STM32MP1 microprocessor
broadening STM32 MPU family

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EMEA Microcontrollers Technical Marketing

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STM32

" If only
I could find
   an Industrial grade processor
for my applications

Industrial grade microprocessor for demanding applications

Industrial qualification combining both:
100% operating time during 10 years
Junction temperature: - 40°C to 125°C

10 years longevity commitment renewed every year

Industrial connectivity, advanced analog Cortex-M4 for real time processing

Advanced security for Industry 4.0

4 packages available in pitch 0.5 & 0.8mm

STM32

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" **If only**
I could make
a Smart Home Gateway
with advanced HMI and HD video

Advanced HMI with graphics and video on top of real time applications

HD video decode
with Dual Arm Cortex-A7 @ 800 MHz

Better user experience
powered by advanced 3D GPU

to support

…

ation of
g
hitecture

STM32

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If only
I could easily
improve my applications
with Artificial Intelligence

Embedding various Neural Networks for cutting-edge applications

TensorFlow Lite native support running on Cortex-A7 / Linux

TensorFlow Lite

STM32Cube.AI tool for machine learning running on Cortex-M4

STM32 Cube.AI

Camera and audio interfaces to simplify input devices' integration

STM32MP1 - Constantly Improving
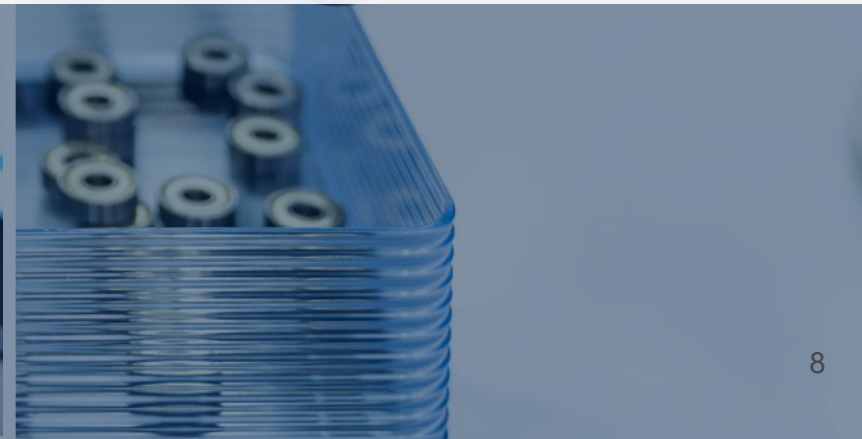
Boosting performances with Dual Cortex-A7 @ 800MHz

A **broader STM32 MPU ecosystem** to reduce development time & cost

STM32MP1: A General Purpose MPU
Suitable for all Developer Types and Multiple Applications

Developer profile

MCU users new to MPU

MCU → MPU

Mixed MCU and MPU users

MCU + MPU

Pure MPU users

MPU

STM32 MP1

Possible applications

Industrial

Consumer

Health & Wellness

Home

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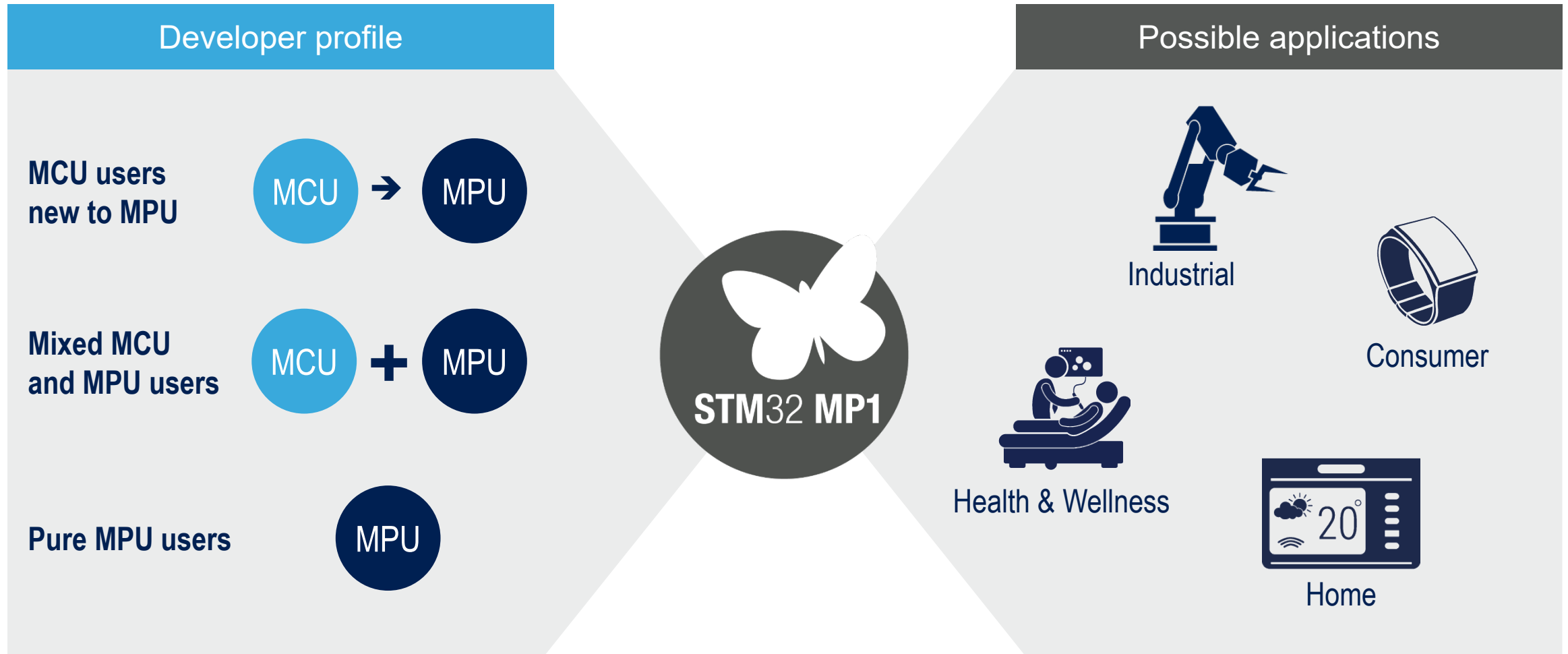
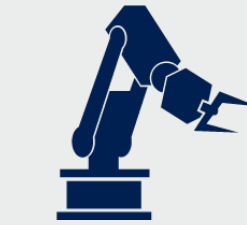# STM32MP1 Series: Value Proposal

Suitable for Scalable Applications

- **Leveraging STM32 Legacy values**
  - Regional technical Support
  - Recognized Supply Chain

- **Flexible Architecture Targeting Real Time and HMI Applications at reduced cost**

- **Reducing Time To Market**
  - Mainlined OpenSTLinux Distribution
  - Third Party Ecosystem
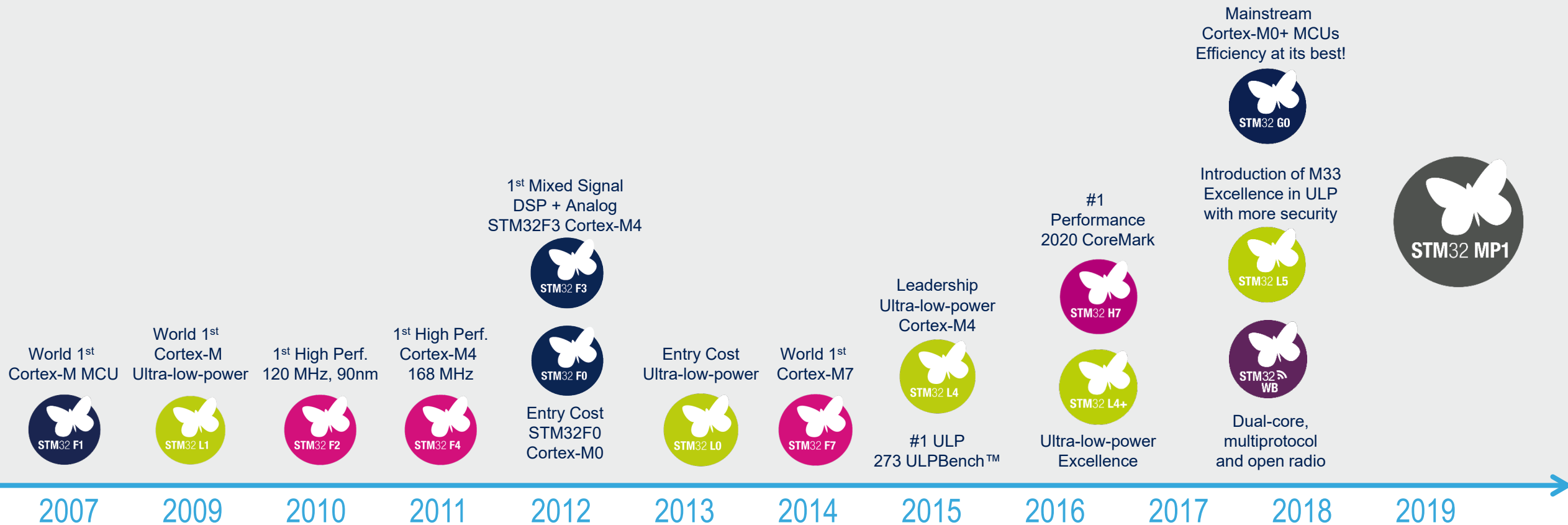
Targeted applications

Industrial

Consumer

Medical

Home

Continuing the STM32 Success Story

Leader in Arm Cortex-M 32-bit General Purpose MCU

Mainstream
Cortex-M0+ MCUs
Efficiency at its best!

STM32 G0

1st Mixed Signal
DSP + Analog
STM32F3 Cortex-M4

STM32 F3

#1
Performance
2020 CoreMark

STM32 H7

Introduction of M33
Excellence in ULP
with more security

STM32 L5

STM32 MP1

World 1st
Cortex-M MCU

STM32 F1

World 1st
Cortex-M
Ultra-low-power

STM32 L1

1st High Perf.
120 MHz, 90nm

STM32 F2

1st High Perf.
Cortex-M4
168 MHz

STM32 F4

STM32 F0

Entry Cost
STM32F0
Cortex-M0

Entry Cost
Ultra-low-power

STM32 L0

World 1st
Cortex-M7

STM32 F7

Leadership
Ultra-low-power
Cortex-M4

STM32 L4

#1 ULP
273 ULPBench™

STM32 L4+

Ultra-low-power
Excellence

STM32 WB

Dual-core,
multiprotocol
and open radio

| 2007 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |

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STM32MP1 - your new companion for advanced applications

Boosting performances
with Dual Cortex-A7 @ 800MHz

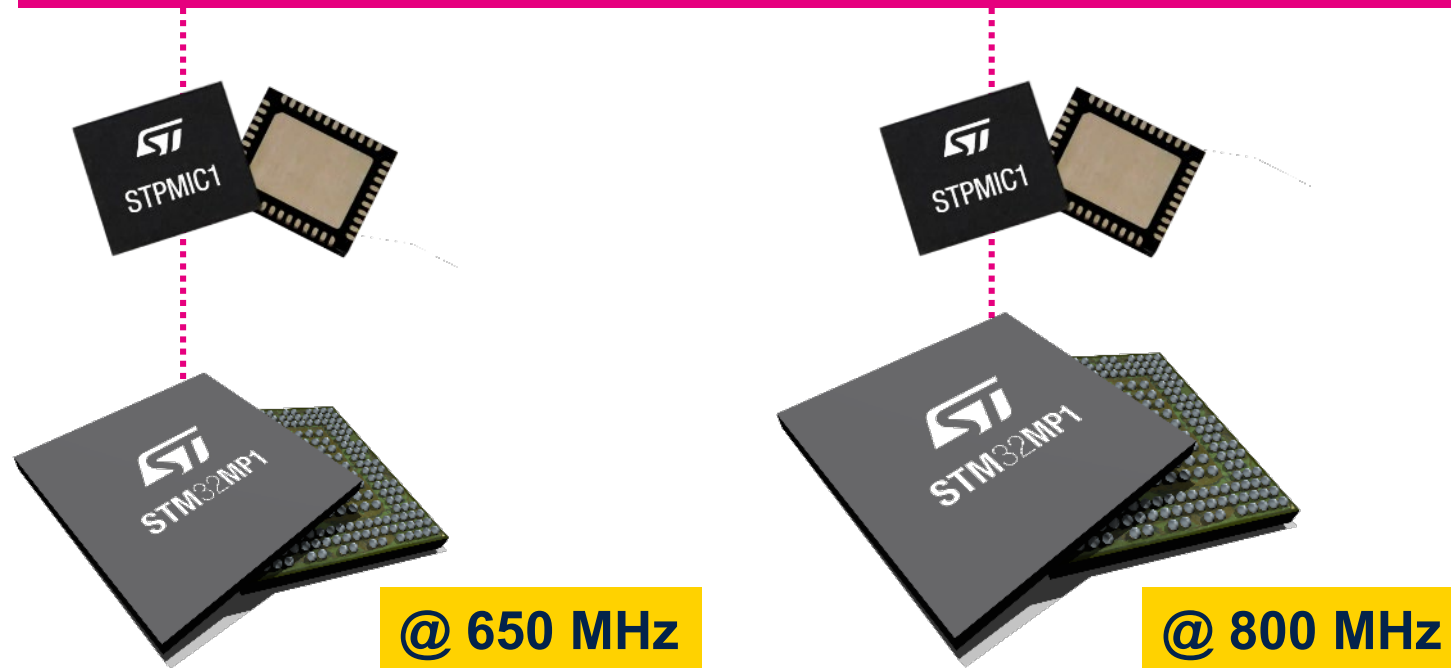A **broader STM32 MPU ecosystem**
to reduce development time & cost

Boosting performances
Broadening possibilities

Pin to pin compatibility across all part numbers
Full HW compatibility with STPMIC1

SW compatibility
across the family

STPMIC1

STPMIC1

STM32MP1

STM32MP1

@ 650 MHz

@ 800 MHz

STM32 Cube

OpenSTLinux
Distribution

A Scalable Solution to best meet customers' needs

STM32MP1 Series Solution
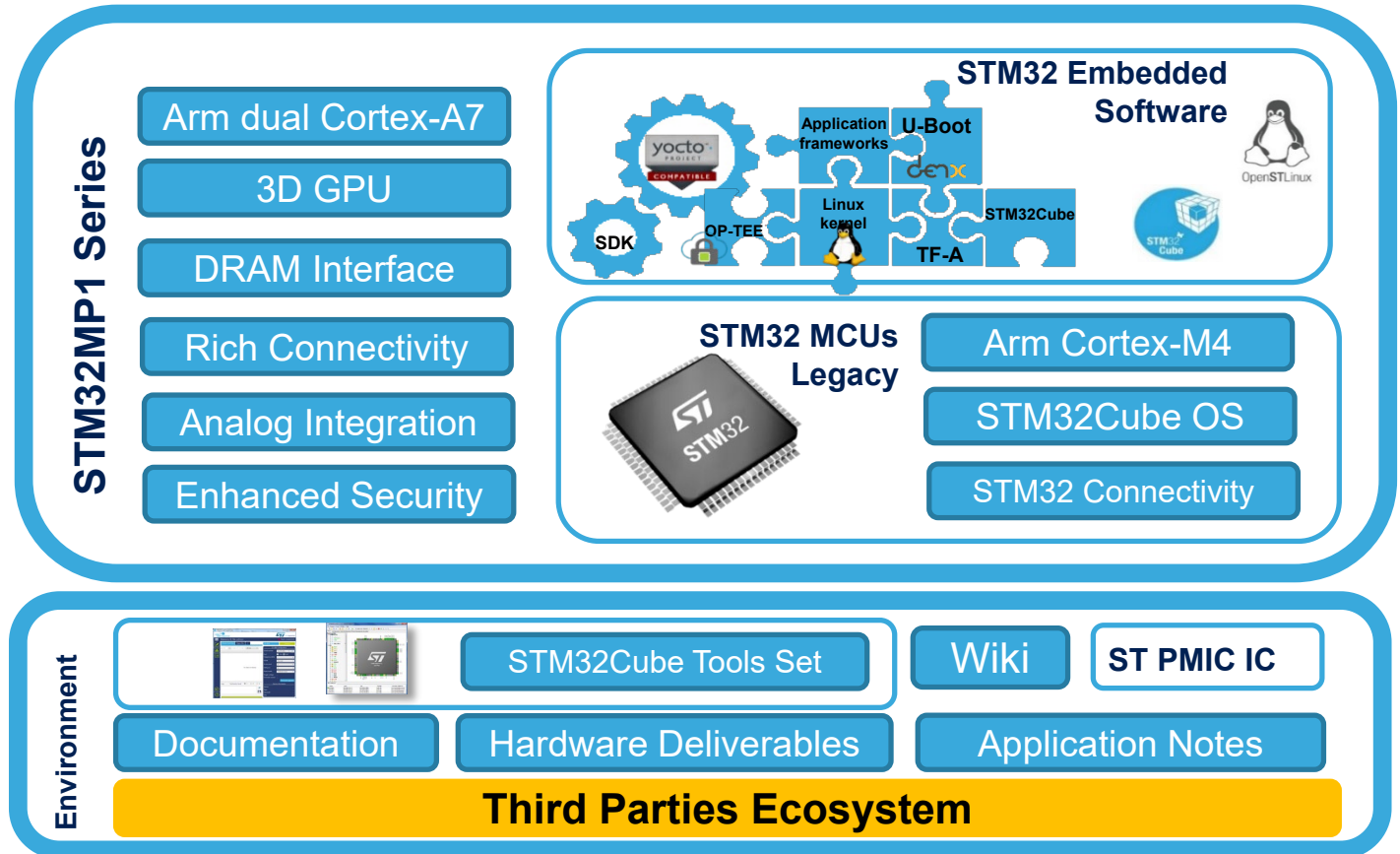
- **Generic Features**
  - **32bit Dual Cortex®-A7 @ 650MHz**
  - **32bit Cortex®-M4 @ 209MHz,**
  - **Vivante 3D GPU @ 533MHz & 26MTri/s**
  - **Industrial Qual'ed at Extended temperature :-40°C up to 125°C Tj**
  - **3 products for one Scalable Series**
    - From .5mm up to 0.8mm pitch Package
    - 10x10mm package

- **Software Environment**
  - OpenSTLinux Distribution
  - Yocto Framework and tools
  - Android Support
  - STM32Cube RTOS
  - STM32Cube Tools Suite

- **Hardware Environment**
  - Dedicated Power Management, STMPMIC1
  - STM32 Discovery Board
  - STM32 Evaluation Board
  - Hardware Deliveries (Schematics, Gerber…)

- **Documentation**
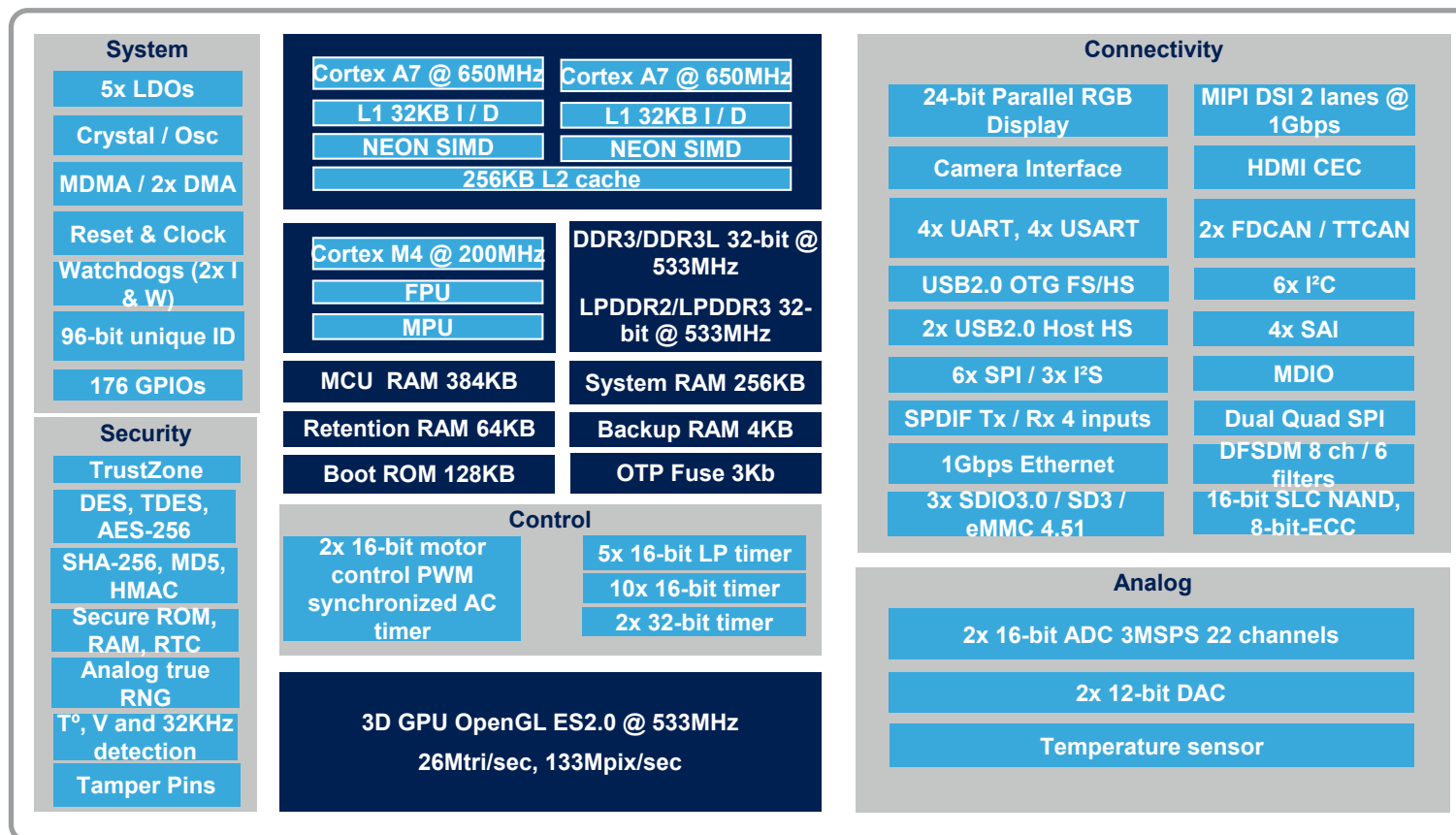 - On line wiki
  - Application Note
  - User Guide, Datasheet, …

STM32MP1 Series Block Diagram

- **32 bit Dual Cortex®-A7 @ 650MHz**
- **32bit Cortex®-M4 @ 200MHz,**
- **40nm LP Technology**
- **Vivante 3D GPU @ 533MHz & 26MTri/s**
- **Industrial Qual'ed at Extended temperature :-40°C up to 125°C Tj**
- Analog
  - Integrated LDO's
  - Integrated advanced ADC & DAC
  - 2x 16 bit Motor Control
- Connectivity
  - 1 Gigabit Ethernet
  - USB 2.0 OTG w/ PHY
  - CAN Interface
  - HDMI CEC
- Memory Support
  - SLC NAND, eMMC, NOR SD Card
  - 256KB RAM, 384KB RAM
  - DDR3/3L 533MHz, LPDDR2 400MHz
- Multimedia
  - 24-bit parallel RGB Display support
  - Display up to WXGA @ 60fps
- Security
  - Secure Boot
  - Cryptography acceleration
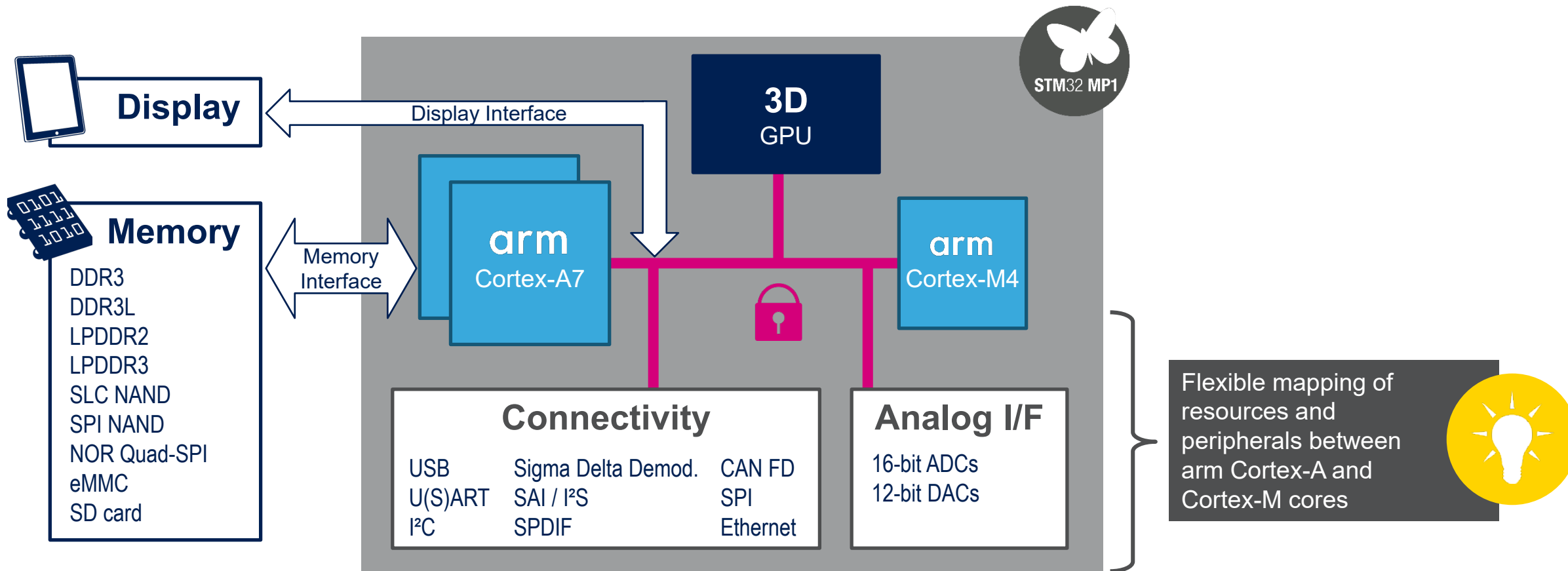 - True Analog RNG
  - 3 Tamper Pins whit one active

System
- 5x LDOs
- Crystal / Osc
- MDMA / 2x DMA
- Reset & Clock
- Watchdogs (2x I & W)
- 96-bit unique ID
- 176 GPIOs

Security
- TrustZone
- DES, TDES, AES-256
- SHA-256, MD5, HMAC
- Secure ROM, RAM, RTC
- Analog true RNG
- T°, V and 32KHz detection
- Tamper Pins

- Cortex A7 @ 650MHz — L1 32KB I / D — NEON SIMD
- Cortex A7 @ 650MHz — L1 32KB I / D — NEON SIMD
- 256KB L2 cache

- Cortex M4 @ 200MHz — FPU — MPU
- DDR3/DDR3L 32-bit @ 533MHz
- LPDDR2/LPDDR3 32-bit @ 533MHz

- MCU RAM 384KB
- System RAM 256KB
- Retention RAM 64KB
- Backup RAM 4KB
- Boot ROM 128KB
- OTP Fuse 3Kb

Control
- 2x 16-bit motor control PWM synchronized AC timer
- 5x 16-bit LP timer
- 10x 16-bit timer
- 2x 32-bit timer

**3D GPU OpenGL ES2.0 @ 533MHz
26Mtri/sec, 133Mpix/sec**

Connectivity
- 24-bit Parallel RGB Display
- Camera Interface
- 4x UART, 4x USART
- USB2.0 OTG FS/HS
- 2x USB2.0 Host HS
- 6x SPI / 3x I²S
- SPDIF Tx / Rx 4 inputs
- 1Gbps Ethernet
- 3x SDIO3.0 / SD3 / eMMC 4.51
- MIPI DSI 2 lanes @ 1Gbps
- HDMI CEC
- 2x FDCAN / TTCAN
- 6x I²C
- 4x SAI
- MDIO
- Dual Quad SPI
- DFSDM 8 ch / 6 filters
- 16-bit SLC NAND, 8-bit-ECC

Analog
- 2x 16-bit ADC 3MSPS 22 channels
- 2x 12-bit DAC
- Temperature sensor

- **SW Environment**
  - OpenSTLinux Distribution
  - Yocto Framework and tools
  - Android capable
  - STM32Cube RTOS
  - STM32Cube Tools Suite

- **HW Environment**
  - Dedicated Power Management, STMPMIC1
  - STM32 Discovery Board
  - STM32 Evaluation Board
  - Hardware Deliveries (Schematics, Gerber…)
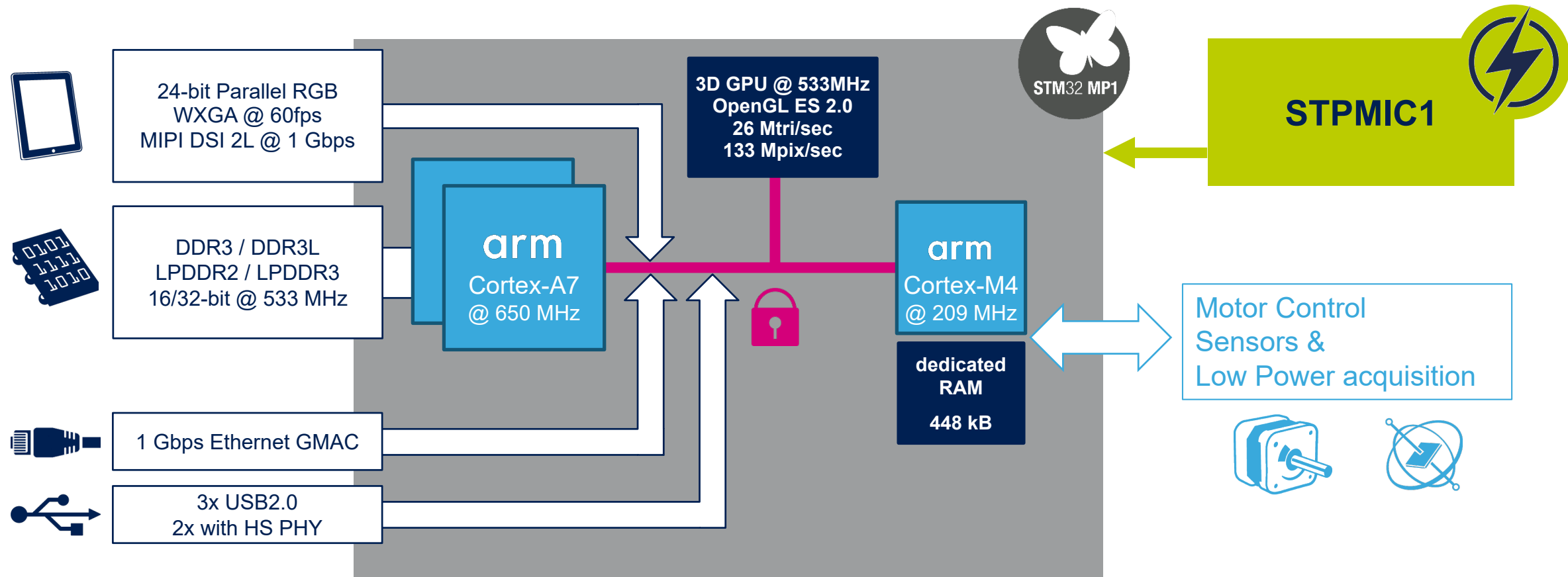
Advanced & Flexible Architecture with 3D GPU

Display

Display Interface

Memory

DDR3
DDR3L
LPDDR2
LPDDR3
SLC NAND
SPI NAND
NOR Quad-SPI
eMMC
SD card

Memory Interface

STM32 MP1

3D GPU

arm Cortex-A7

arm Cortex-M4

Connectivity

USB	Sigma Delta Demod.	CAN FD
U(S)ART	SAI / I²S	SPI
I²C	SPDIF	Ethernet

Analog I/F

16-bit ADCs
12-bit DACs

Flexible mapping of resources and peripherals between arm Cortex-A and Cortex-M cores

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Arm Cortex-A + Cortex-M Architecture

High speed I/F & processing | **Real-time**

24-bit Parallel RGB
WXGA @ 60fps
MIPI DSI 2L @ 1 Gbps

DDR3 / DDR3L
LPDDR2 / LPDDR3
16/32-bit @ 533 MHz

1 Gbps Ethernet GMAC

3x USB2.0
2x with HS PHY

3D GPU @ 533MHz
OpenGL ES 2.0
26 Mtri/sec
133 Mpix/sec

STM32 MP1

STPMIC1

arm
Cortex-A7
@ 650 MHz

arm
Cortex-M4
@ 209 MHz

dedicated
RAM

448 kB

Motor Control
Sensors &
Low Power acquisition

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Processing for HMI and communication + motor control & sensing

STM32 MP1

3D GPU

Full Power

arm **Cortex-A7**

arm **Cortex-M4**

dedicated RAM

DRAM Memory

Motor Control Sensors & Low Power acquisition

Graphic and Communication processing 2470 DMIPS on dual Cortex-A7 + 3D GPU

Motor Control, Sensors and Low Power acquisition 260 DMIPS on Cortex-M4

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Flexible Architecture for Power Efficiency

Motor control & sensing

STM32 MP1

3D GPU

arm Cortex-A7

arm Cortex-M4

dedicated RAM

DRAM Self refresh mode

Power Divided by 4 vs. full power mode

Motor Control Sensors & Low Power acquisition

Graphic and Communication processing STOP MODE

Motor Control, Sensors and Low Power acquisition 260 DMIPS on Cortex-M4

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ST Confidential

Flexible Architecture for Power Efficiency

Standby mode

STM32 MP1

3D GPU

DRAM **Self refresh mode**

arm Cortex-A7

arm Cortex-M4

dedicated RAM

Motor Control Sensors & Low Power acquisition

Power Divided by 2.5K vs. previous mode

Graphic and Communication processing STANDBY MODE

Motor Control, Sensors and low power acquisition STANDBY MODE

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ST Confidential

Flexible Architecture for Power Efficiency

Processing for HMI and communication + motor control & sensing

DRAM Memory

3D GPU

STM32 MP1

Full Power

arm Cortex-A7

arm Cortex-M4

dedicated RAM

Motor Control Sensors & Low Power acquisition

Back to full performance
~1 second to move back to Linux console
~3 seconds for 3D graphic application

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STM32MP1 - Your New Companion

for Advanced Applications

STM32 MP1

Available NOW!

Extending STM32 success and commitment with **Microprocessors**

Flexible architecture
for a wide range of applications

Accelerated development
leveraging the **STM32 Ecosystem**

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Boosting application possibilities

| Graphic and communication **High Performance** processing **up to 3040 DMIPS** | **Real-time** & **Low Power** applications 260 DMIPS |

Advanced GUI & HD Video Decode

STM32MP1

3D GPU @ 533MHz
OpenGL ES 2.0
26 Mtri/sec
133 Mpix/sec

arm
Cortex-A7
**up to
800 MHz**

arm
Cortex-M4
209 MHz

dedicated
RAM

448 kB

Connectivity

STPMIC1

Motor Control Sensors

Open OS

Real time OS
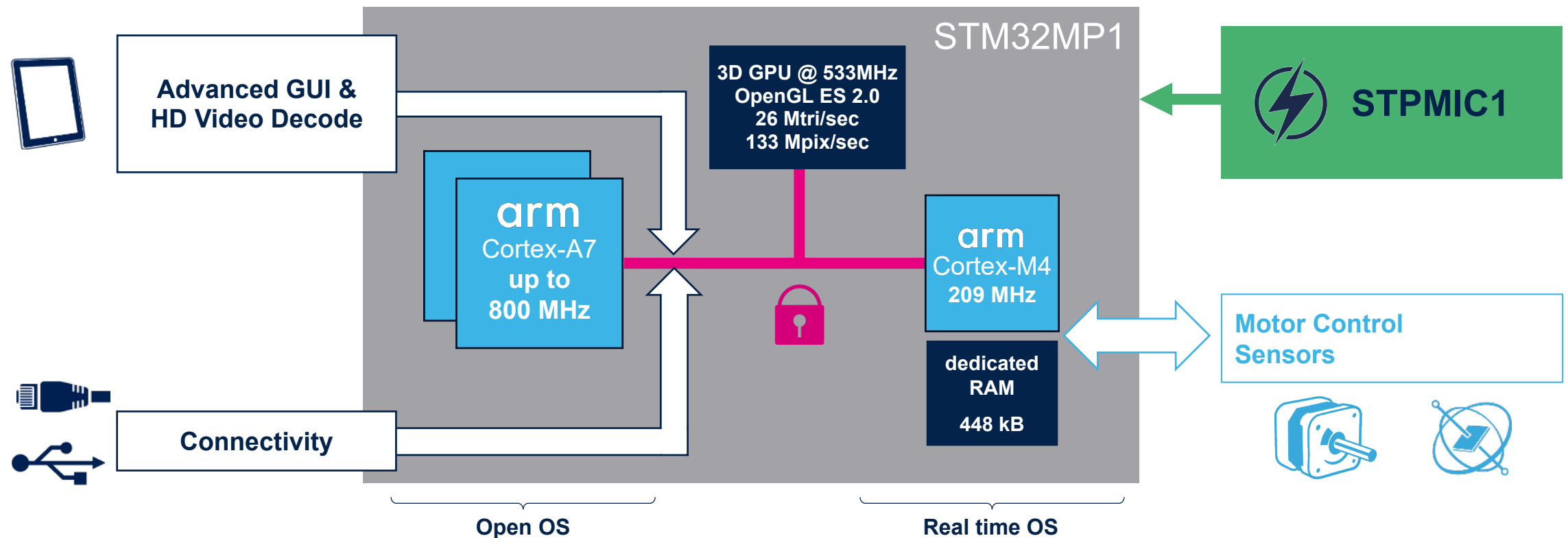
Secure architecture for trusted devices

ENCRYPTION DECRYPTION AUTHENTICATION

- Duplicated resources on Cortex-A7 and Cortex-M4
  - Crypto and Hash Hardware Engines
  - TRNG
- Secure boot (ROM)
- Unique ID

CONFIDENTIALITY ANTI-TAMPERING

- TrustZone
- Secure RAMs and Peripherals
- Secure RTC with Active Tamper
- T°, V and 32KHz sensor monitoring
- Cortex-M4 resources HW isolation
- Secure OS support: OP-TEE

SECURE MANUFACTURING

- Paired Keys Tools Generator
- Signing Tools for boot
- Development and production programmers with provisioning and authentication
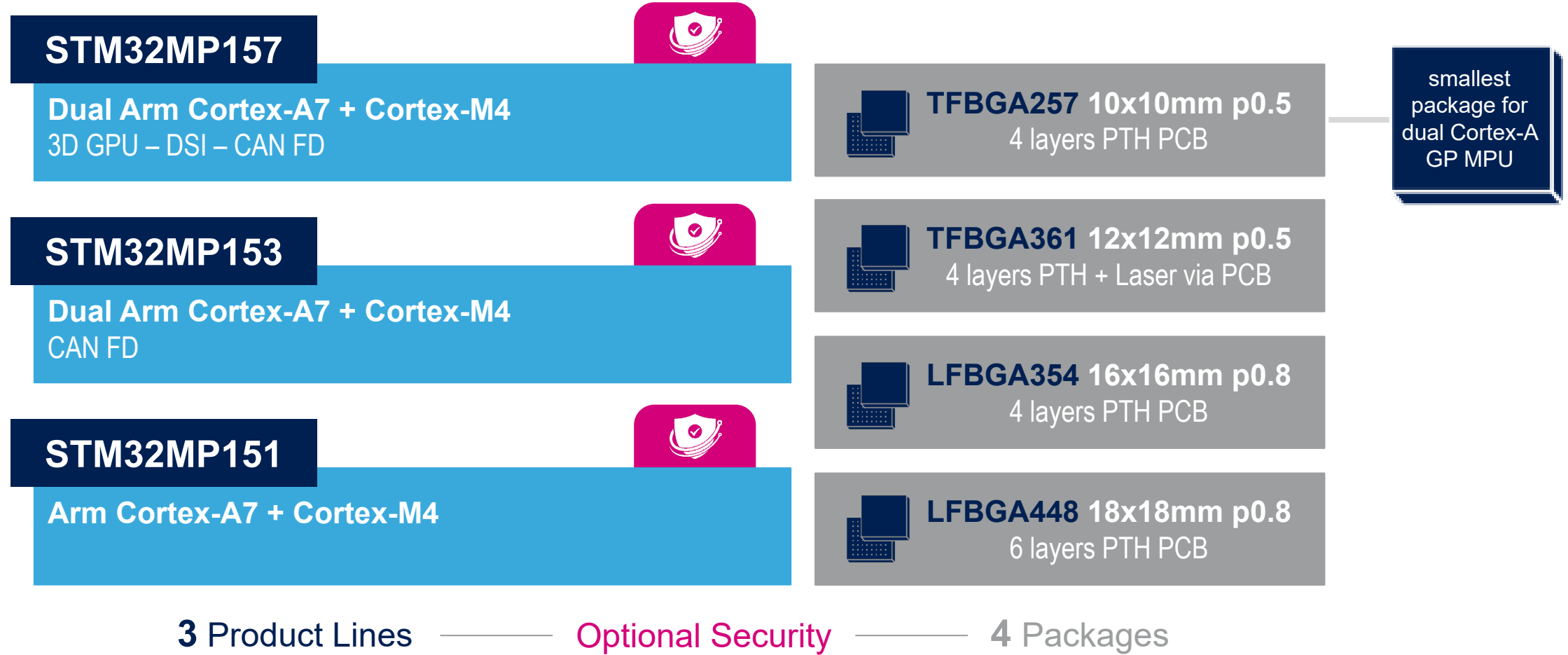
Boosting performances
with Dual Cortex-A7 @ 800MHz

STM32MP157F

System

- 5x LDOs
- Crystal & Internal oscillators
- MDMA + 2x DMA
- Reset and Clock
- Watchdogs (2x I & W)
- 96-bit unique ID
- Up to 176 GPIOs

Security

- TrustZone
- DES, TDES, AES-256
- SHA-256, MD5, HMAC
- 3x Tamper Pins with 1 active
- T°, V and 32KHz detection
- Secure ROM and RAMs
- Secure Peripherals
- Secure RTC
- Analog true RNG

Dual Cortex-A7 @ 800MHz

Core 1 @ 800MHz L1 32KB I / 32KB D	Core 2 @ 800MHz L1 32KB I / 32KB D
NEON SIMD	NEON SIMD
256KB L2 cache	

Cortex-M4 @ 209MHz

FPU	MPU

DDR3/DDR3L 32-bit @ 533MHz
LPDDR2/LPDDR3 32-bit @ 533MHz

System RAM 256KB	MCU System RAM 384KB
Retention RAM 64KB	Backup RAM 4KB
Boot ROM 128KB	OTP Fuse 3Kb

Control

- 2x 16-bit motor control PWM synchronized AC timer

10x 16-bit timer	5x 16-bit LP timer

- 2x 32-bit timer

3D GPU OpenGL ES2.0 @ 533MHz
26Mtri/sec, 133Mpix/sec

Connectivity

24-bit Parallel RGB Display	MIPI DSI 2 lanes @ 1Gbps
Camera Interface	HDMI CEC
1Gbps Ethernet	2x FDCAN / TTCAN
2x USB2.0 Host HS	USB2.0 OTG FS/HS
MDIO	DFSDM 8 channels / 6 filters
6x I²C	4x UART, 4x USART
6x SPI / 3x I²S	4x SAI
SPDIF Tx / Rx 4 inputs	Dual Quad SPI
3x SDIO3.0 / SD3 / eMMC 4.51	16-bit SLC NAND, 8-bit-ECC

Analog

- 2x 16-bit ADC
- 2x 12-bit DAC
- Temperature sensor

Cortex-A7 @ 800MHz only from -20°C < T_j < 105°C

STM32MP1 Tailored for Multiple Applications

24 Sales Type in Production Now

STM32MP157

Dual Arm Cortex-A7 + Cortex-M4
3D GPU – DSI – CAN FD

STM32MP153

Dual Arm Cortex-A7 + Cortex-M4
CAN FD

STM32MP151

Arm Cortex-A7 + Cortex-M4

TFBGA257 10x10mm p0.5
4 layers PTH PCB

smallest package for dual Cortex-A GP MPU

TFBGA361 12x12mm p0.5
4 layers PTH + Laser via PCB

LFBGA354 16x16mm p0.8
4 layers PTH PCB

LFBGA448 18x18mm p0.8
6 layers PTH PCB

3 Product Lines ——— Optional Security ——— **4** Packages

STM32MP1 Line-up

NEW
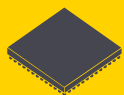
MPU @ 800 MHz

STM32 **MP151D**	MP151F		STM32 **MP153D**	MP153F		STM32 **MP157D**	MP157F
1520 + 260 DMIPS	-		**3040 + 260 DMIPS**	-		**3040 + 260 DMIPS**	-
800 MHz Cortex-A7	-		**800 MHz 2x Cortex A7**	-		**800 MHz 2x Cortex-A7**	-
209 MHz Cortex-M4	-		209 MHz Cortex-M4	-		209 MHz Cortex -M4	-
	Security		CAN FD	Security		CAN FD - 3D GPU - DSI	Security

MPU @ 650 MHz

STM32 **MP151A**	MP151C		STM32 **MP153A**	MP153C		STM32 **MP157A**	MP157C
1235 + 260 DMIPS	-		**2470 + 260 DMIPS**	-		**2470 + 260 DMIPS**	-
650 MHz Cortex-A7	-		650 MHz 2x Cortex-A7	-		650 MHz 2x Cortex-A7	-
209 MHz Cortex-M4	-		209 MHz Cortex-M4	-		209 MHz Cortex-M4	-
	Security		CAN FD	Security		CAN FD - 3D GPU – DSI	Security

LONGEVITY 10 YEARS COMMITMENT

All references are available in **4 Packages**

TFBGA257 10x10mm p0.5 (4 layers PTH PCB) - smallest package for dual Cortex-A GP MPU

TFBGA361 12x12mm p0.5 (4 layers PTH + Laser via PCB)

LFBGA354 16x16mm p0.8 (4 layers PTH PCB)

LFBGA448 18x18mm p0.8 (6 layers PTH PCB)

All parts are software and pin to pin compatible

Arm® Cortex® core	Cortex-A7 + Cortex-M4	Dual Cortex-A7 + Cortex-M4

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Building the future
STM32 MPU portfolio expansion

@ 650 MHz **@ 800 MHz**

STM32 MPU FLAGSHIP
Big step-up in performance, features and security

STM32 MPU ACCESS
Cost optimization and improved security
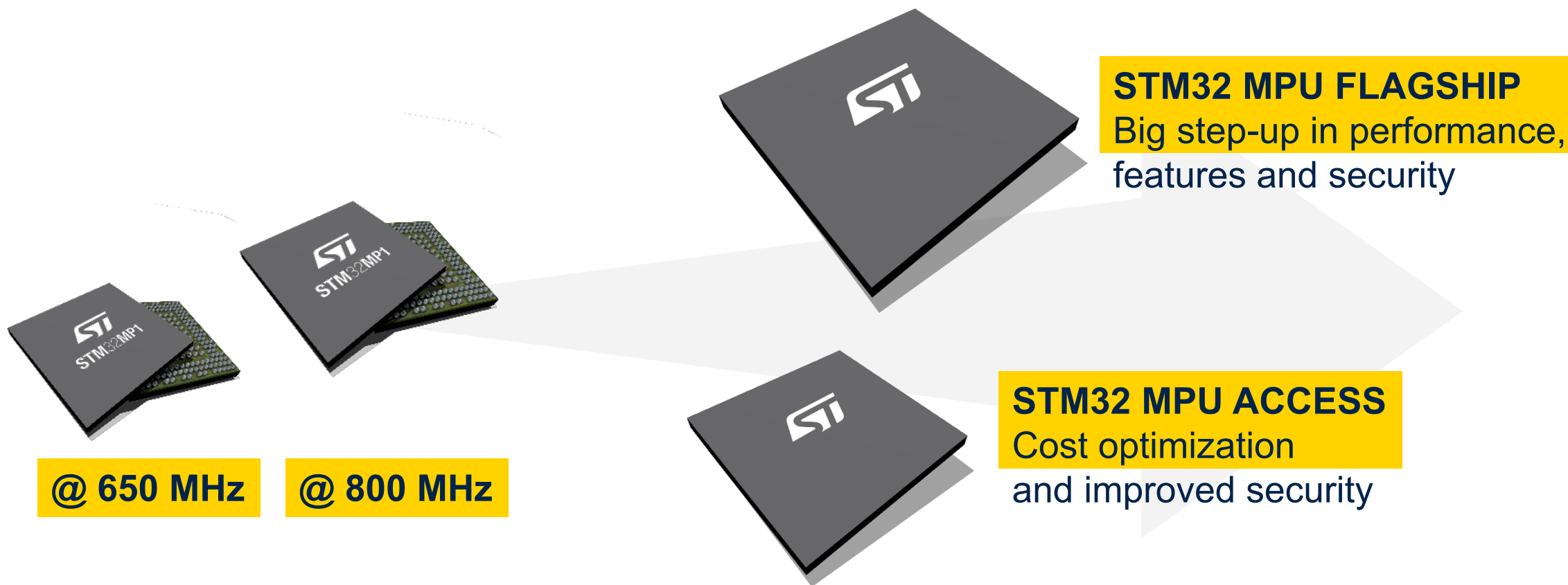
STPMIC1 power management IC dedicated to STM32MP1 MPU

Simplify your design and optimize power consumption
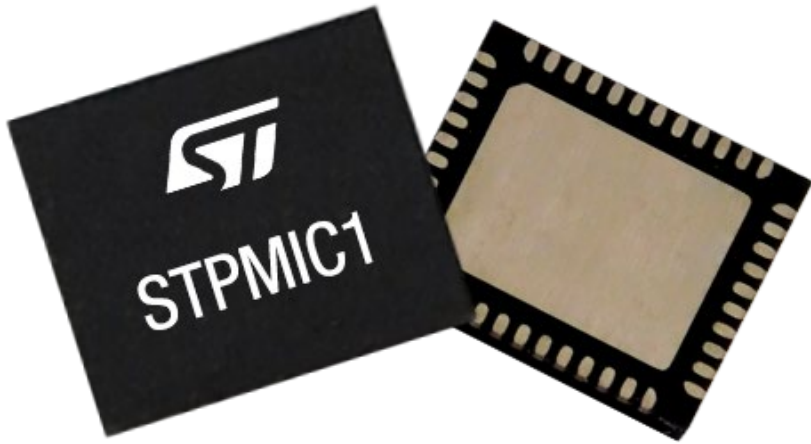
DC/DCs & **LDOs** for
- STM32MP1
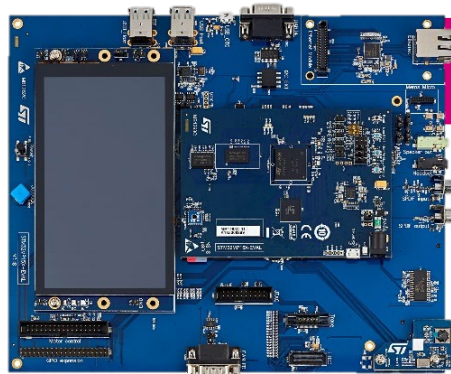- Memories
- External devices

Optimized power consumption

BOM savings for typical applications

Small PCB footprint vs. full discrete solution

STM32MP1 Hardware Solutions

Speed-up evaluation, prototyping and design

Available at $399

Available at $99

Available at $69
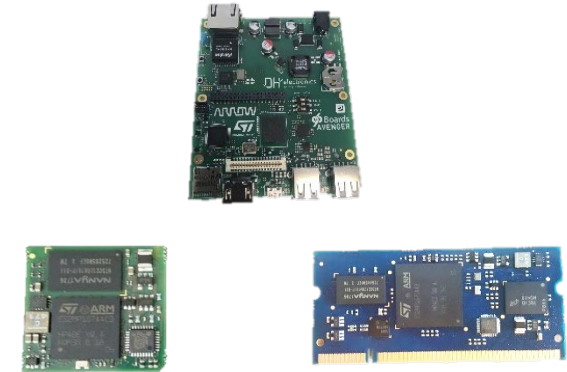
Evaluation Board	Discovery Board	Boards & SoM*s
Full feature STM32MP1 evaluation	**Flexible prototyping & demo**	**3rd Parties Boards for prototyping and production**

• STM32MP157A-EV1
• STM32MP157C-EV1
	• STM32MP157A-DK1
	• STM32MP157C-DK2
	    + MIPI DSI WVGA display
	    + Wi-Fi/BT combo module
		• Board Specification from Linaro (96boards.org)
		• Commercial SoM w/ different forms

*System on Module

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Simplify your Linux Development

Fully mainlined open source Linux distribution for Arm Cortex-A7
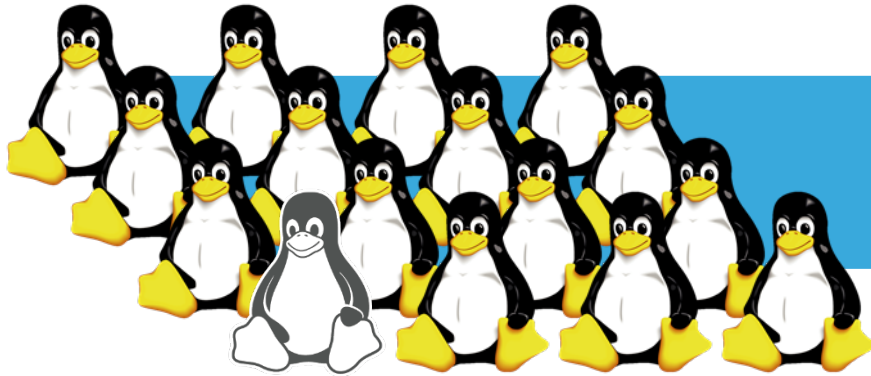
OpenSTLinux Distribution

STM32MP1 SoC drivers
already adopted by the Linux community

STM32MP1 supported in Linux 4.19 LTS

Fully compliant with open-source standards

THE LINUX FOUNDATION

yocto PROJECT

Linaro

Pre-integrated Secure OS

OP-TEE .org

ST OpenSource Offering: Easy&Fast

- Making the build easy thanks to STM32Cube Tools Set
  - STM32MP1 Device Tree Generation
  - Generate HAL initialisation for Cortex M4
  - Distribution package to generate final image

- Making the Customer code faster:
  - Fully mainlined ST Drivers & GitHub deliveries
  - Linux Community API compliancy
  - Easy selection of Linux user space components thru OpenSTLinux Config

- Making your Image secure
  - OP-TEE fully adapted to v7 Arm instruction set
  - supported by Linaro
  - Global Platform API compliancy

STM32Cube

Trusted Applications	Linux Applications	Real Time Applications
Global Platform API	Linux API	
	Linux Libraries	Middleware (FreeRTOS, OpenAMP…)
Global Platform API	Linux API	HAL/LL drivers, BSP
Secure Monitor OP-TEE	Linux OS Kernel	

User Space · Kernel Space

OpenSTLinux Distribution

Cube

Cortex-A7   **Cortex-M4**

STM32MP1 Series based Solution

Partner Program

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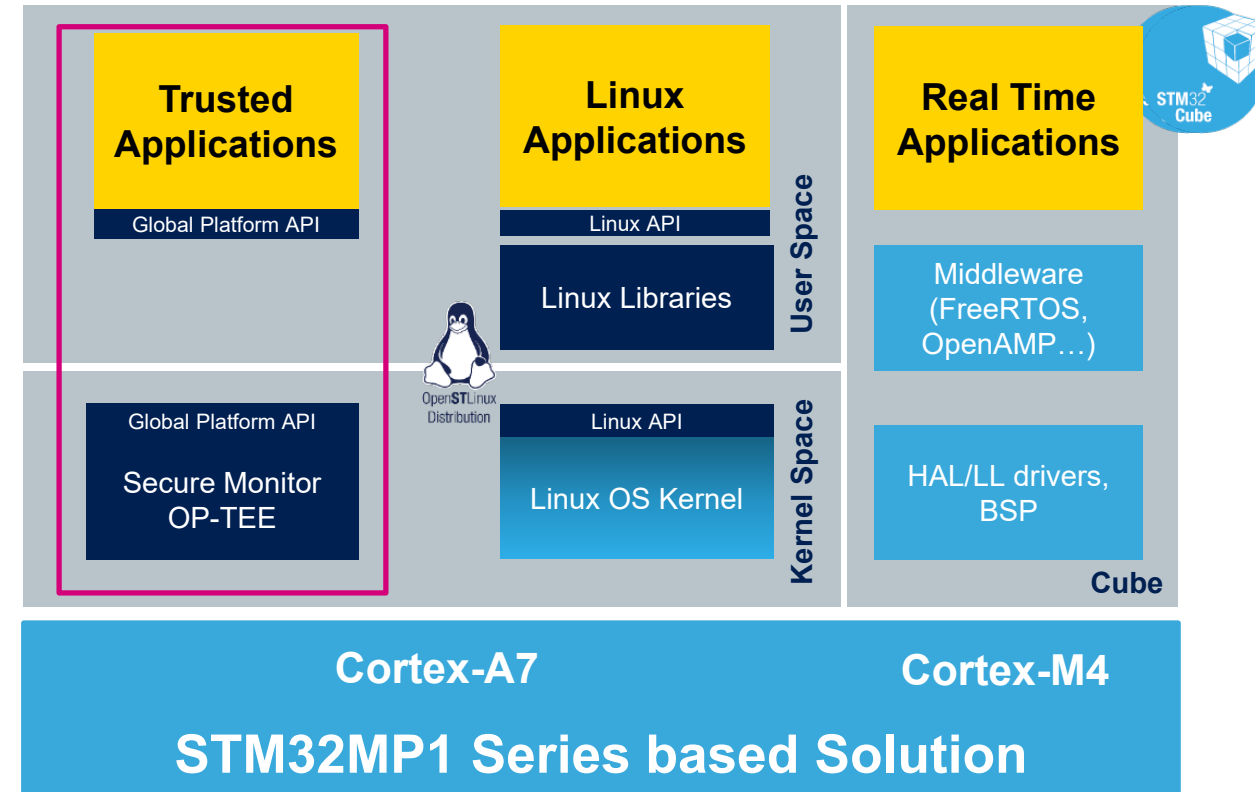
ST Adaptation — Secure Context
Community — Customer

A Fully Integrated Design Suite
Leveraging the STM32Cube Environment

arm
Cortex-A7

OpenSTLinux Distribution

STM32 Cube

arm
Cortex-M4

STM32MP1 Embedded Software Distribution

Benefit from Field-Proven RTOS Tools

Full re-use of STM32 MCU Cube firmware on Arm Cortex-M

STM32 Cube

Several APIs to access peripherals
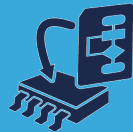
Collection of Middleware components for Cortex-M

Hundreds of Examples

Production-ready Quality

Business-friendly license terms

A broader STM32 MPU ecosystem to reduce development time & cost

Create cloud based applications with STM32MP1 solutions

Complete support of main cloud provider

aws qualified device

Microsoft Azure IoT Platform

IBM Watson support soon

Sensing
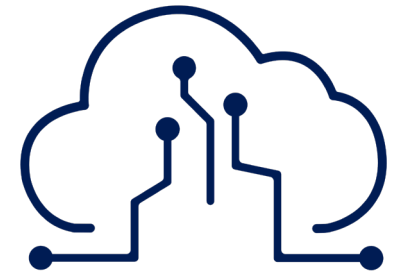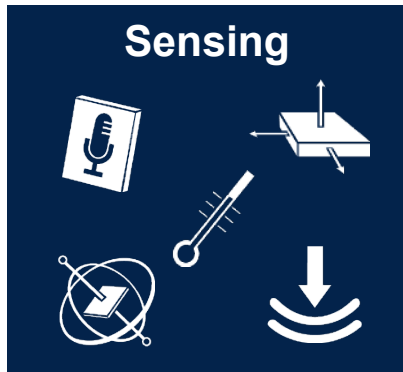
Example of STM32MP1 Discovery board used for EDGE processing

STM32 MPUs Roadmap

STM32MP157

@ 650 MHz

@ 800 MHz

STM32 MPU FLAGSHIP
Big step-up in performance and security

STM32 MPU ACCESS
Cost optimization and improved security

Thank you

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