



# Driving Down Automotive Costs for Richer HMIs

Qt for MCUs on NXP i.MX RT 1170

# 25+ years

since first public release

# 1,5 M+

developers

# 70

Industries

# 3500

Commercial Customers



The Qt Group offices are located in China, Finland, France, Germany, India, Japan, Norway, South Korea, and the USA. The HQ is in Espoo, Finland.



BUILT WITH QT



2019 CUSTOMER SURVEY

95%

ROI expectations exceeded

70%

find Qt easy to use

80%+

are more productive with Qt



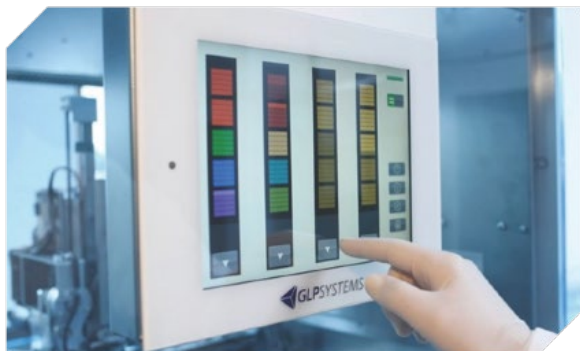
# Embedded Software powered by Qt



Automotive



Consumer Electronics



Industrial Automation

20/04/2021



Medical Devices

Driving Down Automotive Costs for Richer HMIs

Companies use Qt to build powerful software and graphical user interface for connected devices.

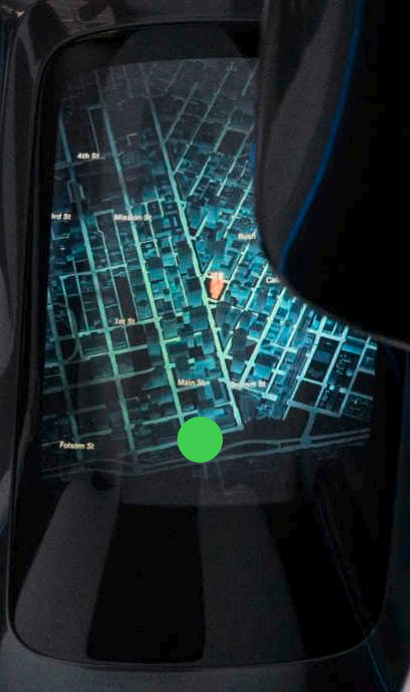


# Qt quality - ISO 9001

- › Quality requirements are daily issues in Qt
- › We provide a quality baseline to our product, based on ISO and other standardizations
- › Qt provides documentation and transparency into the development processes, product performance, and internal validation and testing
- › Assessment information is provided to customers and audits are allowed as defined in contract







# Qt on NXP i.MX Automotive

SoC	GPU	Vendor / Part Name	Operating System
i.MX RT1170	VeriSilicon GC355	NXP	FreeRTOS
i.MX 6Q / 6D	Vivante GC2000	Toradex Apalis iMX6	Embedded Linux
i.MX 7Solo / Dual Core	Integrated	Toradex Colibri iMX7	Embedded Linux
i.MX 8QuadMax	Vivante GC7000	Toradex Apalis iMX8	QNX

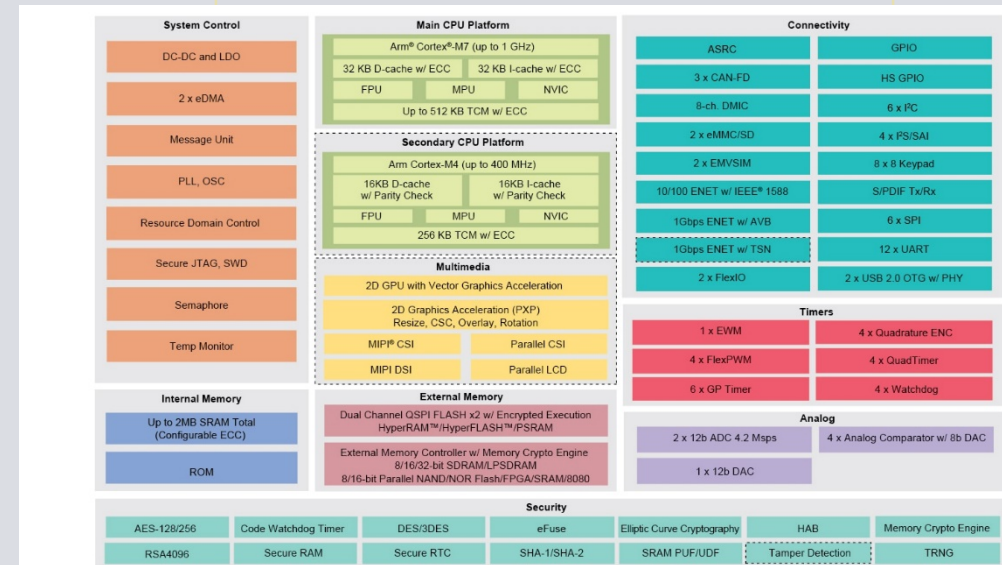
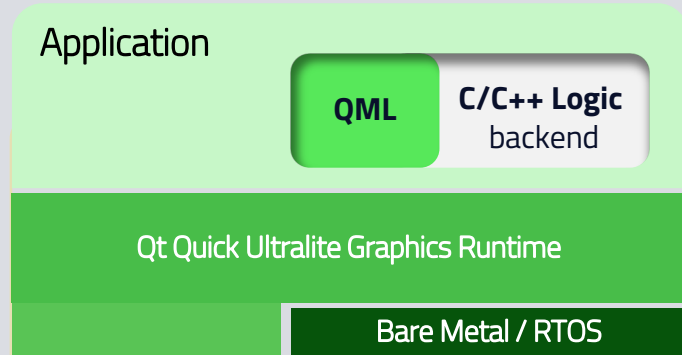


# Ultimate Performance. Tiny Footprint.

## Qt Quick Ultralite rendering engine

- > delivers high graphics performance by utilizing NXP i.MX RT1170's HW accelerators,
- > consumes ~80KB of memory, allowing the rest for application usage

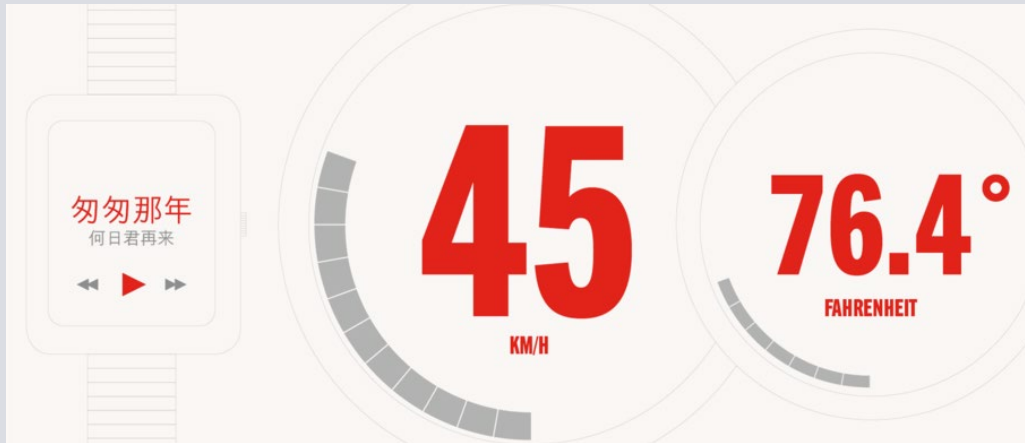
## Qt for MCUs



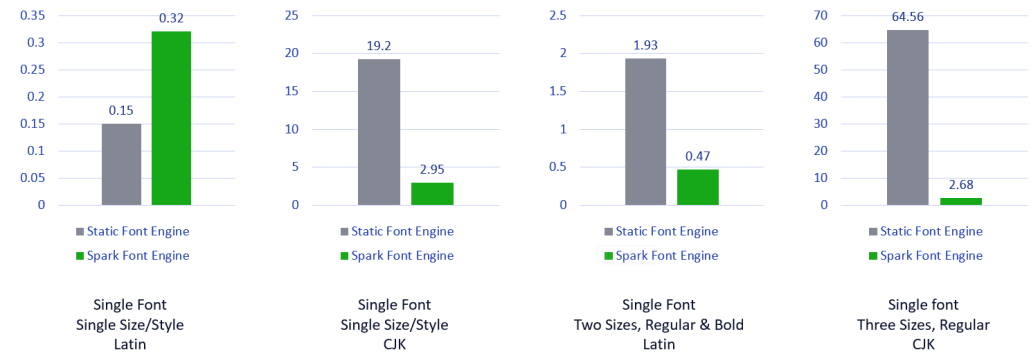
Available on certain products within the family

SUPPORTS DYNAMIC, FULLY SCALABLE FONTS. NO NEED TO SACRIFICE TEXT QUALITY.

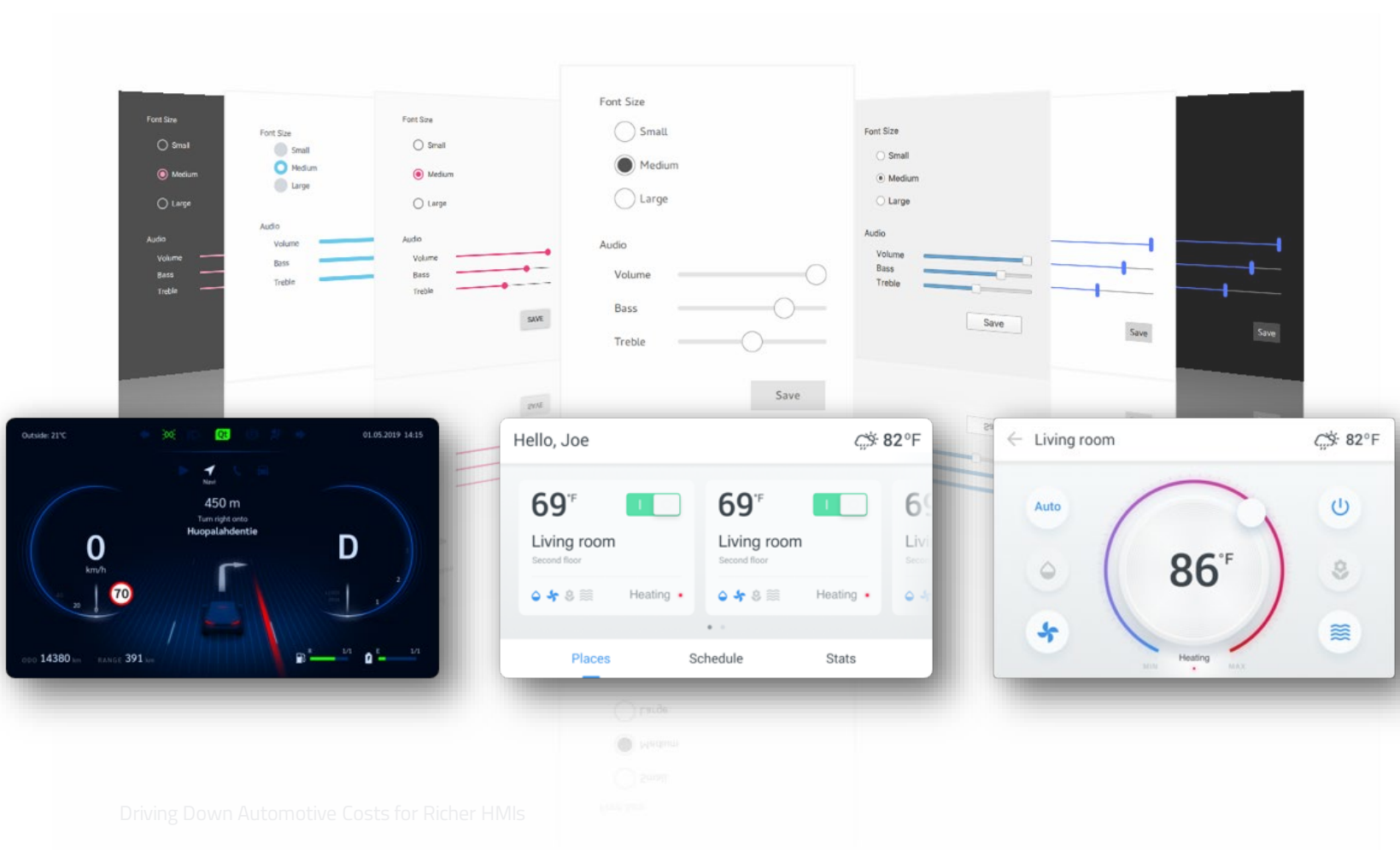
# Beautiful Text – font engine optimized for low end hardware



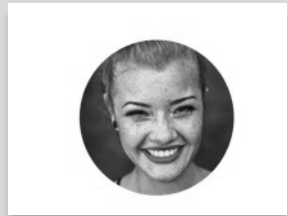
› Binary sizes in MB (lower is better)



# WOW effect - Rich UI controls for a smartphone like UX



# Speed Up - Tools for Designers and Developers



Visual Designer

## Design



Interaction Designer



Design and implement pixel-perfect UIs immediately usable for developers

## Develop



Developer



Integrate up-to-date designs and focus on back-end and application logic development

Validate designs  
Prototype



Deploy

Test  
Deploy

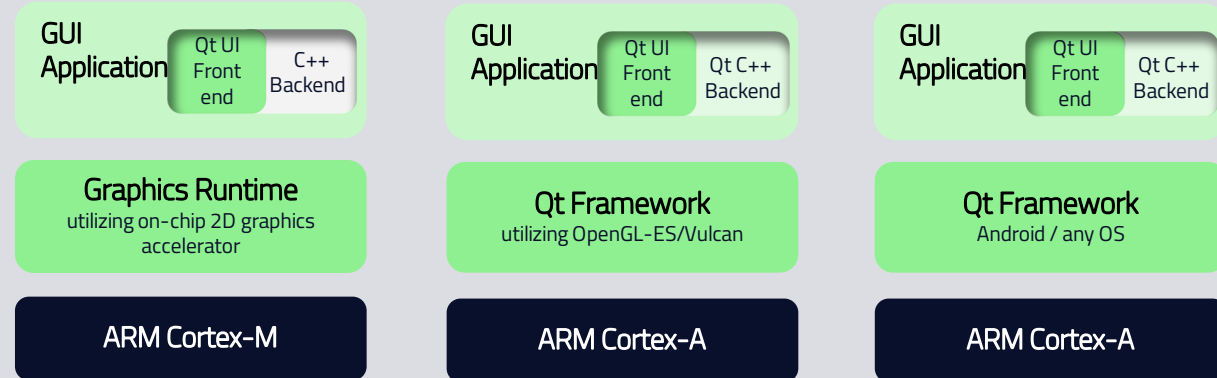
# Get more from your software investments - Reuse

## > Code Once, Deploy Everywhere

- > Qt is a true cross-platform framework – from embedded devices to mobile to desktops
- > Scale from Cortex-M devices/MCUs to Application Processors with OpenGL and even to Smartphone platforms

## > Model-View-Controller paradigm

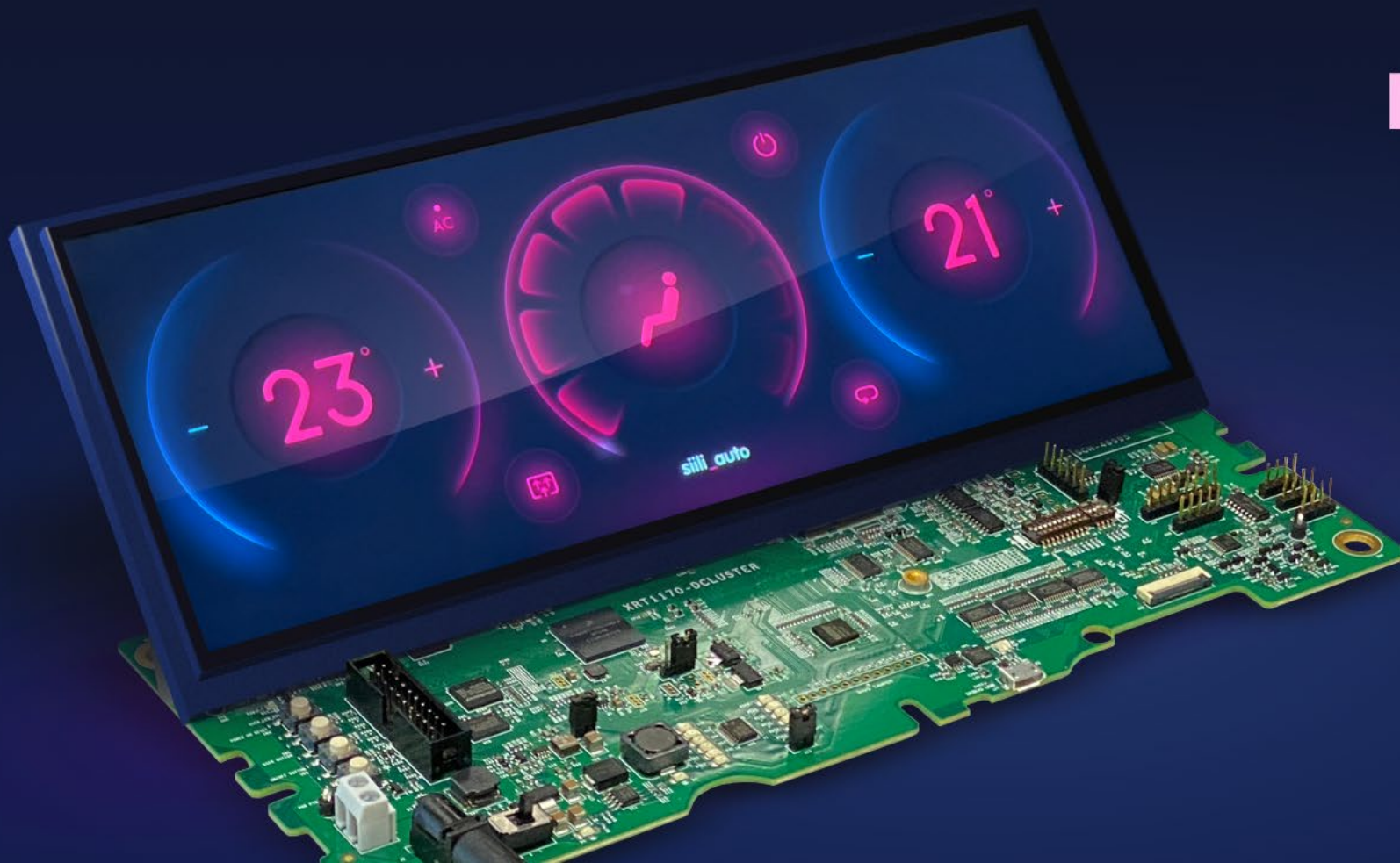
- > GUI code is separated from business logic
- > Easily integrate existing business logic with frontend GUI



# Over to my colleague Marcin Lisowski



# DUAL-CORE FOR COST-EFFECTIVE AUTOMOTIVE HMI SOLUTION



Built with

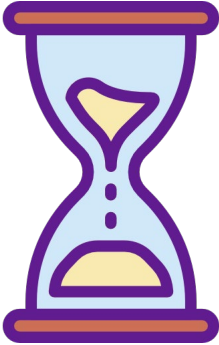
Qt

siili\_auto

# Challenges



Complexity



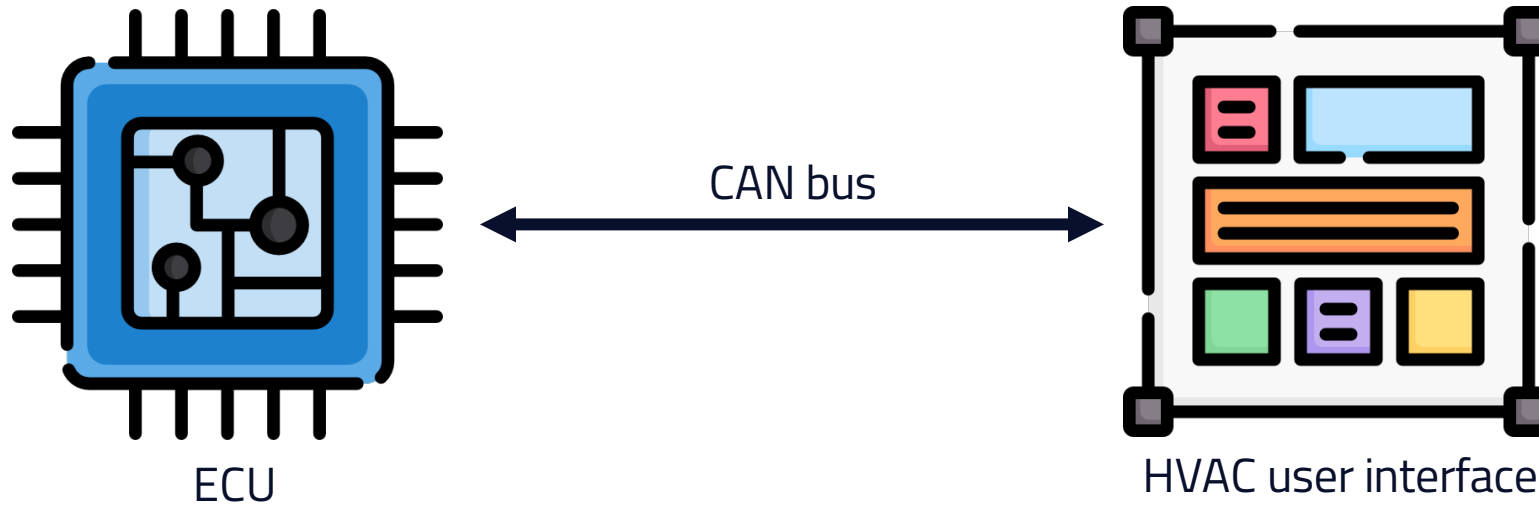
Time



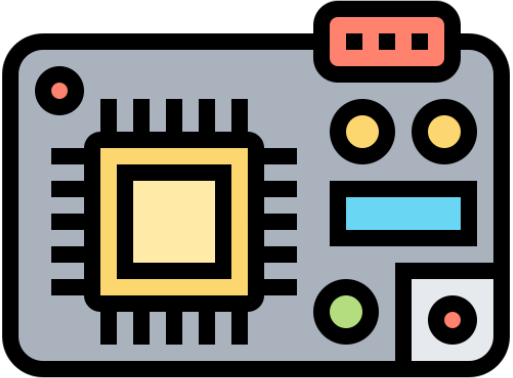
Costs



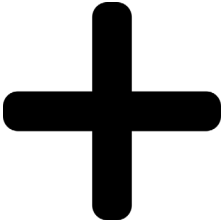
# Real case scenario



# building the solution

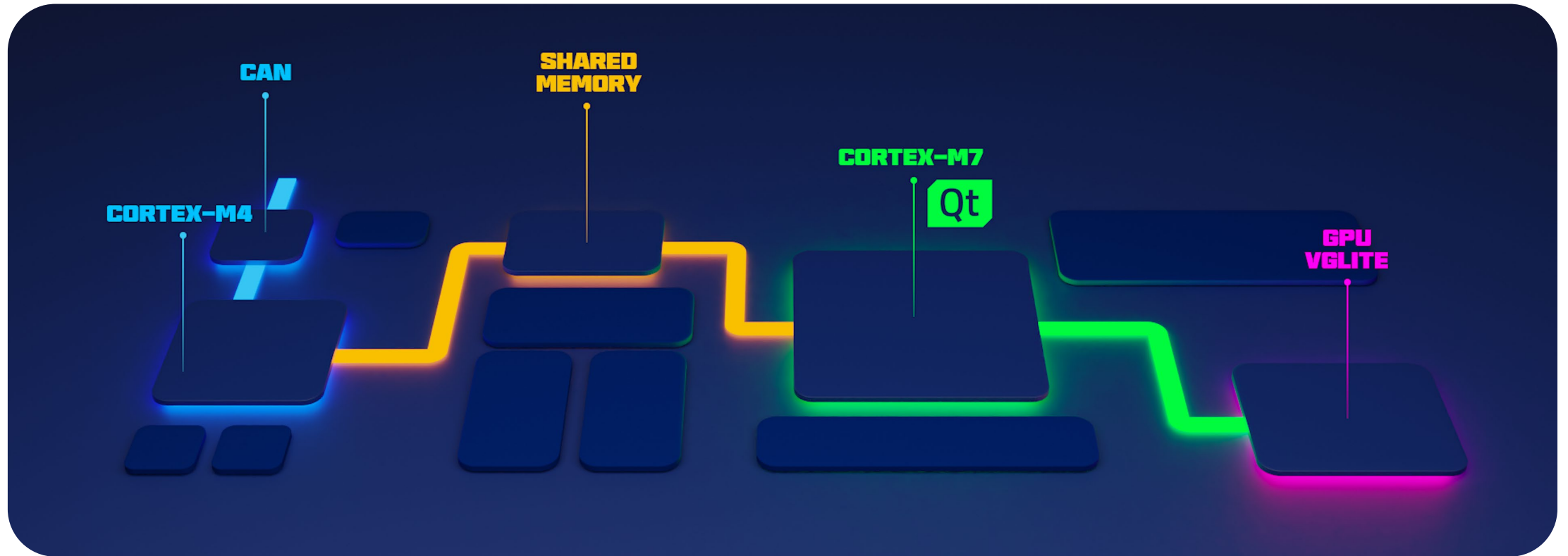


NXP MIMXRT1170

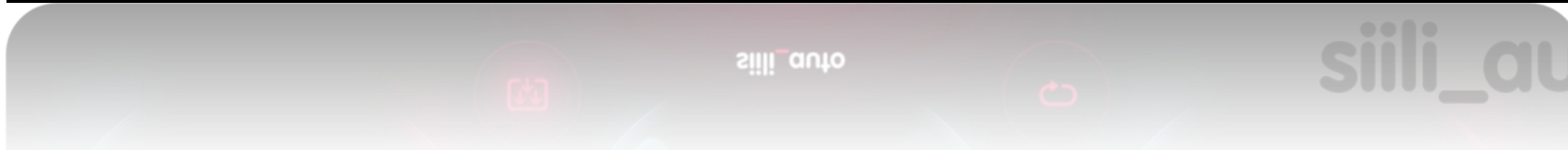
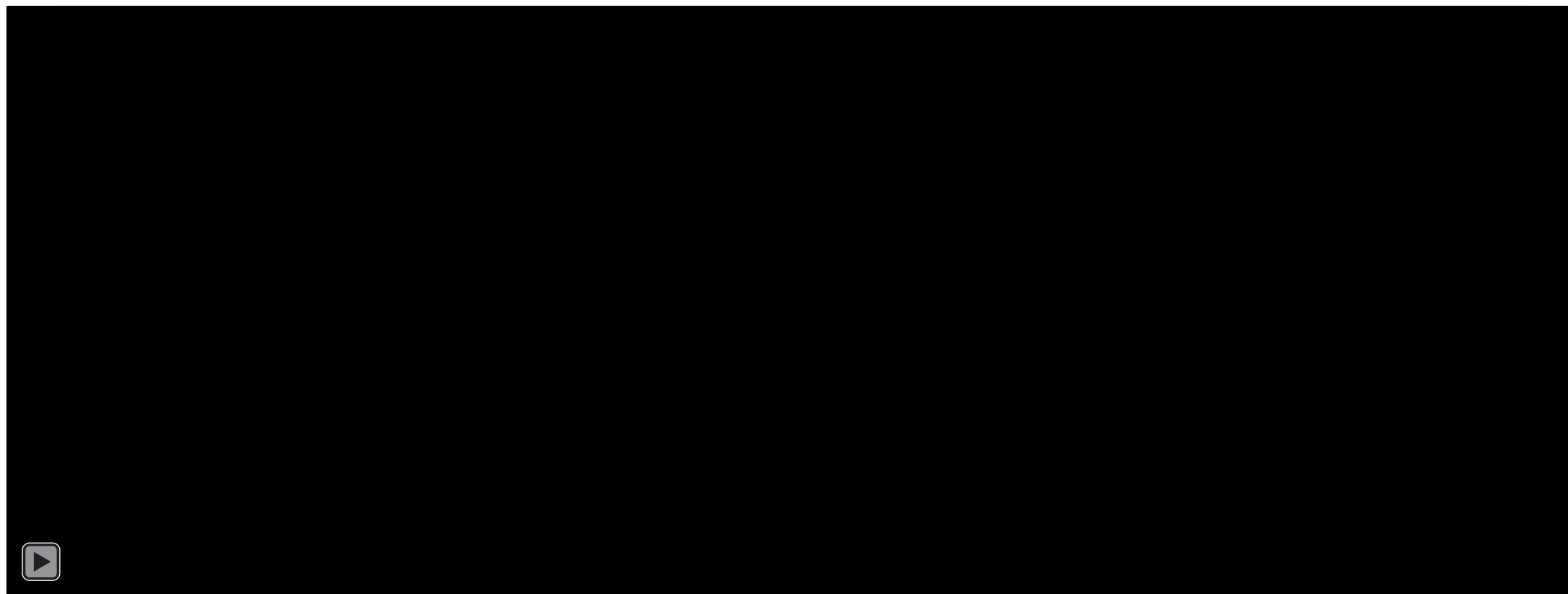


Qt for MCUs

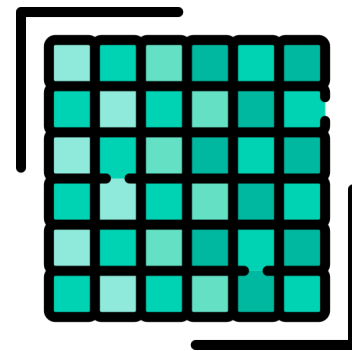
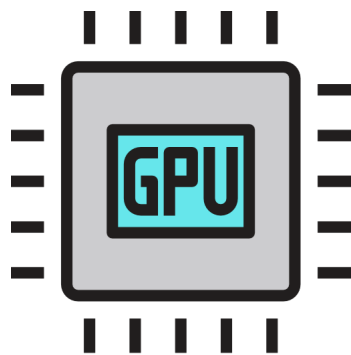
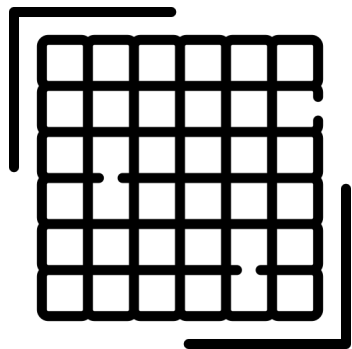
# Drawing the architecture



# The ui



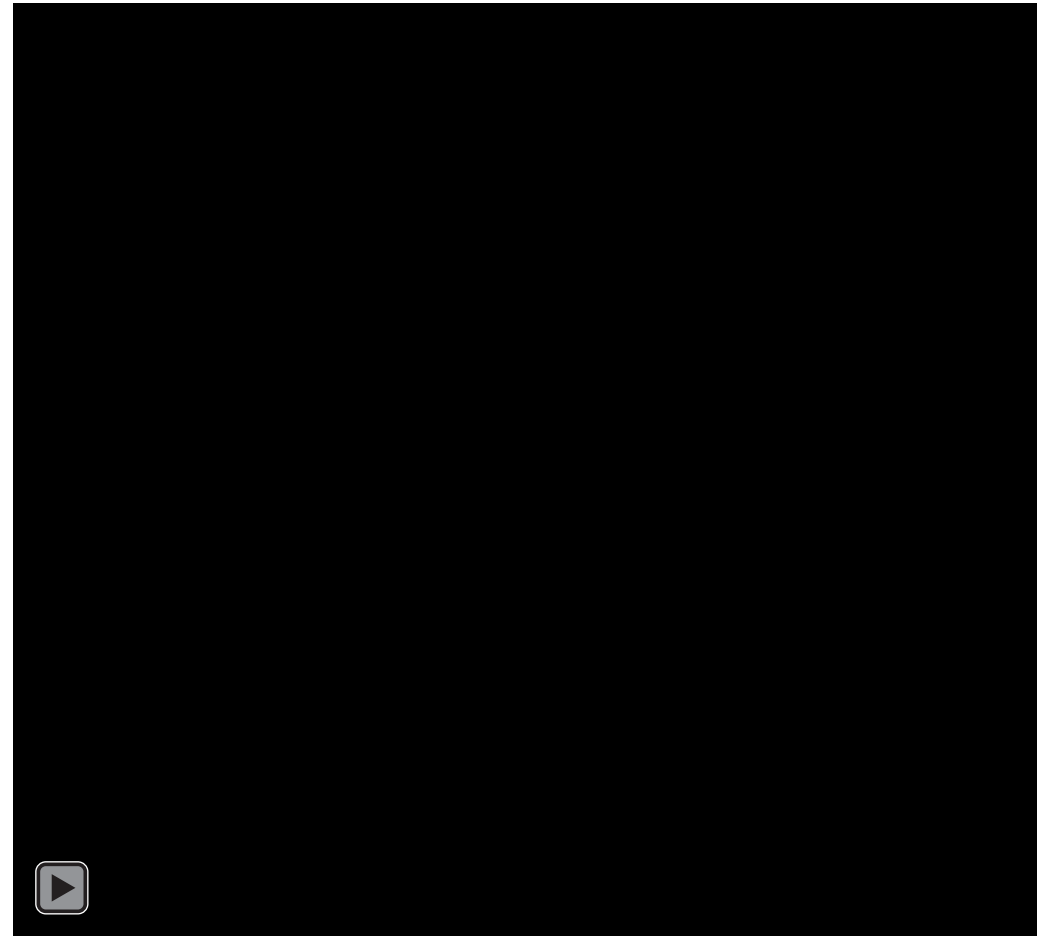
# Alpha maps



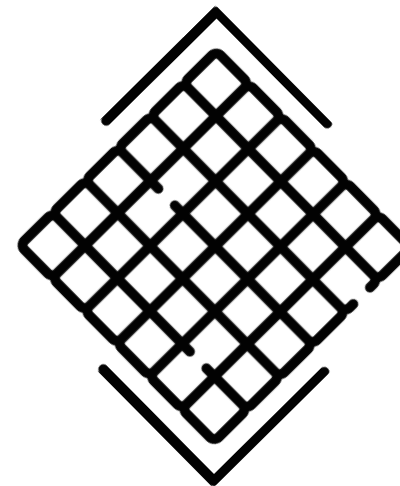
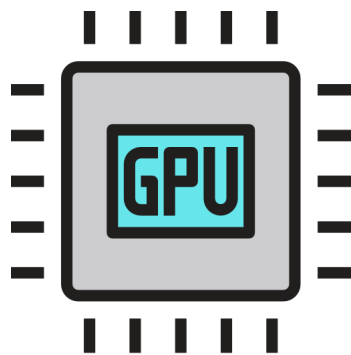
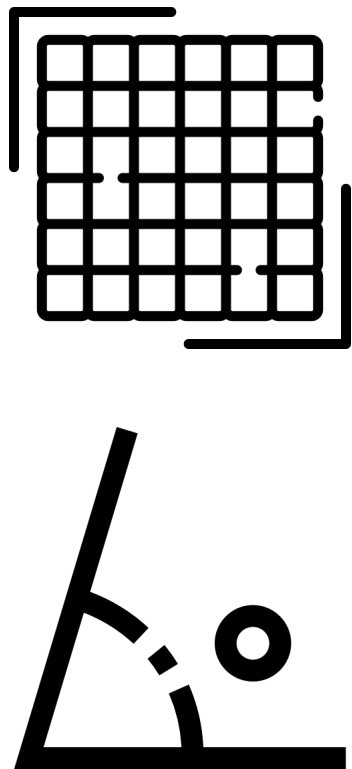
# Alpha maps



```
ColorizedImage {  
  source: "qrc:/assets/leaf.png"  
  color: temperature > 20 ? red : blue  
  
  Behavior on color {  
    ColorAnimation { duration: 300 }  
  }  
}
```



# transformations



# Transformations

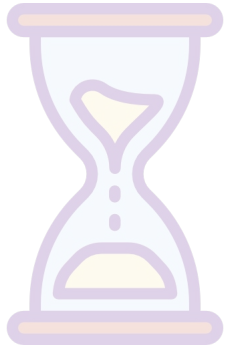
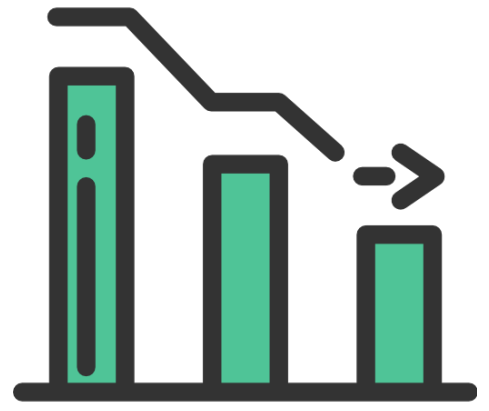
```
ColorizedImage {  
  id: leaf  
  source: "qrc:/assets/leaf.png"  
  color: temperature > 20 ? red : blue  
  
  Behavior on color {  
    ColorAnimation { duration: 300 }  
  }  
  
  transform: Rotation {  
    origin.x: leaf.width / 2;  
    origin.y: leaf.height / 2;  
    angle: leafAngle  
  }  
}
```



# Benefits from Qt

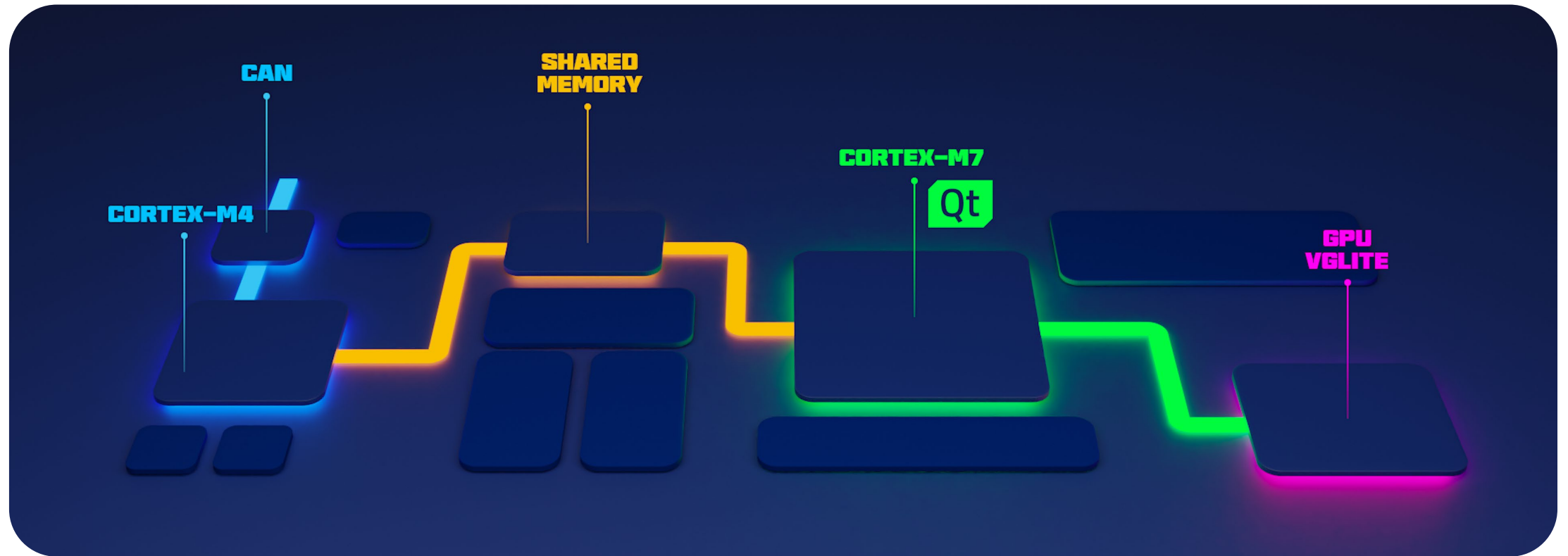


Complexity

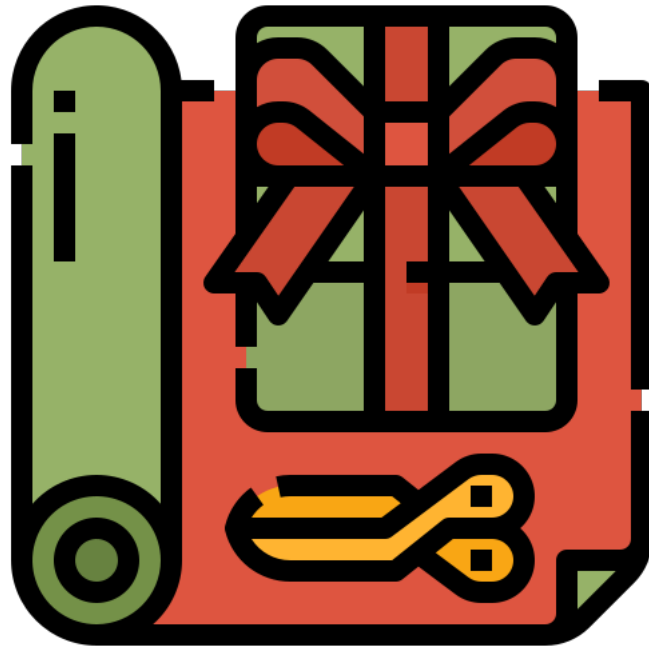


Time

# Powering cortex-m4



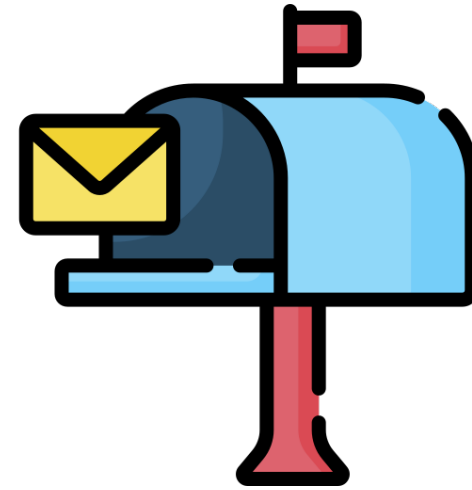
# Wrapping the binary



# Importance of MCMGR & RPMSG



MCMGR



RPMSG

# Importance of MCMGR & RPMSG

```
int main()
{
    Qul::initPlatform();

    uint32_t core1_image_size = get_core1_image_size();
    memcpy(CORE1_BOOT_ADDRESS,
           (void *)CORE1_IMAGE_START,
           core1_image_size);

    MCMGR_StartCore(kMCMGR_Core1,
                   CORE1_BOOT_ADDRESS,
                   0,
                   kMCMGR_Start_Synchronous);

    /*
     * Cortex-M7 application loop.
     */
}
```



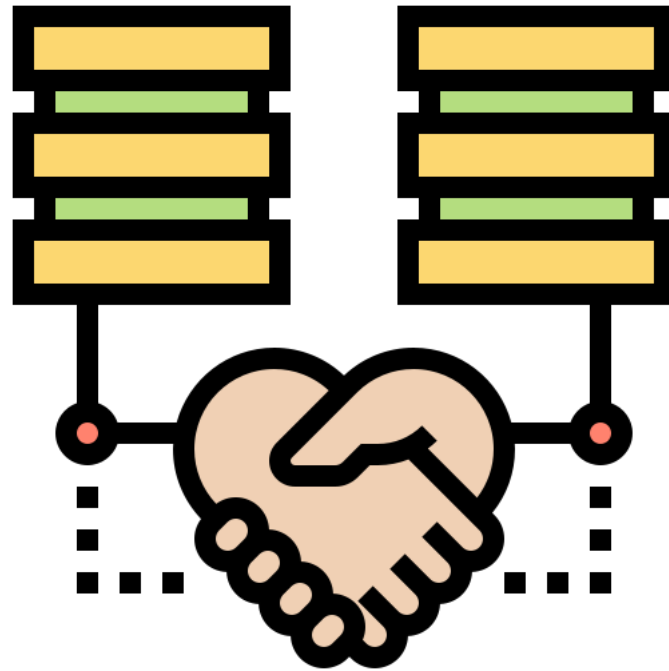
```
int main()
{
    BOARD_InitPins();
    BOARD_BootClockRUN();
    BOARD_InitDebugConsole();

    MCMGR_Init();

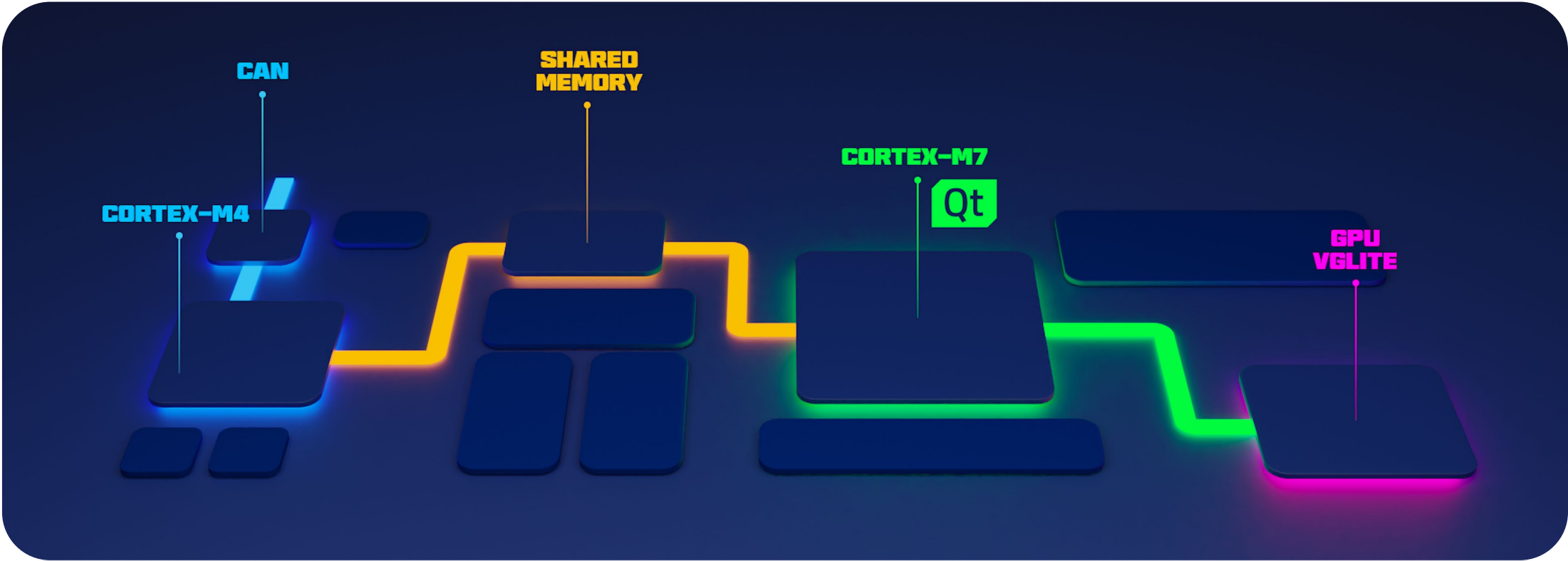
    uint32_t startupData;
    mcmgr_status_t status;
    do
    {
        status = MCMGR_GetStartupData(&startupData);
    } while (status != kStatus_MCMGR_Success);

    /*
     * Cortex-M4 application loop.
     */
}
```

# Inter core communication



# CAN ON Cortex-m4



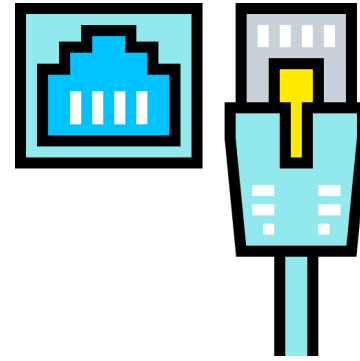
# Cortex-M4 is smart



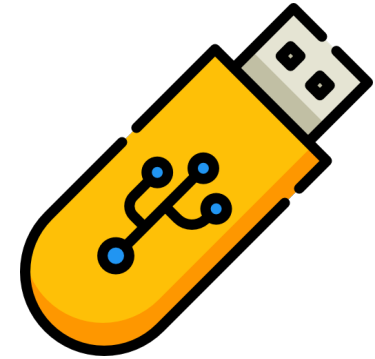
Safe renderer



LTE / Bluetooth



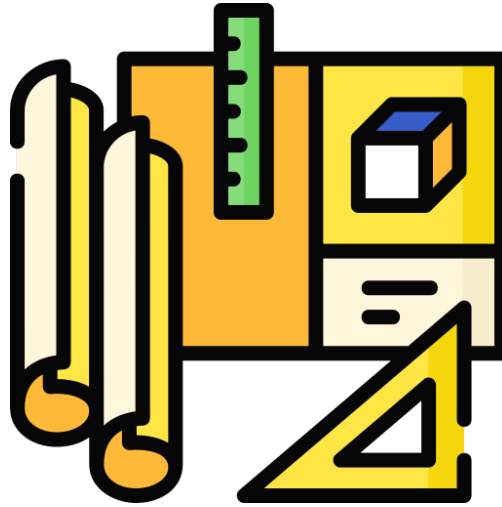
Ethernet



Peripherals

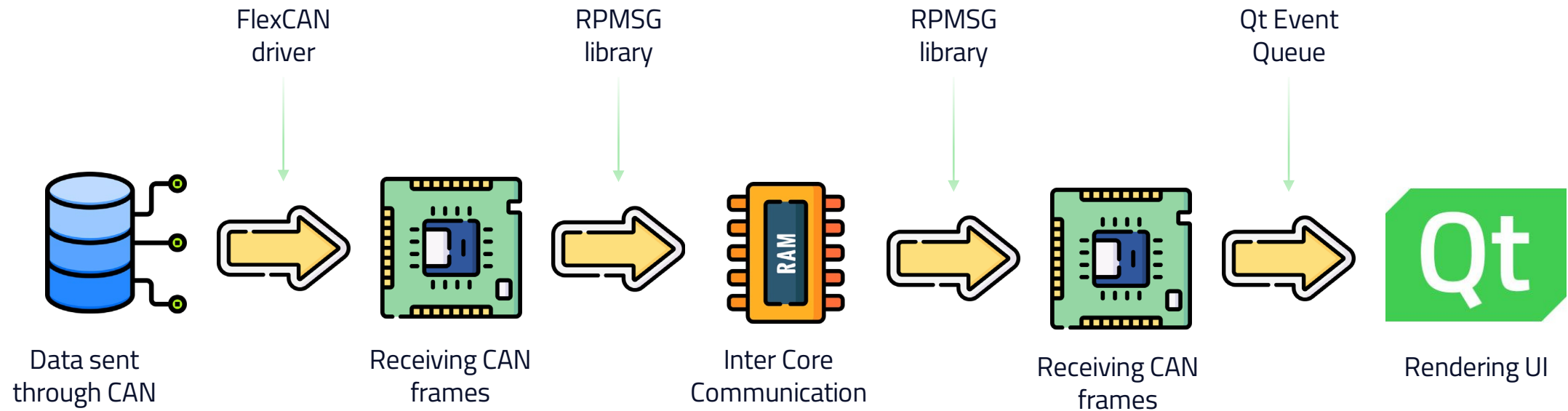


# Benefits from nxp

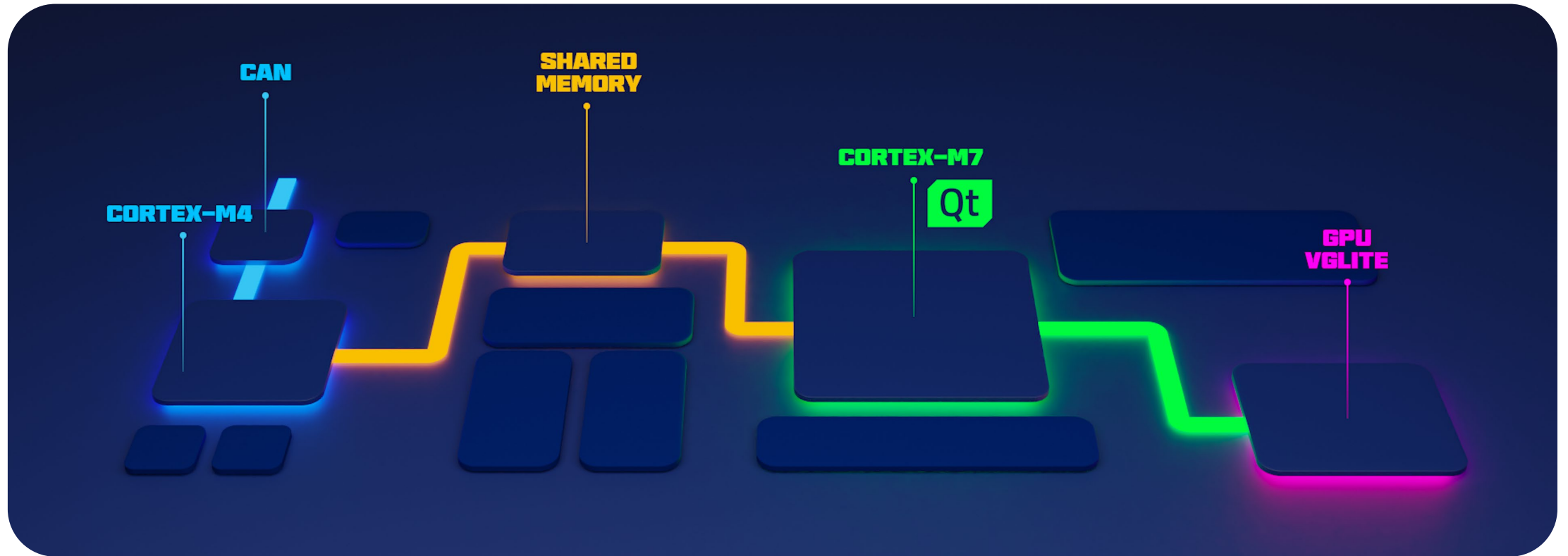


1170 SDK is well prepared

# All together



# All together



Thank you

## Offer for webinar attendees –

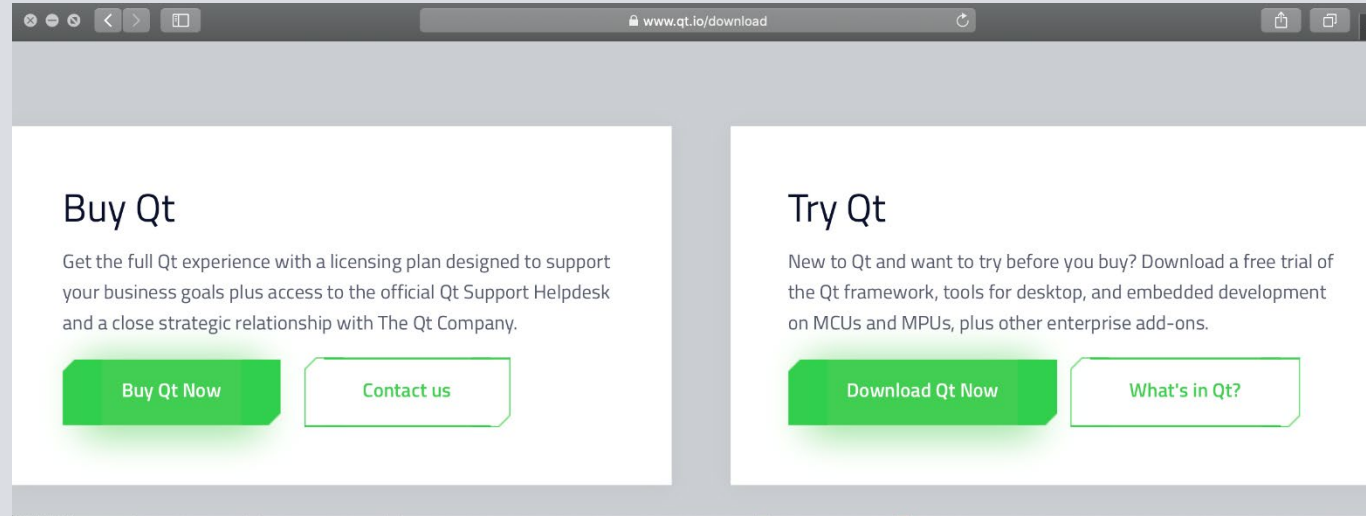
100% off \$350 Early bird pricing, \$400 regular



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New Technical Training - Now Available  
Creating UI/UX for MCUs  
STMicroelectronics NXP RENESAS  
Enroll today! Bring the team!  
MCU  
Microcontrollers

- > Creating User Interfaces for Microcontrollers (NXP), June 8-9
  - > <https://www.qt.io/events/creating-user-interfaces-for-microcontrollers-1614803076>
- > Programming for Microcontrollers with Qt (STMicroelectronics), May 25-26
  - > <https://www.qt.io/events/programming-for-microcontrollers-with-qt-stmicroelectronics-1614823030>
- > Design & Development for Microcontrollers (Renesas), June 15-16
  - > <https://www.qt.io/events/hmi-ui-ux-design-development-for-microcontrollers-renesas-rh850-1614824699>

# Useful Links



- > [www.qt.io/download](http://www.qt.io/download)
- > <https://resources.qt.io/qt-mcus>
- > <https://doc.qt.io/QtForMCUs/index.htm>
- > <https://www.qt.io/microcontrollers-nxp>
- > <https://resources.qt.io/qt-mcus/minimizing-risks-when-building-an-instrument-cluster-hmi-on-demand-webinar-2>
- > <https://resources.qt.io/qt-mcus/from-mcu-to-mpu-targeting-multiple-devices-in-your-embedded-project-2>
- > <https://resources.qt.io/qt-mcus/creating-dynamic-uis-with-qt-design-studio-and-photoshop-on-mcus-on-demand-webinar>

# Questions

Free trial [qt.io/download](https://qt.io/download)



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# Thank you!

Get in touch with us  
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Qt Developer  
Accelerator

