GPU	<input checked="" type="checkbox"/> STM32MP2x	<input checked="" type="checkbox"/> STM32MP2x	<input checked="" type="checkbox"/> STM32MP2x	<input checked="" type="checkbox"/> STM32MP13
Security support on	<input checked="" type="checkbox"/> Cortex-A35 <input checked="" type="checkbox"/> Cortex-M33	<input checked="" type="checkbox"/> Cortex-A35 <input checked="" type="checkbox"/> Cortex-M33	<input checked="" type="checkbox"/> Cortex-A35 <input checked="" type="checkbox"/> Cortex-M33	<input checked="" type="checkbox"/> Cortex-A35 <input checked="" type="checkbox"/> Cortex-M33	<input type="checkbox"/> Cortex-A35 <input checked="" type="checkbox"/> Cortex-M33
Low power	<input checked="" type="checkbox"/> Integrated	<input checked="" type="checkbox"/> Integrated	<input checked="" type="checkbox"/> Integrated	<input checked="" type="checkbox"/> Integrated	<input checked="" type="checkbox"/> Integrated
Host environment	<input checked="" type="checkbox"/> Ubuntu <input type="checkbox"/> Windows	<input checked="" type="checkbox"/> Ubuntu <input type="checkbox"/> Windows	<input checked="" type="checkbox"/> Ubuntu <input type="checkbox"/> Windows	<input checked="" type="checkbox"/> Ubuntu <input type="checkbox"/> Windows	<input checked="" type="checkbox"/> Ubuntu <input checked="" type="checkbox"/> Windows
■ Cortex-A35 Secure	<input checked="" type="checkbox"/> Bootloader: TF-A <input checked="" type="checkbox"/> TEE: Trusty	<input checked="" type="checkbox"/> Bootloader: TF-A <input checked="" type="checkbox"/> TEE: OP-TEE	<input checked="" type="checkbox"/> Bootloader: TF-A <input checked="" type="checkbox"/> TEE: OP-TEE	<input checked="" type="checkbox"/> Bootloader: TF-A <input checked="" type="checkbox"/> TEE: OP-TEE	<input checked="" type="checkbox"/> Bootloader: FSBL-A <input checked="" type="checkbox"/> FreeRTOS (LVGL)
■ Cortex-A35 Non-Secure	<input checked="" type="checkbox"/> Bootloader: U-Boot <input checked="" type="checkbox"/> Android (1080p30)	<input checked="" type="checkbox"/> Bootloader: U-Boot <input checked="" type="checkbox"/> Yocto / Weston	<input checked="" type="checkbox"/> Bootloader: U-Boot <input checked="" type="checkbox"/> Buildroot / QT5	<input checked="" type="checkbox"/> Bootloader: U-Boot <input checked="" type="checkbox"/> OpenWrt	<input type="checkbox"/> <i>Not applicable</i>
■ Cortex-M33 Secure	<input checked="" type="checkbox"/> Bootloader: MCUBOOT <input checked="" type="checkbox"/> TEE: TF-M	<input checked="" type="checkbox"/> Bootloader: MCUBOOT <input checked="" type="checkbox"/> TEE: TF-M	<input checked="" type="checkbox"/> Bootloader: MCUBOOT <input checked="" type="checkbox"/> TEE: TF-M	<input checked="" type="checkbox"/> Bootloader: MCUBOOT <input checked="" type="checkbox"/> TEE: TF-M	<input checked="" type="checkbox"/> Bootloader: MCUBOOT <input checked="" type="checkbox"/> TEE: TF-M
■ Cortex-M33 Non-Secure	<input checked="" type="checkbox"/> STM32Cube with FreeRTOS	<input checked="" type="checkbox"/> STM32Cube with FreeRTOS	<input checked="" type="checkbox"/> STM32Cube with FreeRTOS	<input checked="" type="checkbox"/> STM32Cube with FreeRTOS	<input checked="" type="checkbox"/> STM32Cube with FreeRTOS
Cold boot from	<input checked="" type="checkbox"/> Cortex-A35 (Android 13) <input checked="" type="checkbox"/> Cortex-M33 (Android 15)	<input checked="" type="checkbox"/> Cortex-A35 <input checked="" type="checkbox"/> Cortex-M33	<input checked="" type="checkbox"/> Cortex-A35 <input type="checkbox"/> Cortex-M33	<input checked="" type="checkbox"/> Cortex-A35 <input type="checkbox"/> Cortex-M33	<input type="checkbox"/> Cortex-A35 <input checked="" type="checkbox"/> Cortex-M33
Expansion packages	<input type="checkbox"/> <i>Not applicable</i>	<input checked="" type="checkbox"/> X-LINUX-...	<input type="checkbox"/> <i>Not applicable</i>	<input type="checkbox"/> <i>Not applicable</i>	<input type="checkbox"/> <i>Not applicable</i>
Drivers	<input checked="" type="checkbox"/> All IPs	<input checked="" type="checkbox"/> All IPs	<input checked="" type="checkbox"/> All IPs	<input checked="" type="checkbox"/> All IPs	<input checked="" type="checkbox"/> All IPs
Flash support (A35+M33)	<input checked="" type="checkbox"/> SD eMMC+sNOR	<input checked="" type="checkbox"/> SD eMMC NAND*+sNOR	<input checked="" type="checkbox"/> SD eMMC NAND*+sNOR	<input checked="" type="checkbox"/> SD eMMC NAND*+sNOR	<input checked="" type="checkbox"/> SD eMMC NAND*+sNOR <input checked="" type="checkbox"/> sNOR (single Flash)
MISRA 2012	<input checked="" type="checkbox"/> STM32Cube	<input checked="" type="checkbox"/> STM32Cube	<input checked="" type="checkbox"/> STM32Cube	<input checked="" type="checkbox"/> STM32Cube	<input checked="" type="checkbox"/> STM32Cube

*: NAND = sNAND and // NAND



OpenSTLinux now: from 2 → to 5 years

OpenSTLinux releases and support scheme

2 versions in parallel with
5-year support by ST

References:

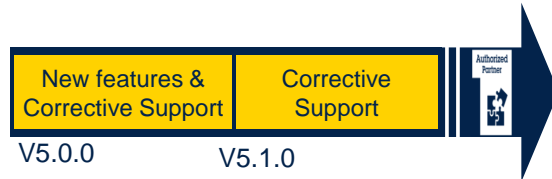
- Linux kernel releases: <https://www.kernel.org/category/releases.html>
- Yocto releases: <https://www.yoctoproject.org/development/releases>



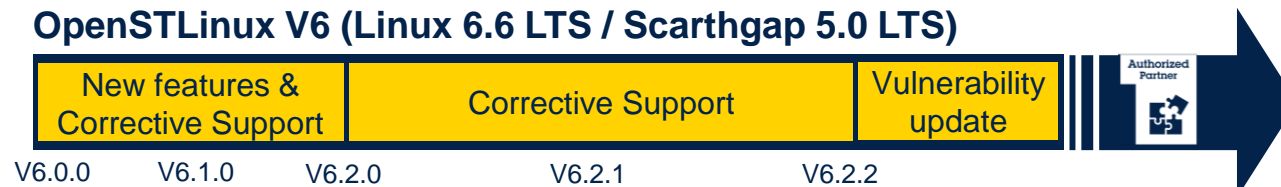
OpenSTLinux
Distribution



OpenSTLinux V5 (Linux 6.1 LTS / Mickledore 4.2)



OpenSTLinux V6 (Linux 6.6 LTS / Scarthgap 5.0 LTS)





STM32 hardware MPU for any UI needs





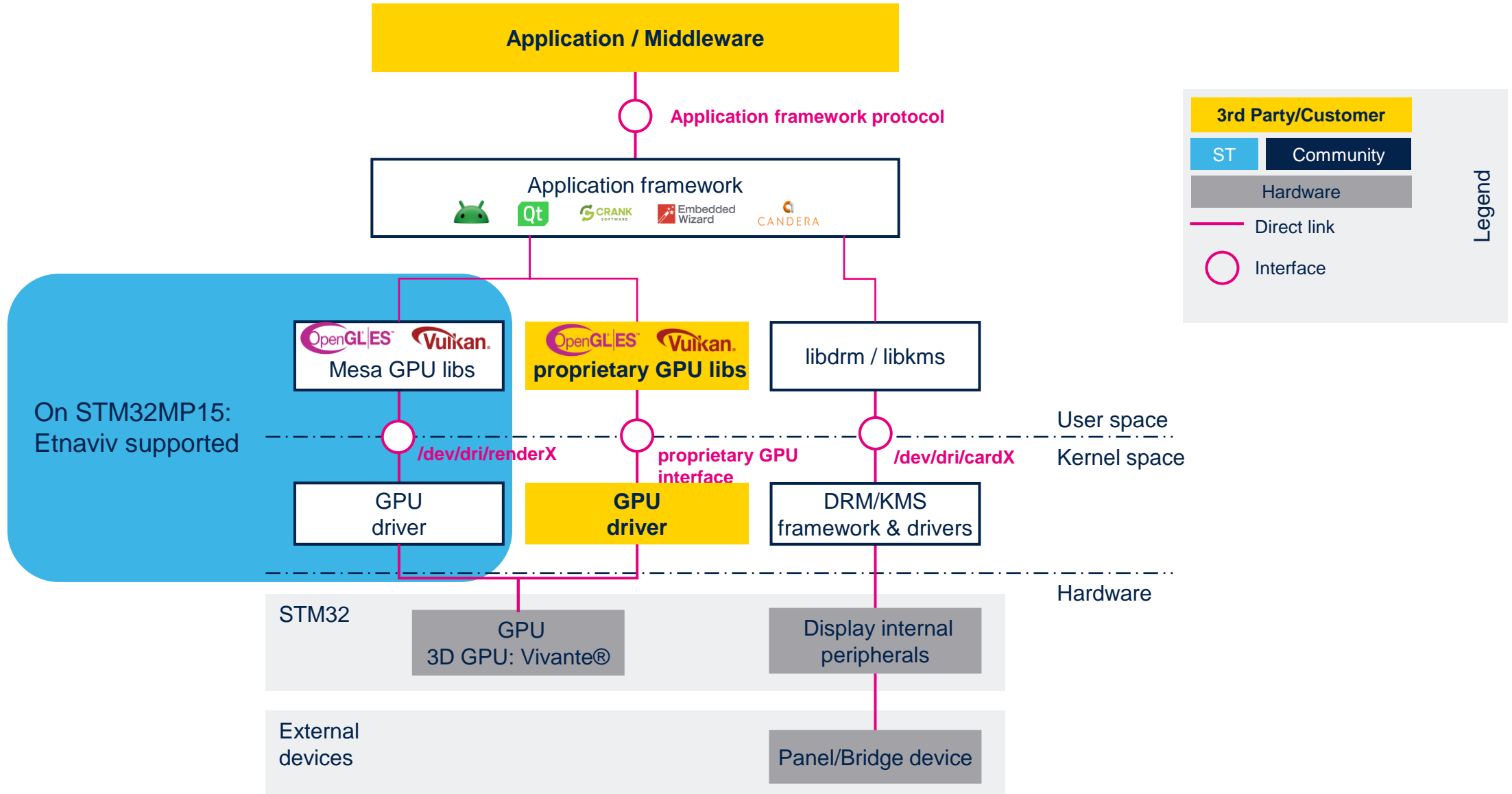
STM32 hardware MPU for any UI needs

	<u>STM32MP13</u>	<u>STM32MP15</u>	<u>STM32MP25</u>	<u>STM32MP23</u>
Camera interface	DCMI Up to 240 Mbytes using a 120 MHz pixel clock and 16-bit of data. 3 megapixels @30 fps in color 5 megapixels @15 fps in color	DCMI Up to 140 Mbytes using an 80 MHz pixel clock and 14-bit of data	MIPI CSI-2 with Lite-ISP (5 megapixels @30 fps DCMI 1 megapixels @15 fps)	
Display interface	LCD-TFT WXGA (1366x768) @60 fps up to full HD (1920 x 1080) @30 fps	LCD- TFT WXGA (1366 x 768) @60 fps up to full HD (1920 x 1080) @30 fps MIPI® DSI 2 data lanes	LCD-TFT FHD (1920 x 1080) @60 fps LVDS Up to QXGA (2048 x 1536) @60 fps with dual link DSI Up to QXGA (2048 x 1536) @60 fps	
NEON (Arm Cortex®-A)	video encode/decode, 2D/3D graphics	video encode/decode, 2D/3D graphics	audio, video, 3D graphics, image, and speech processing	
GPU		3D GPU: Vivante® OpenGL® ES 2.0 - Up to 27 Mtriangle/s, 133 Mpix/s	3D GPU: VeriSilicon® - Up to 900 MHz OpenGL® ES 3.2.8 - Vulkan 1.2-OpenCL™ 3.0, OpenVX™ 1.3 Up to 150 Mtriangle/s, 900 Mpix/s	3D GPU: VeriSilicon® - Up to 400 MHz OpenGL® ES 3.2.8 - Vulkan 1.2-OpenCL™ 3.0, OpenVX™ 1.3 Up to 66 Mtriangle/s, 400 megapixels/s





GPU stack software implementation





Software stack

GCNano

GCNano is a complete OpenGL ES 2.0 GPU architected for MCU / MPU systems with limited power, memory, and bandwidth configurations.

The graphics core is optimized to offload and significantly.

OpenGL® ES 3.2.8

OpenGL (Open Graphics Library) is a cross-language, cross-platform application programming interface (API) for rendering 2D and 3D vector graphics.

The API is typically used to interact with a graphics processing unit (GPU), to achieve hardware-accelerated rendering.

Vulkan

Vulkan is a new-generation graphics and compute API for high-efficiency, cross-platform access to GPUs.

As the industry's only open standard modern GPU API, Vulkan is unique in enabling developers to write applications that are portable to multiple diverse platforms.

OpenCL™ 3.0

OpenCL™ is a free, open standard for parallel programming across various platforms and devices such as

supercomputers, servers, PCs, mobile devices, and embedded systems.

It enhances performance and responsiveness for a broad range of applications in fields like creative tools, scientific and medical programs, vision processing, and neural network operations.

OpenVX™

OpenVX™ is a royalty-free standard for accelerating computer vision applications across different platforms.

It optimizes performance and power for real-time and embedded scenarios, supporting use cases like tracking, surveillance, ADAS, reconstruction, AR, inspection, and robotics.



Libraries running with the STM32 MPU ecosystem

GTK - GIMP Toolkit

- Free and open-source
- C and many other languages
- Set of widgets ready to use
- OpenSTlinux support (Yocto and Buildroot)



- Free and open-source (Android open-source project)
- Variety of graphics rendering APIs for 2D and 3D
- Android support



QT

- Set of widgets ready to use
- C++ and many other languages
- Supported on many platforms
- OpenSTlinux support (Yocto and Buildroot)



LVGL - Light and Versatile graphics Library

- Free and open source
- C language
- Set of widgets ready to use
- OpenSTlinux support (Yocto and Buildroot)
- Bare metal support



- WYSIWYG tools
- Drag and drop interface



- WYSIWYG tools
- Drag and drop interface



- WYSIWYG tools
- Drag and drop interface



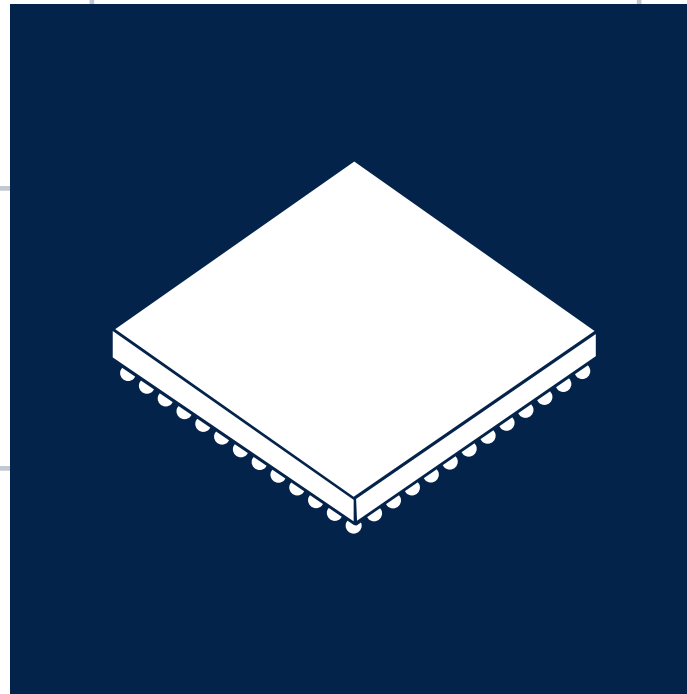
- WYSIWYG GUI editor
- Can be scaled to a variety of STM32



- Works with LVGL or GTK libraries
- Programming language needed



- WYSIWYG GUI editor
- Scalable on any STM32 for free



Trusted domain (TD) flavor selection helper



STM32MP2x embedded software's overview



STM32MP25 Planned

STM32MP23 Planned

Our technology starts with You



Find out more at www.st.com

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