Simplify Your GUI Development with Embedded Wizard and MCUXpresso
SCALABILITY OF EMBEDDED PROCESSING
THE NEW NORMAL

Applications Processors

Ultra-low Power Dynamic & Static
ARM v8/v8m + GPU/DSP
ARM v7/v7m + 2D/3D
ARM v7m + Audio

MCU

i.MX 6UL/ULL

i.MX RT

i.MX 7ULP
Low Power i.MX RT Roadmap

- **i.MX RT1050**
  - Cortex-M7, 32K/32K L1
  - 512KB SRAM
  - 8/16-bit EMI (SDRAM/SRAM)
  - LCD / CSI / 2D acceleration
  - Standard Security

- **i.MX RT1060**
  - Cortex-M7, 32K/32K L1
  - 1MB SRAM
  - 8/16-bit EMI (SDRAM/SRAM)
  - LCD / CSI / 2D acceleration
  - Standard Security

- **i.MX RT1064**
  - Cortex-M7, 32K/32K L1
  - 1MB SRAM, 4MB Flash
  - 8/16-bit EMI (SDRAM/SRAM)
  - LCD / CSI / 2D acceleration
  - Standard Security

- **i.MX RT1020**
  - Cortex-M7, 16K/16K L1
  - 256KB SRAM
  - 16-bit EMI (SDRAM/SRAM)
  - Standard Security

- **i.MX RT1015**
  - Cortex-M7, 16K/16K L1
  - 128KB SRAM
  - 1x QSPI
  - Standard Security

Support available now

- **i.MX RT1064**
  - BGA196

Higher Performance

Lower Cost

2017

2018

2019
### i.MX RT1050: Block Diagram

#### System Control
- Secure JTAG
- PLL, OSC
- eDMA
- 4 x Watch Dog
- 6 x GP Timer
- 4 x Quadrature ENC
- 4 x QuadTimer
- 4 x FlexPWM
- IOMUX

#### Main CPU Platform
- **Core**
  - Arm® Cortex®-M7
- **Memory**
  - 32 KB I-cache
  - 32 KB D-cache
  - FPU
  - Up to 512KB TCM

#### Connectivity
- **eMMC 4.5/SD 3.0**
- 8 x UART
- 8 x 8 Keypad
- 4 x I2C
- 4 x SPI
- GPIO
- 3 x I2S/SAI
- S/PDIF Tx/Rx
- 2 x CAN
- 2 x USB2.0 OTG with PHY
- 1 x 10/100 ENET with IEEE 1588

#### Multimedia
- 8/16-bit Parallel Camera Interface
- 24-bit Parallel LCD (RGB)
- Pixel Processing Pipeline (PXP)
- 2D Graphics Acceleration
- Resize, CSC, Overlay, Rotation

#### Internal Memory
- 512 KB SRAM/TCM
- 96KB ROM

#### External Memory
- Dual-Channel Quad-SPI with Bus Encryption Engine
- External Memory Controller
- 8/16-bit SDRAM
- Parallel NOR Flash
- NAND Flash

#### Security
- TRNG&PRNG (NIST SP 800-90 Certified)
- 128-AES cryptography
- Bus Encryption Engine: Protect QSPI Flash Content

#### Specifications
- Package: MAPBGA196 | 10x10mm^2, 0.65mm pitch (130 GPIOs)
- Temp / Qual: -40 to 105°C (Tj) Industrial / 0 to 95°C (Tj)

#### Consumer High Performance Real Time System
- **Cortex-M7 up to 600MHz**, 50% faster than any other existing M7 products
- 20ns interrupt latency, a **TRUE Real time processor**
- 512KB SRAM, configurable to 512KB TCM

#### Rich Peripheral
- Motor Control: Flex PWM X 4, Quad Timer X 4, ENC X 4
- 2x USB, 2x SDIO, 2x CAN, 1x ENET with 1588, 8xUART, 4x SPI, 4x I2C

#### Security
- TRNG&PRNG (NIST SP 800-90 Certified)
- 128-AES cryptography
- Bus Encryption Engine: Protect QSPI Flash Content

#### Ease of Use
- **MCUXpresso with SDK**
- FreeRTOS
i.MX RT1050 Evaluation Kit

Part Number: IMXRT1050-EVKB
Optional Display (4.3”): RK043FN02H-CT

Processor
• NXP Semiconductors MIMXRT1052DVL6B
  600MHz ARM Cortex-M7

Memory
• 256 Mbit SDRAM memory
• 512 Mbit Hyper Flash
• Footprint for QSPI Flash
• TF socket for SD card

Display
• Parallel LCD connector
• Camera Connector

Audio
• Audio Codec
• 4-pole Audio Headphone Jack
• External speaker connection
• Microphone
• SPDIF Connector

Connectivity
• Micro USB Host connector
• Micro USB OTG connector
• Ethernet (10/100T) connector
• CAN Transceivers
• ARDUINO interface

Debug
• JTAG connector
• On board DAP-Link debugger

Sensor
• 6-Axis Ecompass (3-Axis Mag, 3-Axis Accel) sensor FXOS8700CQ

Tools & OS Support
• MCUXpresso, IAR, Keil
• SDK with FreeRTOS

Others
• All in one board design
• 4 layer through hole PCB

Embedded Wizard port available now
MCUXpresso Software and Tools
for LPC & Kinetis MCUs and i.MX RT crossover processors

- **MCUXpresso IDE**
  Edit, compile, debug and optimize in an intuitive and powerful IDE

- **MCUXpresso SDK**
  Runtime software including peripheral drivers, middleware, RTOS, demos and more

- **MCUXpresso Config Tools**
  Online and desktop tool suite for system configuration and optimization

Learn more at: [www.nxp.com/mcuxpresso/sdk](http://www.nxp.com/mcuxpresso/sdk)
MCUXpresso SDK
Software Framework and Drivers

Architecture:
• CMSIS-CORE compatible
• Single driver for each peripheral
• Transactional APIs w/ optional DMA support for communication peripherals

Reference Software:
• Peripheral driver usage examples
• Application demos
• FreeRTOS usage demos
• IoT connectivity examples

License:
• BSD 3-clause for startup, drivers, USB stack

Toolchains:
• MCUXpresso IDE
• IAR®, ARM® Keil®, GCC w/ Cmake

Integrated RTOS:
• Amazon FreeRTOS
• RTOS-native driver wrappers

Integrated Stacks and Middleware:
• USB Host, Device and OTG
• lwIP, FatFS, LittleFS
• Crypto acceleration plus wolfSSL & Arm Mbed TLS
• AWS IoT and Microsoft Azure IoT
• SD and eMMC card support
• TensorFlow Lite and ARM CMSIS-NN (eIQ™ ML Software)

Quality:
• Production-grade software
• MISRA 2004 compliance
• Checked with Coverity® static analysis tools
Who we are

- TARA Systems founded in 1990 in Munich, Germany
- Privately owned limited company
- Started in the domain of Consumer Electronics
- Strong engineering background in embedded systems
- 2 business units
  - Software for Consumer Electronics
  - GUI Solutions
TARA’s own and independent GUI solution

GUI development and instant prototyping tool

Follows a code generation model – not just a pure graphics library or runtime interpreter

MCU and MPU type target hardware

Evolved over 25 years

No external dependencies, open source or other 3rd party stacks

Customers worldwide, >100 Mio. devices deployed using Embedded Wizard technology
### Benefits for i.MX RT series

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>![Computer Icon]</td>
<td>Full-featured <strong>IDE</strong> to develop HMIs</td>
</tr>
<tr>
<td>![Speedometer Icon]</td>
<td>Utilizing RT’s built-in <strong>Pixel Processing Pipeline</strong> to achieve high FPS with low CPU load</td>
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<tr>
<td>![Launch Icon]</td>
<td>State-of-the-art GUIs with <strong>high-performance</strong> animations and transitions</td>
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<tr>
<td>![Code Icon]</td>
<td>Generation of <strong>pure ANSI C</strong> source code with no further dependencies</td>
</tr>
<tr>
<td>![RAM Icon]</td>
<td>Very <strong>low</strong> RAM and flash <strong>footprint</strong></td>
</tr>
<tr>
<td>![Controller Icon]</td>
<td>HMIs run on <strong>bare metal</strong> or with any (RT)OS</td>
</tr>
<tr>
<td>![Pig Icon]</td>
<td><strong>Reasonable</strong> business model - no royalty fees per device!</td>
</tr>
</tbody>
</table>

**Embedded Wizard**
Live Demo
Information on NXP Devices and Enablement

• Visit nxp.com for information on devices
  • i.MX RT range of crossover processors: nxp.com/imxrt
  • MIMXRT1050 evaluation kit: nxp.com/mimxrt1050
  • i.MX Processor Community: https://community.nxp.com/community/imx

• MCUXpresso Software and Tools Web Pages
  • MCUXpresso Software and Tools: www.nxp.com/mcuxpresso
    • MCUXpresso SDK: www.nxp.com/mcuxpresso/sdk
    • MCUXpresso IDE: www.nxp.com/mcuxpresso/ide
    • MCUXpresso Config Tools: www.nxp.com/mcuxpresso/config

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    • MCUXpresso Config Tools: https://community.nxp.com/community/mcuxpresso/mcuxpresso-config
Further Information

- Download Free Edition
  www.embedded-wizard.de/download

- Showcases and demos
  www.embedded-wizard.de/demo

- Online knowledge base
  doc.embedded-wizard.de

- Open community support forum
  ask.embedded-wizard.de

- YouTube channel
  www.youtube.com/c/EmbeddedWizard

- Follow us on Twitter
  www.twitter.com/EmbeddedWizard
SECURE CONNECTIONS FOR A SMATER WORLD