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Enhancing the User Experience with Graphics

July 2020

Accelerating the HMI of Things

Enabling high-end user experience in embedded devices

Smarter and richer devices requiring Advanced Graphical User Interfaces

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What to consider when designing platform with graphics

- What are the tasks of the system
  - System complexity impacts the solution required
  - Acceleration, memory and overall architecture
- Display
  - Size/Resolution and Color Depth
  - Interface (MIPI DSI, LCD-TFT, SPI, parallel 8080/6800)
- Development Resources
  - Graphic Designers
  - Firmware Engineers
  - Hardware Engineers

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Small SPI Display showing Sensor Data

I need a basic STM32 MCU and a few engineers

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Medium DSI LCD with menus and connectivity

I need a high performance STM32 MCU with graphics capability and a full engineering team

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10” TFT LCD with 3D menus, cloud connectivity, and real-time control

I need a STM32MP1 running Linux, a full team, and maybe a ST Partner

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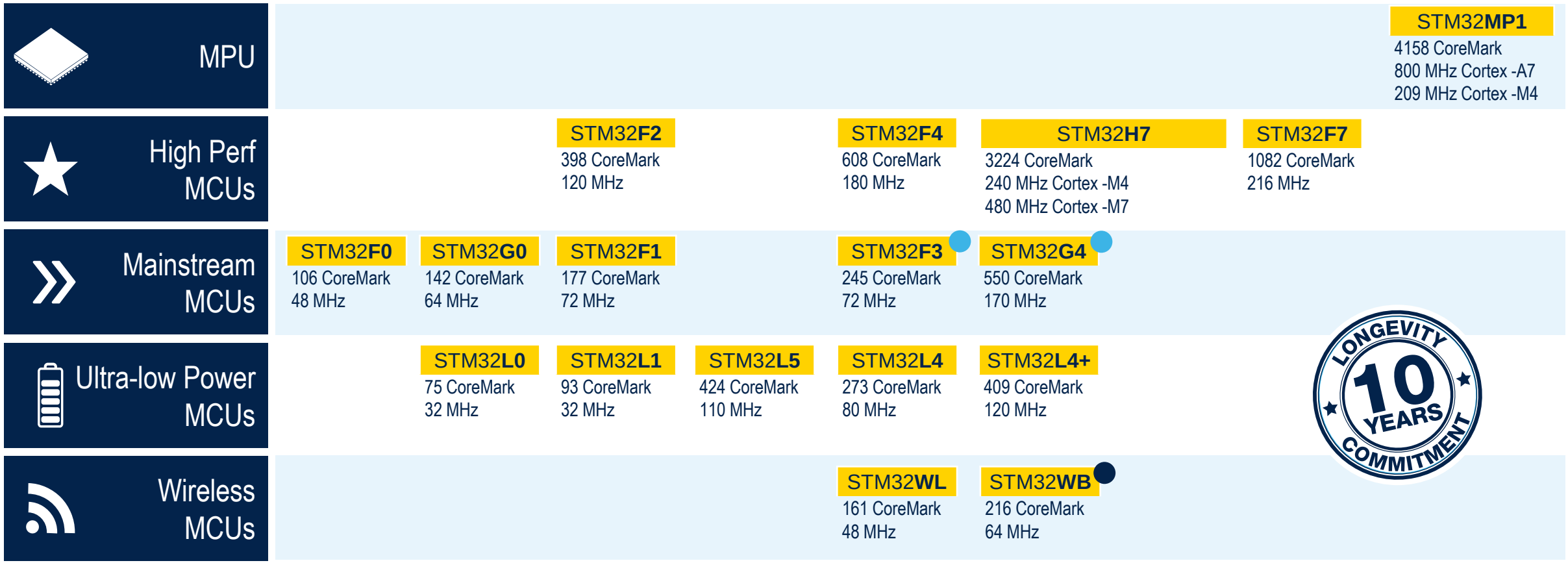
STM32 Enables Graphics

STM32 MCU and MPU Roadmap



Optimized for mixed-signal applications

Cortex-M0+ Radio co-processor

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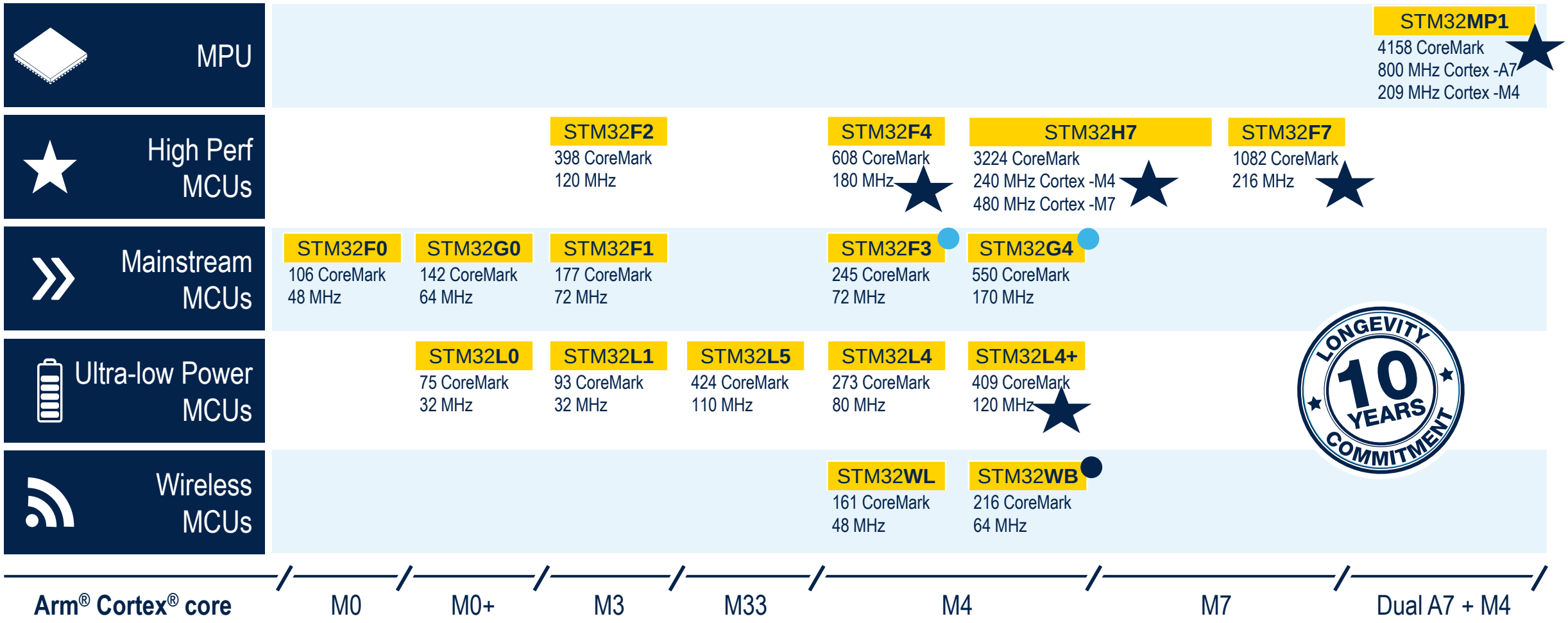
STM32 Devices with Graphics Acceleration



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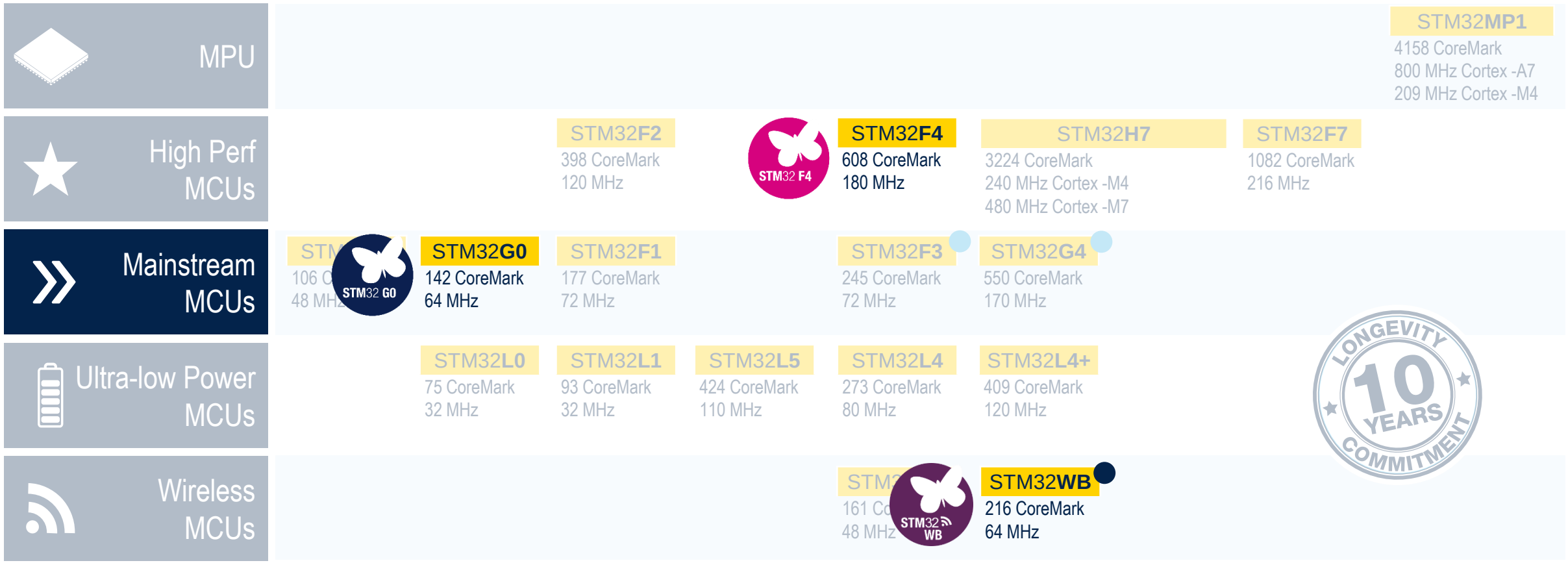
STM32 Products with Advanced Graphics

Device	Core	Flash	RAM	Display Controller	Chrom-ART	Other Optimization
STM32MP1	A7 @ 800MHz M4 @ 209MHz	-	-	TFT, DSI	-	OpenGL GPU ARM NEON
STM32H7 DC	M7 @ 480MHz M4 @ 240MHz	1MB to 2MB	1MB	TFT, DSI	✓	JPEG
STM32H7 SC	M7 @ 480MHz	1MB to 2MB	1MB	TFT	✓	JPEG
STM32H7A3 STM32H7B3	M7 @ 280MHz	1MB to 2MB	1.4MB	TFT	✓	JPEG Chrom-GRC
STM32H7B0	M7 @ 280MHz	128KB	1.4MB	TFT	✓	JPEG Chrom-GRC
STM32H750	M7 @ 480MHz	128KB	1MB	TFT	✓	JPEG
STM32F7 Adv	M7 @ 216MHz	1MB to 2MB	320KB, 512KB	TFT, DSI	✓	JPEG
STM32F750	M7 @ 216MHz	64KB	320KB	TFT	✓	
STM32F4 Adv	M4 @ 180MHz	512KB to 2MB	256KB, 384KB	TFT, DSI	✓	
STM32L4+	M4 @ 120MHz	1MB to 2MB	640KB	TFT, DSI	✓	Chrom-GRC

Other STM32 Options for Graphics



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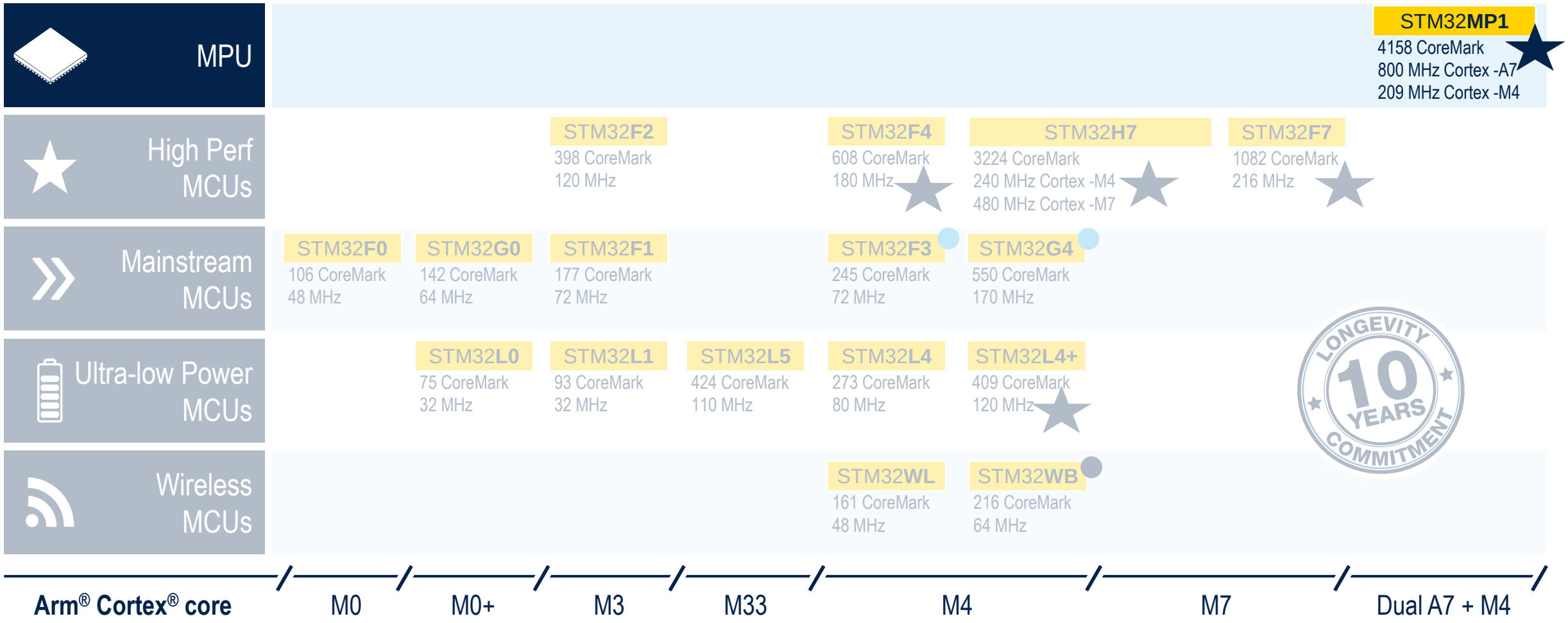
STM32 Devices with Graphics Acceleration



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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 OpenGL 3D GPU

Wide range of partners ready to support you on many topics:
Graphics, HW & SW Services…

Seamless and flexible combination of audio and real time processing
with Cortex-A + Cortex-M architecture

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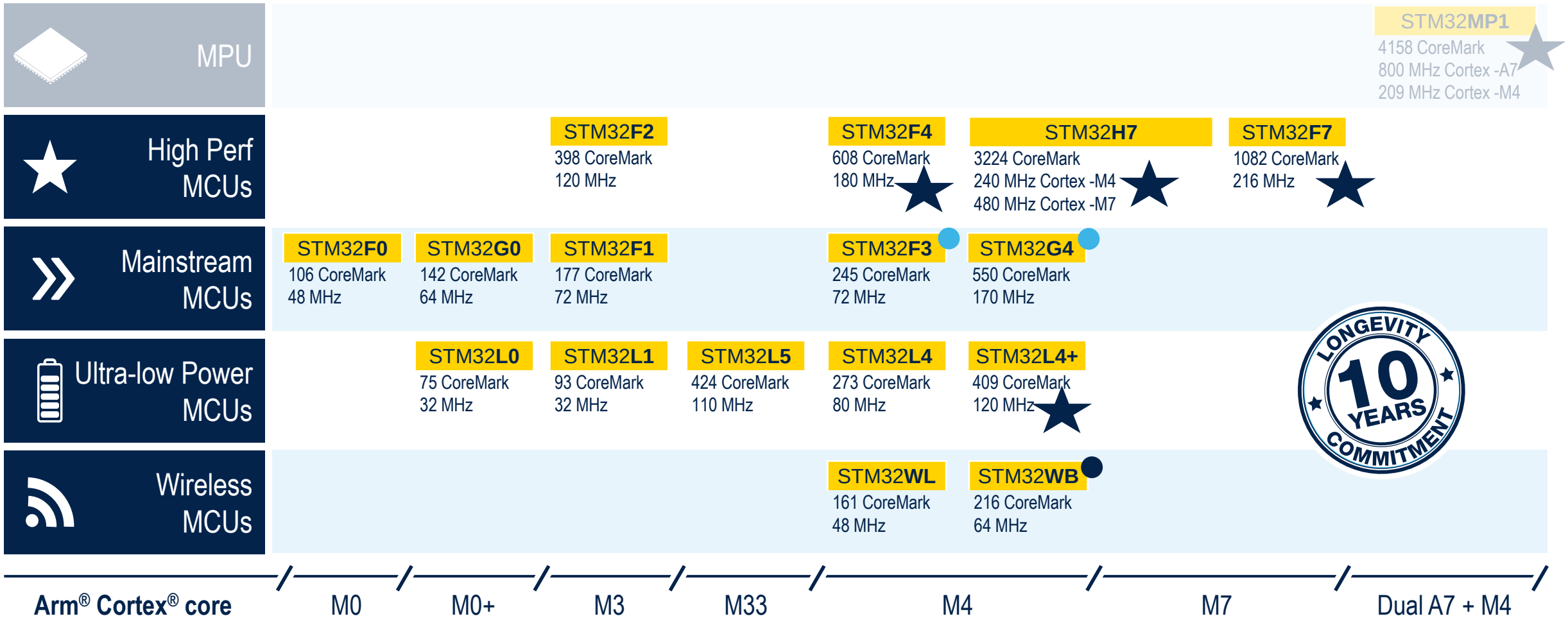
STM32 Devices with Graphics Acceleration



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Latest STM32 MCUs with Advanced Graphics

Cost Optimized – Feature Enhanced!

STM32H7 and F7 Value Lines

Cost Optimized – Essential Flash Only
- Interfaces supporting external flash

Advanced Graphics Features
- Chrom-ART™
- JPEG Codec
- TFT controller

Large choice of packages
- QFP and BGA

STM32H7A3
STM32H7B3

BoM Optimized with 1.4MB Internal RAM
- Supports 480x320 24bit without external RAM

Advanced Graphics Features
- Chrom-ART™
- JPEG Codec
- TFT controller
- Chrom-GRC™

Large choice of packages
- QFP, BGA and CSP
- Graphics support starting from QFP 64 pins

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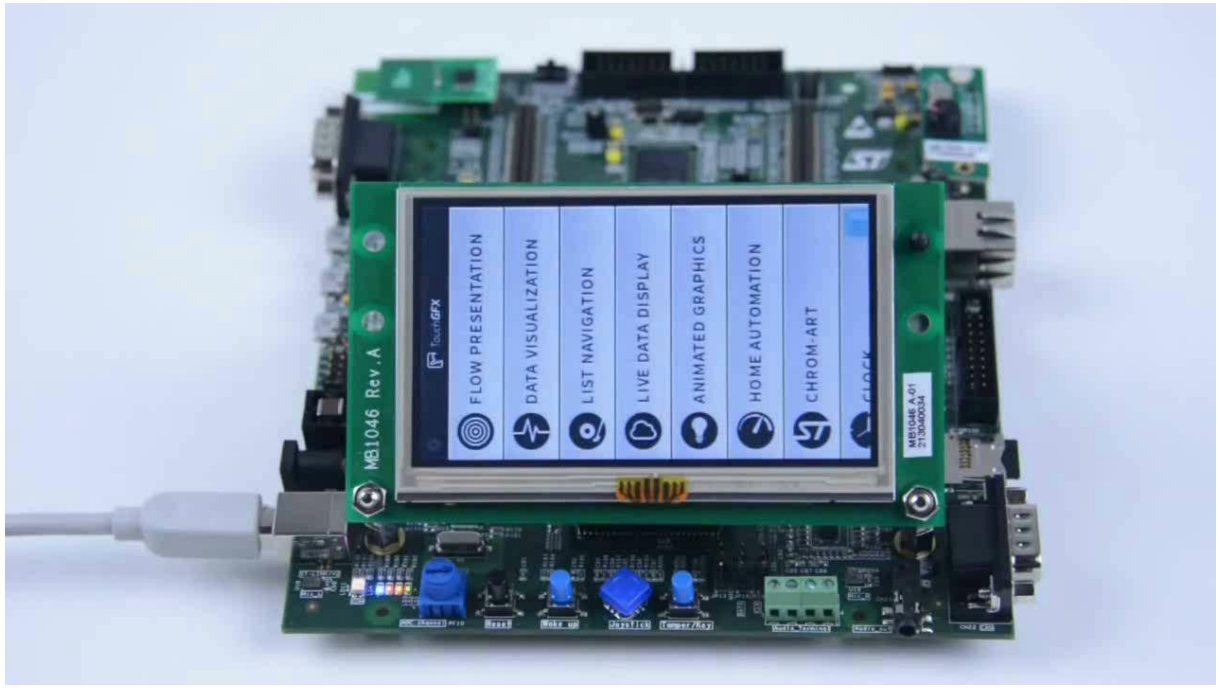
STM32 MCU Graphics Optimizations

- Chrom-ART Accelerator
  - Direct Memory Access, reducing CPU usage
  - Alpha Blending
- Hardware JPEG Codec
  - Accelerated JPEG Decode for Videos
- Chrom-GRC
  - Optimized memory usage for non-rectangular LCDs



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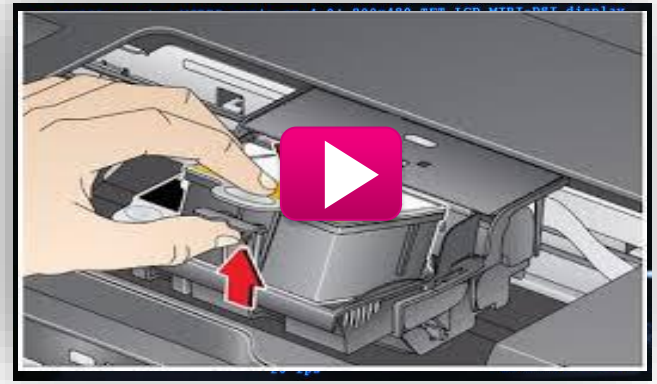

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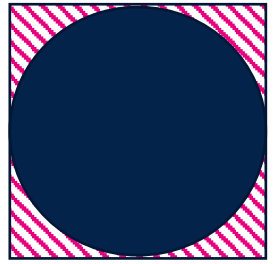

Saved Memory

- **For 360x360 round display**
  - @16bpp **~205kBytes** (vs 253kBytes)
  - @24bpp **~307kBytes** (vs 380kBytes)
- **For 400x400 round display**
  - @16bpp: **250kBytes** (vs 312kBytes)
  - @24bpp: **372kBytes** (vs 469kBytes)

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Free Graphics Framework and Tools

TouchGFX – Unbeatable GUI performance on STM32

Maximum Performance

The TouchGFX technology enables you to achieve the highest level of smartphone GUI performance on STM32 devices

Create Anything

The structure and flexibility of TouchGFX gives the Developer control to easily create unique UI designs

Easy to Use

TouchGFX combines a WYSIWYG designer, auto code generation and a PC simulator with the efficiency and flexibility of the C++ language

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TouchGFX

STM32 Partner Graphics Software Options

Advanced graphics software ported for STM32 hardware

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Extended Graphics Ecosystem

Advanced graphics services and support – ST approved

- Extended Support
- Porting
- Application Development
- Onsite Development
- Training
- Hardware Development
- Full Turnkey Solutions
- Electronic Manufacturing
- User Experience
- Graphic Design

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edt

EKTOS

EMBEDDED PARTNERS

EMG SOFT

itk ENGINEERING

iWave Embedding Intelligence

Mjølner INFORMATICS

PsiControl

SDATAWAY

泰辑科技 Taiji Software

SIANA SYSTEMS

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Useful Links to Get Started with Graphics

- STM32 Microcontrollers
  - STM32 MCU Graphics Landing Page
  - TouchGFX Free Graphics Tool
  - TouchGFX Documentation Page
- STM32MP1 Microprocessor
  - STM32MP1 Series Landing Page
  - STM32MP1 Wiki

Questions?

Thank you

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