



life.augmented

STM32H7R/S high-performance lines

Scalable & secure bootflash
microcontrollers






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 3,224 CoreMark score



Mainstream
MCU



High-performance
MCU



Embedded
MPU

32- and 64-bit microprocessors



Enabling edge AI solutions



Scalable security

Opening new innovation possibilities with scalable and secure bootflash-microcontrollers

General-purpose MCU lines

STM32H7R3/S3

Graphics MCU lines

STM32H7R7/S7

**Run MPU-like applications
on a real-time MCU**

**Leverage more design
freedom**

**Fast-track your
development with MCU
ecosystem**



What the STM32H7R/S lines offer

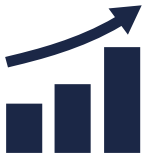
Max performance: 600 MHz bootflash MCU

- Real-time execution from internal or external memories
- High speed serial & parallel memory interfaces up to 200 MHz DTR
- Large internal SRAM



High scalability to optimize your design & reduce costs

- Flexible external memory capacity
- 10 packages: from cost-effective 68 to 225 pins



Security assurance: ready for future security directives

- Target security certification: SESIP Level 3 and PSA certified L3.
- On-the-fly decrypt/encrypt & secure boot

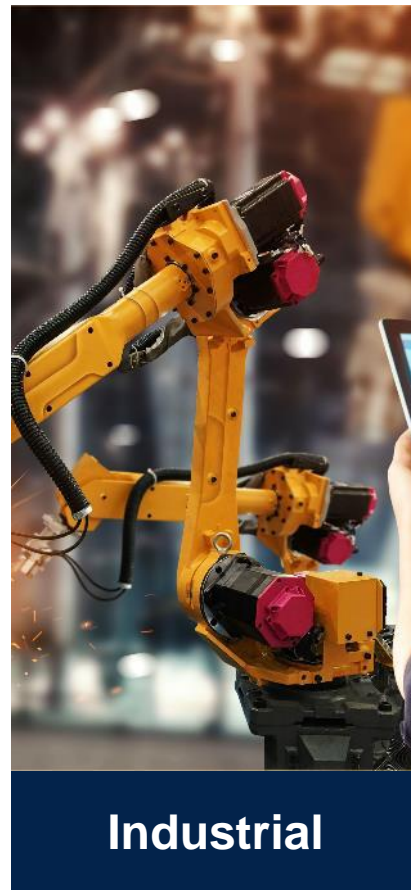


Best-in-class platform for graphics applications

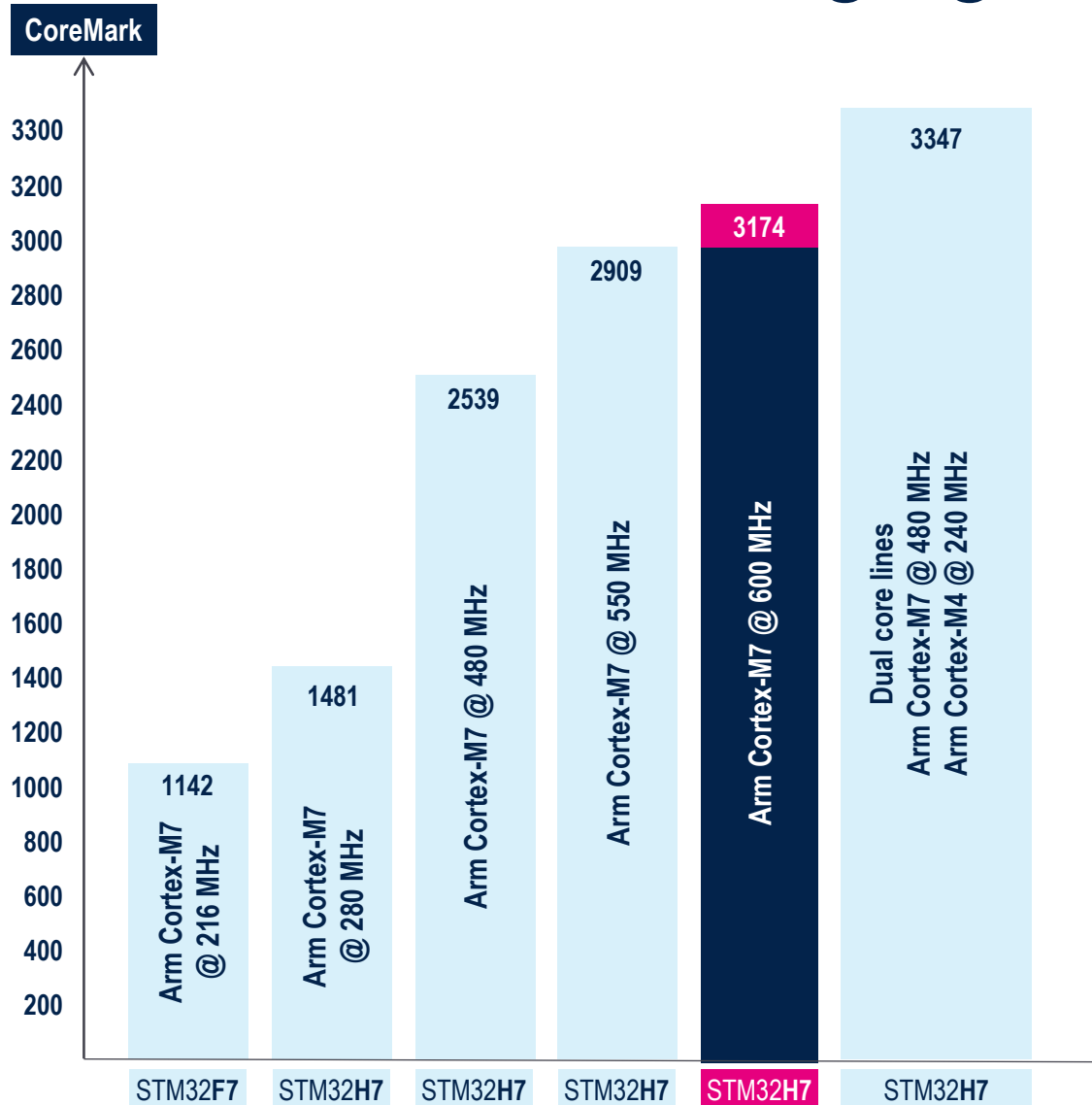
- Powerful 2.5D NeoChrom GPU - smart DMA architecture memory/GPU
- Enabling UIs with HD resolution.



High-performance & multi-purpose MCUs for a wide range of applications



A high-performance architecture leveraging internal and external memories



Arm® Cortex®-M7 @ 600 MHz

- Double precision FPU, MPU, advanced DSP
- 32 Kbytes + 32 Kbytes L1 I/D allowing zero wait-state execution from external memories
- 620 Kbytes of SRAM
- High speed external memory support up to 200 MHz DTR

1284 DMIPS

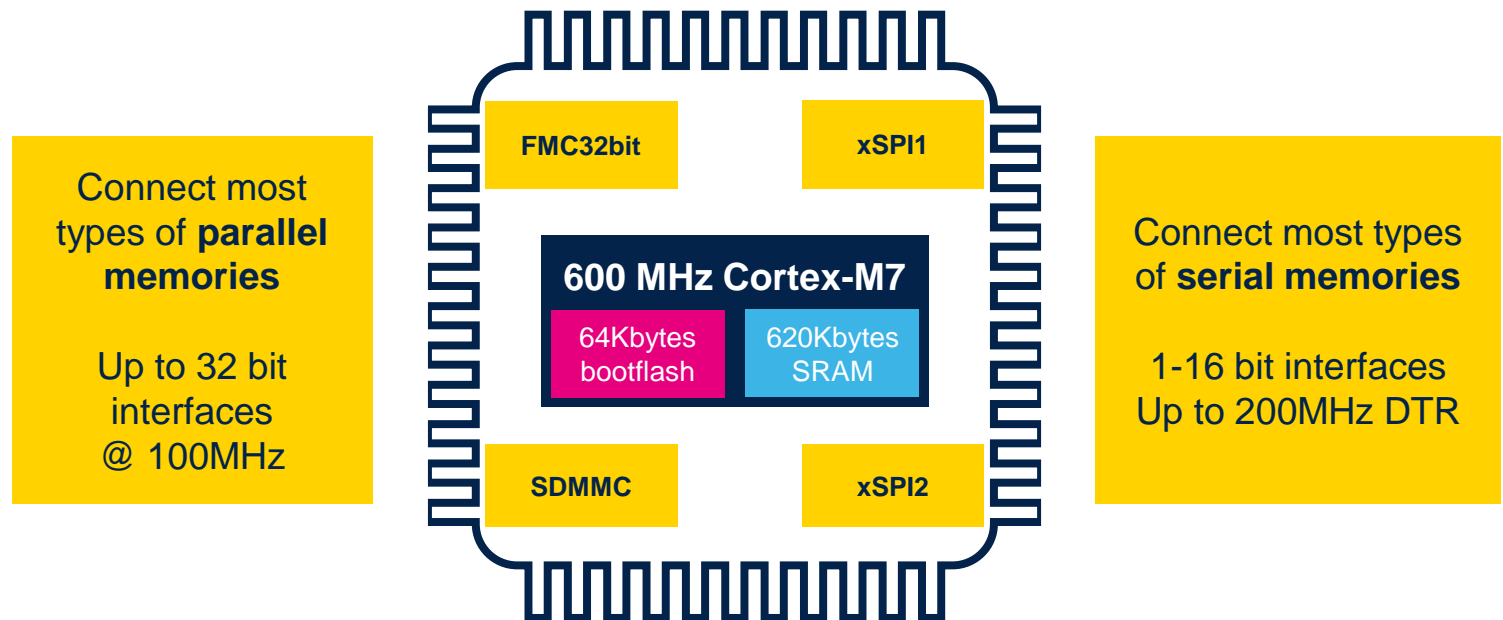
3174 CoreMark

Why choose the STM32H7R/S bootflash MCU?

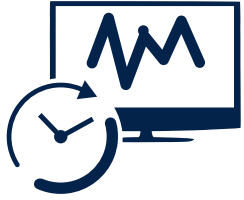
- #1 Lowest cost STM32H7 to-date
- #2 Fast memory interfaces up to 200MHz DTR
- #3 More freedom to connect any MCU memory type
- #4 Ecosystem to configure boot & code execution
- #5 Load & run code in large internal SRAM for faster execution

The STM32HR/S lines are the **most cost-effective** STM32H7 MCUs.

They offer fast external memory interfaces to provide more **freedom on memory selection and architecture.**



Bringing new features to the STM32H7 series



200 MHz Hexadeca SPI with PHY and DTR-mode
Fewer pins, more performance



NeoChrom GPU, JPEG Codec and LTDC
Accelerating MPU-like GUIs



Code execution from external/internal memory
Securing internal & external code & data



I3C with DMA & 2xUSB HS/FS with PHY & UCPD
Enriched communication interfaces



Securing external memories

Security option with memory crypto engine for on-the-fly encryption and decryption

STM32H7S3
or
STM32H7S7
S=Crypto

MCE1
w. AES: Block & Stream

MCE2
w. Noekeon: Block

MCE3
w. Noekeon: Block

2x SDMMC
No MCE

Rich & fast
memory
interfaces

xSPI1/2

xSPI2/1

FMC8/16/32

SD/SDIO/MMC

Choose tyour preferred
memory type

Up to 200MHz 16-bit Serial
RAM and Flash (DTR)

Up to 200MHz 8-bit Serial
RAM and Flash

Up to 100MHz 32-bit Parallel
RAM and Flash

Up to 100MHz
e.MMC, SDCard,

Performance impact example using MCE security option

Code execution from external memory with Data in D-TCM

	CoreMark				Fast fourier transform (FFT)	
	Execute: ext. OctoSPI Cache: ON	Execute: ext. 16-bit PSRAM Cache: ON	Execute: ext. OctoSPI Cache: OFF	Execute: ext. 16-bit PSRAM Cache: OFF	FFT example Execute: PSRAM/OctoFlash Cache: ON	FFT example Execute: PSRAM/OctoFlash Cache: OFF
OctoSPI Flash: 200MHz 16bit Serial PSRAM: 200MHz DTR						
No Cipher vs Block AES/Noekeon:	0-1% impact	0-1% impact	9-% impact	15-22% impact	0-1% impact	12-27% impact
No cipher vs Fast Block AES/Noekeon	0-1% impact	0-1% impact	9-16% impact	15-22% impact	0-1% impact	11-27% impact
No Cipher vs AES Stream	0% impact	0% impact	2.4% impact	3% impact	0-1% impact	1-5% impact



STM32H7RS power consumption

Flexible low power modes

Cortex-M7 RUN (VOS HIGH) 600 MHz	112 μA / MHz
Cortex-M7 RUN (VOS LOW) 400MHz	92 μA / MHz
Cortex-M7 SLEEP (VOS High) 600 MHz	33 μA / MHz
CM7 STOP (SVOS LOW), Flash low power	265 μA
STANDBY, 3.3V	3.7 μA
vBAT	0.8 μA

Notes:

- IDD RUN, code int flash, TYP SMPS, perip off, cache on
- IDD SLEEP: ECC enabled, perip OFF, VOS High
- IDD STANDBY: IWDG OFF, Backup SRAM Off, RTC & LSE ON, 3.3V
- IDD VBAT: Backup SRAM OFF, RTC/LSE ON



STM32



STM32H7RS MCU block diagram

High performance

Scalable security

Large embedded RAM memory

Fast & flexible external memory I/F

Advanced graphic capabilities

STM32H7Rx/Sx portfolio

General-purpose & graphics lines, security options, large package offering

Flash memory size / RAM size (bytes)

Legend:

Without HW crypto/hash

With HW crypto/hash

Option: 16-bit Serial High speed PHY / 32-bit FMC

Graphics (NeoChrom + LTDC)



Graphics line

STM32H7S7Z8	STM32H7S7A8	STM32H7S7I8	STM32H7S7L8
STM32H7R7Z8	STM32H7R7A8	STM32H7R7I8	STM32H7R7L8

STM32H7S3R8	STM32H7S3V8	STM32H7S3Z8	STM32H7S3A8	STM32H7S3I8	STM32H7S3L8
STM32H7R3R8	STM32H7R3V8	STM32H7R3Z8	STM32H7R3A8	STM32H7R3I8	STM32H7R3L8

68-pin
VQFN

100-pin
LQFP/TFBGA

101-pin
WLCSP

144-pin
LQFP/UFBGA

169-pin
UFBGA

176-pin
LQFP/UFBGA

225-pin
TFBGA

Pin count

Smother and richer graphics with NeoChrom GPU

The NeoChrom GPU offloads the CPU from the graphic computations, freeing up the memory and boosting performance.

Fully supported in the X-CUBE-TOUCHGFX



Scale/animate bitmaps



Full screen transitions



360° Bitmap rotations



Text scrolling



Vector graphics (SW)



Perspective correct texture mapping



Fast 2D bitmap copy color format conversion



MJPEG videos

GUI application example



Alpha Blending

Moving bitmaps

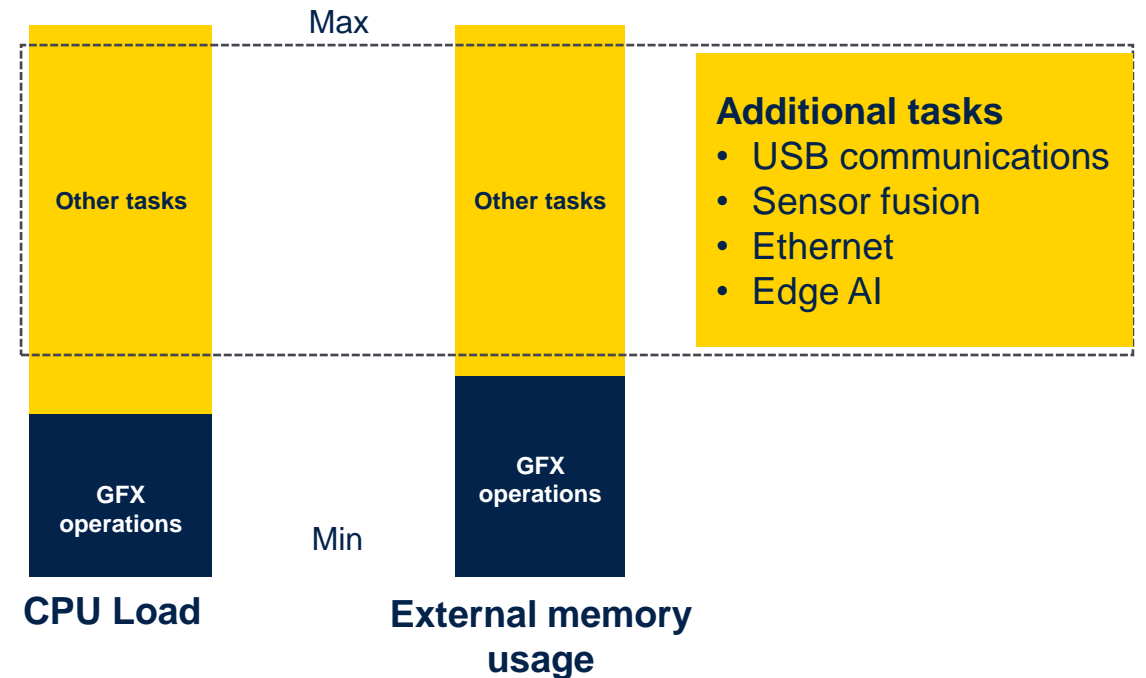
Bitmaps scaling/rotation

MJPEG Video

MPU-like applications

Run rich GUIs and much more

[Watch video now!](#)



Scalable security to boost your time to market

How many security building blocks do you need to reach your security goals?



Choose between different security offers

From secure hardware to full solution owned & maintained by ST



target certifications

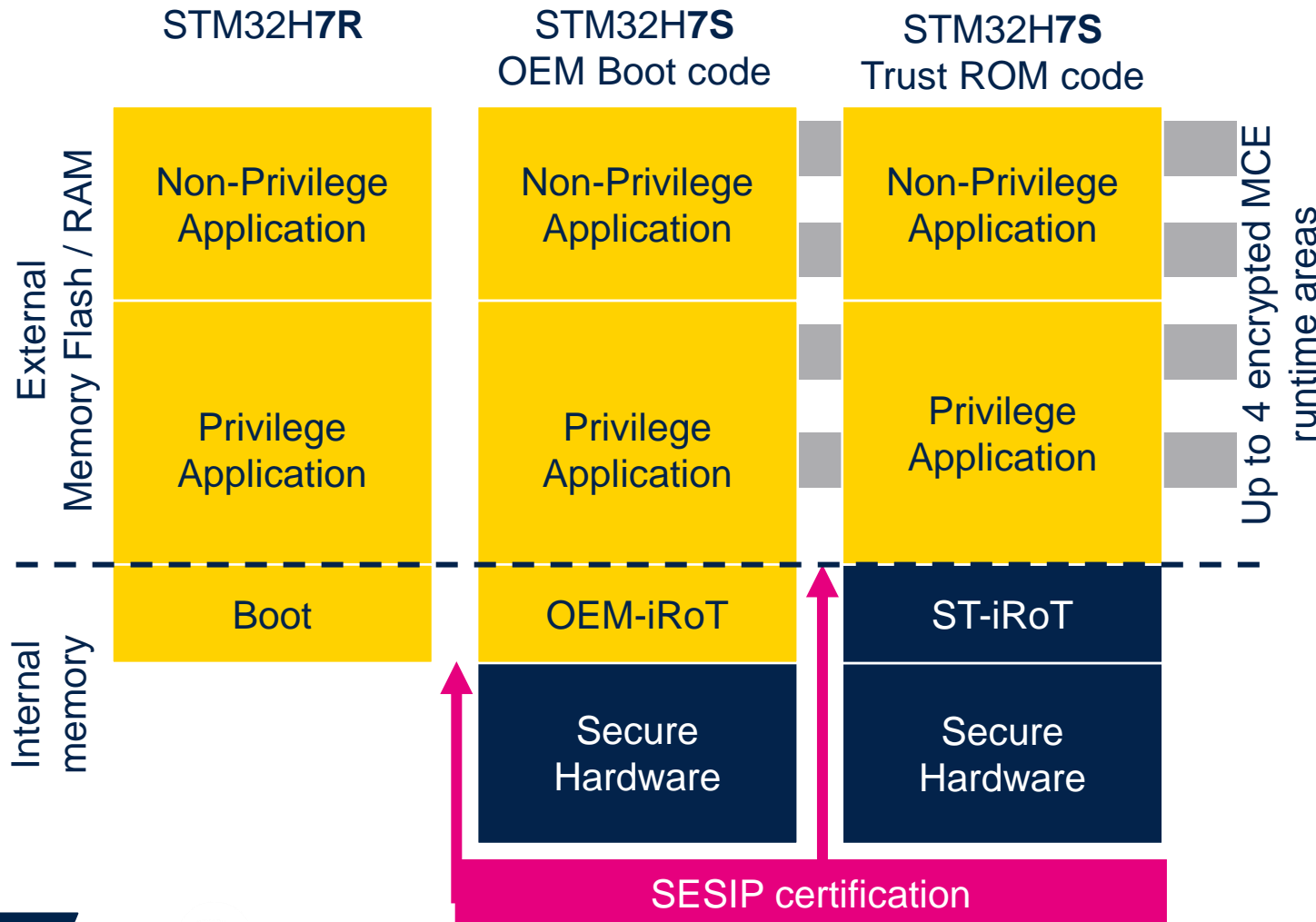
Robust hardware features and turnkey SoC software implementations

<p>Memory protections against illegal access control</p>	<p>Cryptography for hardware robustness</p>	<p>Turnkey SOC security services</p>	
<p>OTP, HDP, WRP, MPU Ext. Flash Enc/Dec MCE Ext. RAM Enc/Dec MCE Secure Debug, Active Tamper</p>	<p>Side channel AES, PKA TRNG, MCE1, MCE2, HUK NIST - CAVP certified CryptoLib</p>	<p>STM32Trust RoT reference codes</p>	
<p>Platform authentication during product lifecycle</p>	<p>Code isolation for runtime protection</p>	<p>Hardware Security robustness</p>	
<p>2 boot stages Protection level states Debug authentication</p>	<p>3 isolation stages 4 encrypted MCE domains Dedicated keystores</p>	<p>Secure Firmware IP Installation</p>	
		<p>XIP encrypted code</p>	
		<p>Immutable Root of Trust</p>	

State-of-the-art security assurance level



Scalable security to accelerate time to market



Scalable configurations

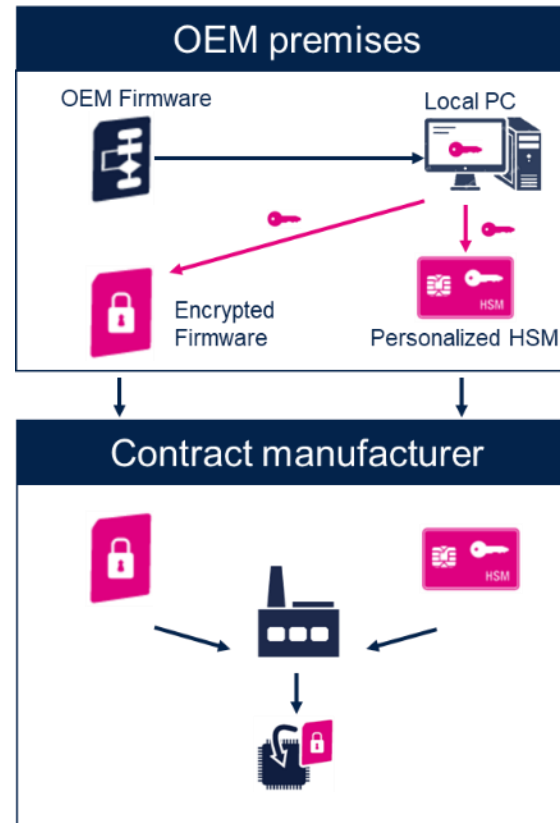
Security for int./ext. memories

Supporting remote provisioning

Ready for device certification

Secure your production flow secure firmware install (SFI)

Protect application firmware during the manufacturing stage



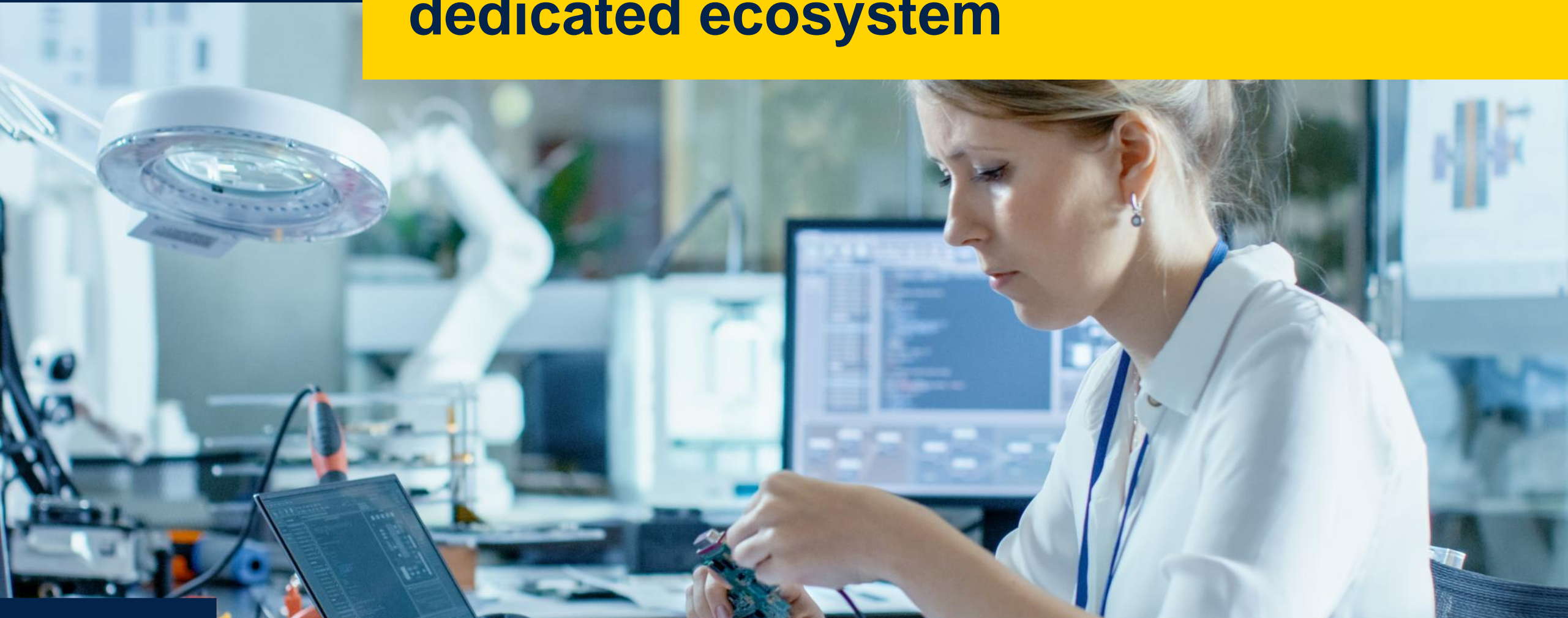
End-to-End security Programming

Complete toolset to encrypt OEM binaries with the [STM32 Trusted Package Creator](#) software

Securely flash the STM32 with licenses from a [STM32HSM](#) at the programming partner location

Control the [number of devices](#) programmed with the firmware

**Accelerate your development with our
dedicated ecosystem**





STM32Cube framework

Tools and software supporting you during all your design steps

Evaluation,
prototyping
and selection

Hardware and
software
configuration

Application development and debug

Code and hardware
options
programming

Run-time
application
monitoring

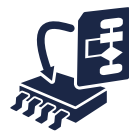


STM32
Finder

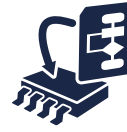
STM32
Evaluation
Tools



STM32
CubeMX



STM32
CubeMCU Packages



STM32
CubeExpansion

&
Verticals and
partner solutions



STM32
CubeIDE

&
Partner IDEs



STM32
CubeProgrammer

&
Programmers from partners



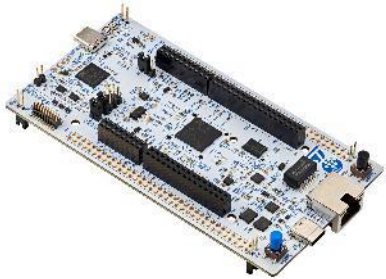
STM32
CubeMonitor

Worldwide support channels



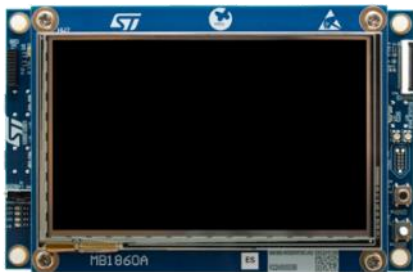
Development tools for STM32H7R series

Jump-start your development with STM32H7R evaluation kits



* \$35

NUCLEO-H7S3L8



* \$99

STM32H7S78-DK

- **Prototyping with STM32H7S Nucleo board**
 - 256 Mbit Octo-SPI NOR Flash
 - Ethernet, USB,
 - STLINK debugger, Arduino UNO extension interface
- **Feature-rich prototyping with STM32H7S discovery kit**
 - 1 Gbit Octo-SPI NOR Flash, 256Mbit Octo-SPI PSRAM
 - WVGA TFT display, Ethernet, USB, microSD, audio, microphone mems
 - STLINK debugger, Arduino UNO, and camera extension interfaces
- **Move from idea to implementation in no time**
 - STM32CubeMX assisted project start on STM32H7S Nucleo board
 - Full project template with BSP and ready to call services
 - Preconfigured STM32 clocks, pinout, and peripherals



Simplified external memory-based development

Application

STM32CubeMX assisted application project initialization with pinout, clock tree, MCU peripherals and middleware configuration.

External memory loader

STM32CubeMX assisted creation of memory loader tuned for your selected external memory.

Boot

STM32CubeMX assisted creation of your boot project including access management to your selected external memory with Load-and-Run or Execute-in-place boot options.



Simplified external memory-based development

Application

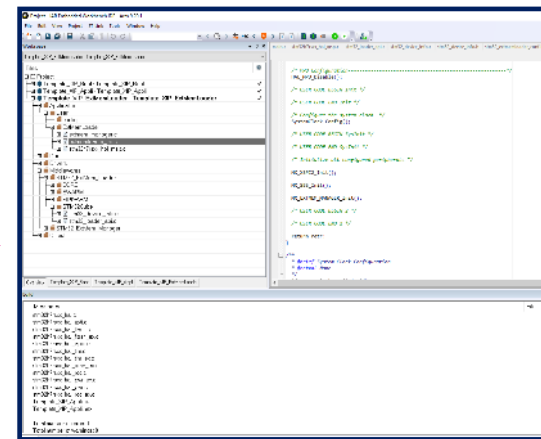
STM32CubeMX assisted application project initialization with pinout, clock tree, MCU peripherals and middleware configuration.



Configure and generate code



Edit, Build and debug



Application code

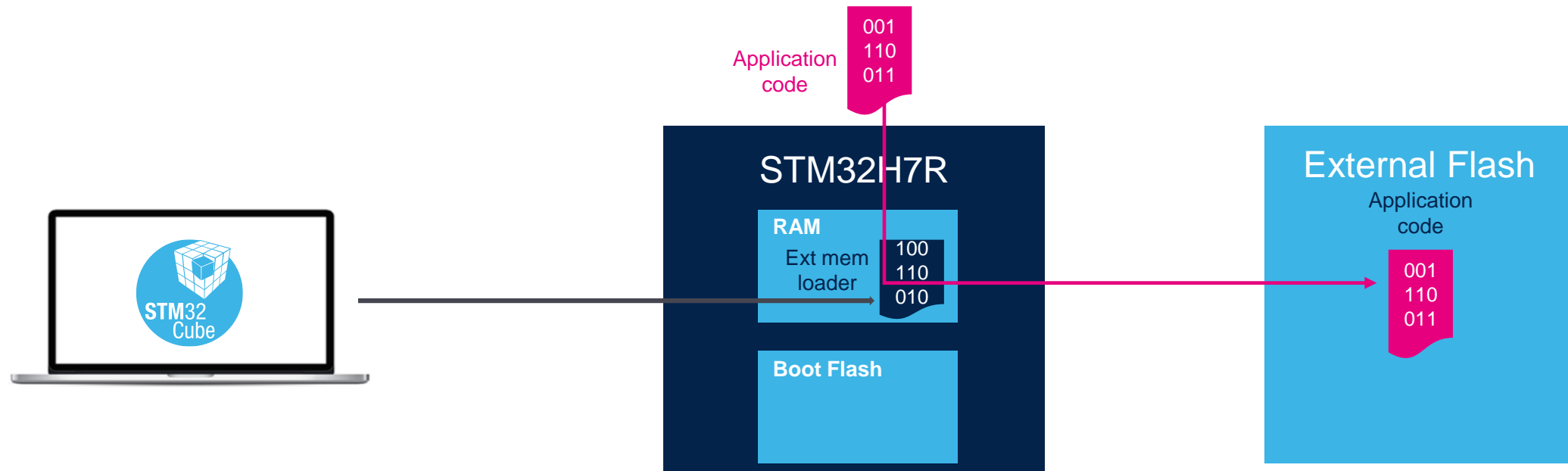
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Simplified external memory-based development

External memory loader

STM32CubeMX assisted creation of memory loader tuned for your selected external memory.

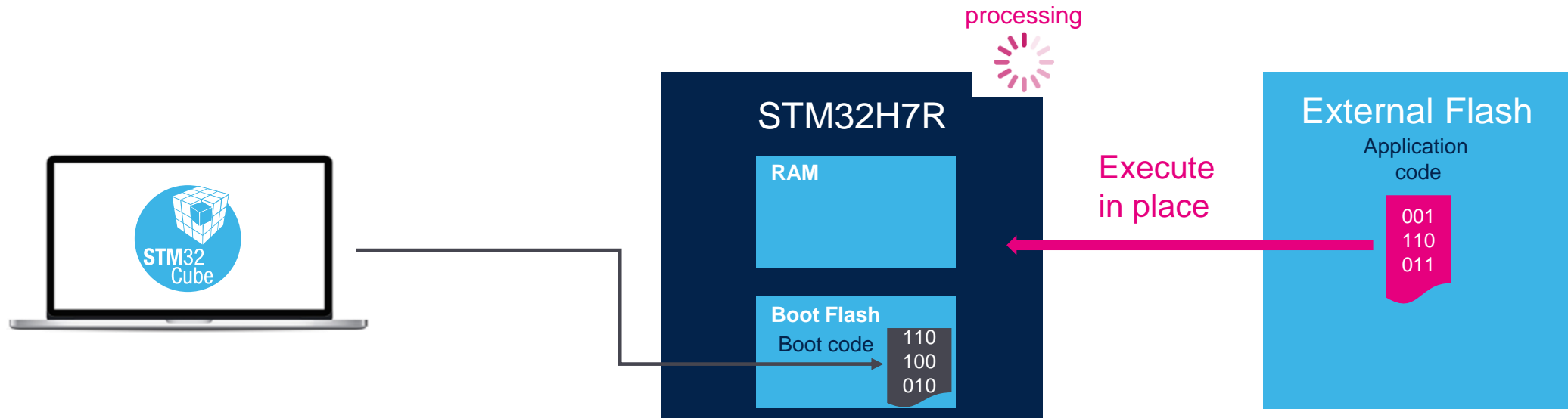




Simplified external memory-based development

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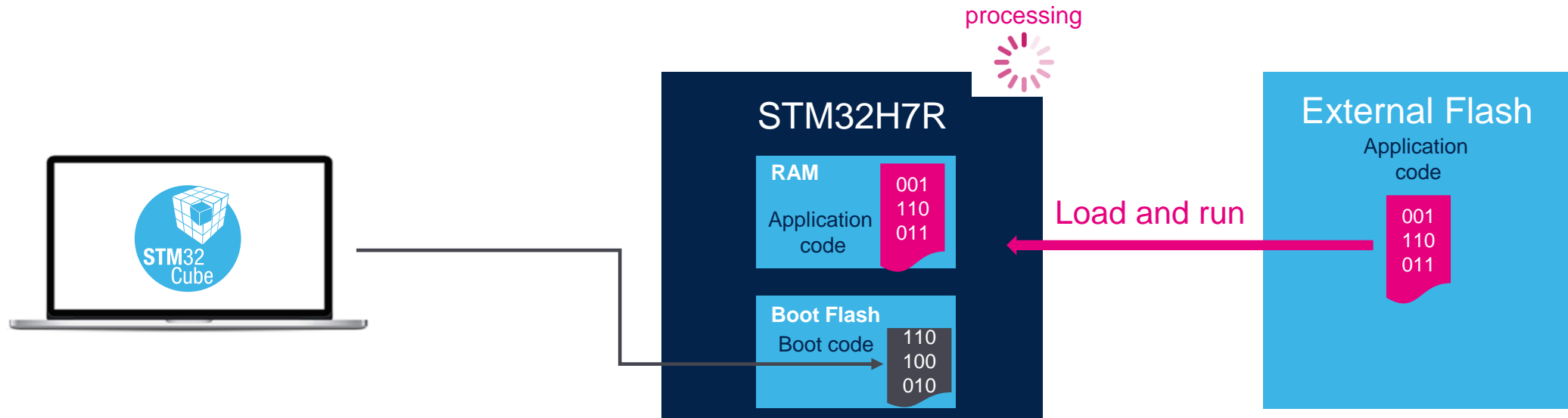




Simplified external memory-based development

Boot

STM32CubeMX assisted creation of your boot project including access management to your selected external memory with Load-and-Run or Execute-in-place boot options.



Releasing your creativity



[@STM32](#)



[@ST_World](#)



[community.st.com](#)



[http://www.st.com/stm32h7](#)



[STM32H7RS YouTube playlist](#)



[wiki.st.com/stm32mcu](#)



[github.com/stm32-hotspot](#)



[STM32H7RS blog article](#)



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