Embedded Wizard

Learn How GUI Development on LPC546xx Devices Can Be Just Like Magic

Hosted by Brendon Slade (NXP) and Manuel Melic (TARA Systems)

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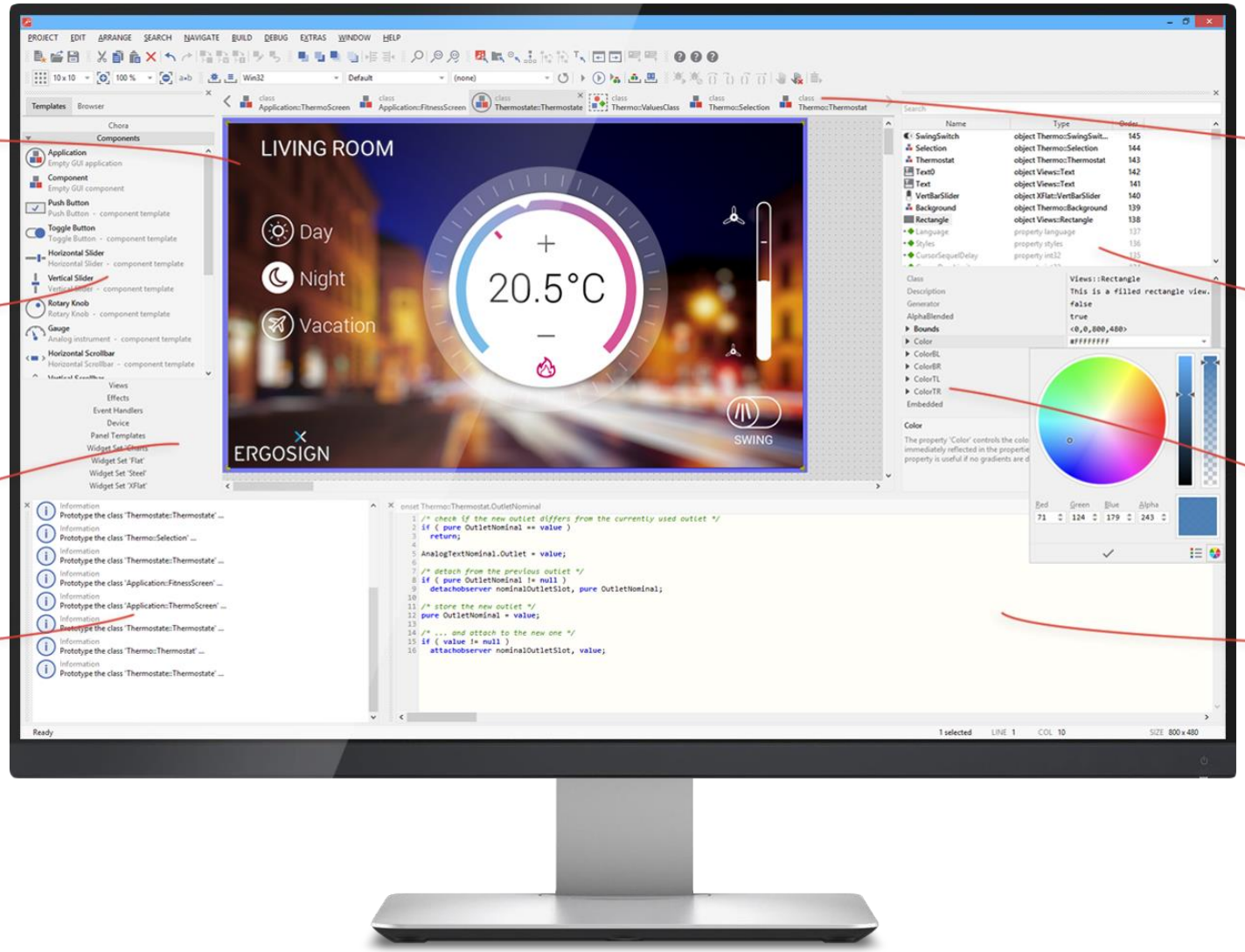
Agenda

- Embedded Wizard introduction
- NXP microcontroller support
- Live demonstration of Embedded Wizard
- Q & A

What is Embedded Wizard?

- Product of TARA Systems, an ISV specialized on development for embedded systems based in Munich, Germany
- GUI development and prototyping tool with code generation model – not just a pure graphics library
- Dedicated WebPage incl. Demos, Tutorials, Docs, Eval edition, etc.: www.embedded-wizard.de
- MCU and MPU type target hardware
- Evolved over 20 years
- Customers worldwide, >100 Mio. devices deployed using Embedded Wizard technology

Workspace



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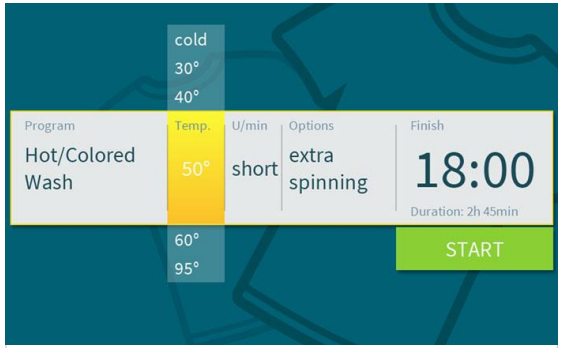
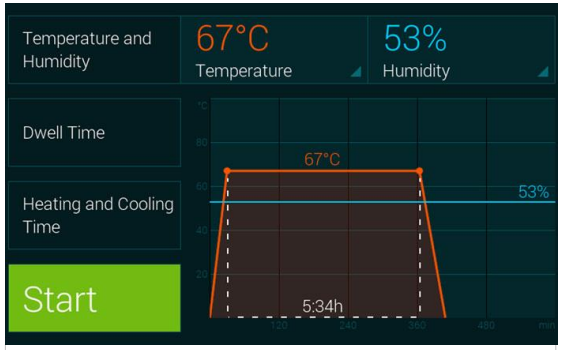
For whom is Embedded Wizard?

- From Low- to High-End SoCs. Minimum Requirements:
  - 32Bit SoC
  - Access to Memory
  - Access to System-Ticks (to process animations, transitions, effects, …)
  - Access to the Framebuffer
- Customers who want one supplier who have in-depth knowledge about the whole ecosystem along the vertical integration chain: From the UI application to the underlying HW adaptation
- No external dependencies to other 3rd party or open source components
- Target Framework Memory Footprint: 32KB, 48KB (Index8 only)
- Market-Proven GUI Tool to develop modern HMIs, driven from the consumer electronic domain

Sample GUIs



Washing Machine

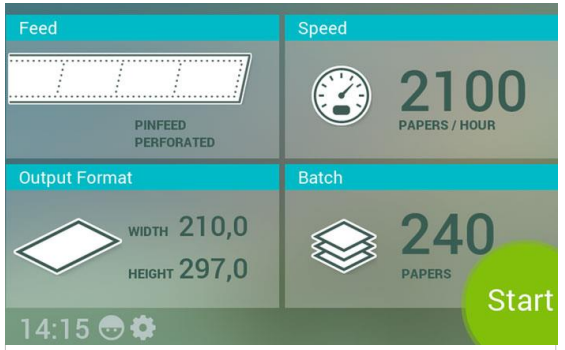


Climatic Cabinet

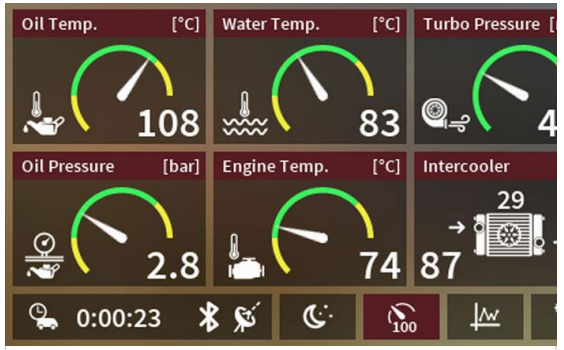
Various Gauges

Various Charts

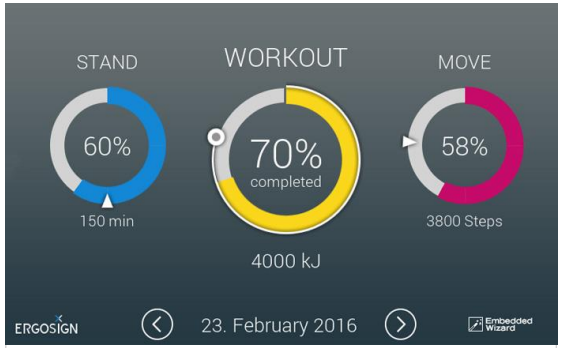
Smart Thermostat



Paper Cutting Machine



Vehicle Data Logger



Fitness Tracker

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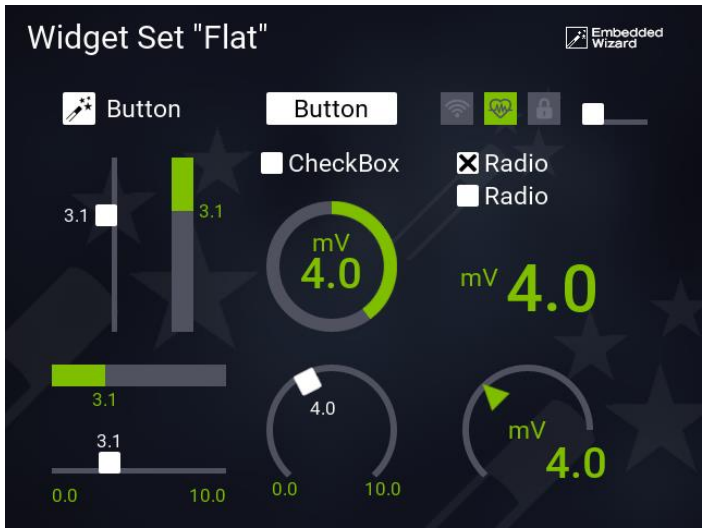
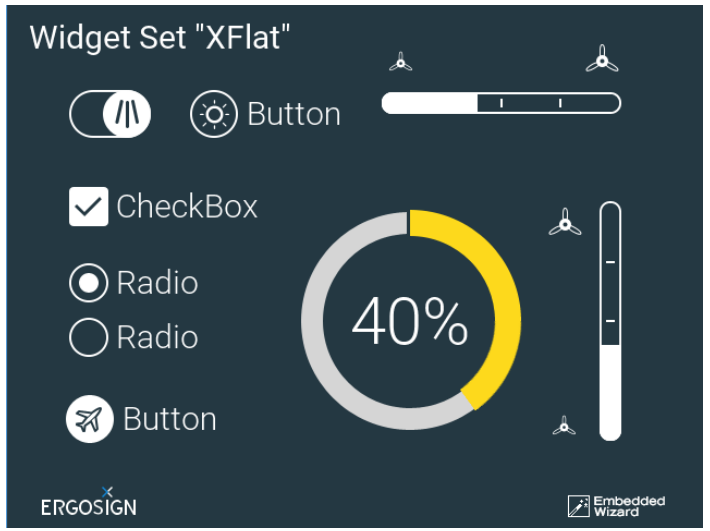
Key Features

- Comfortable IDE with drag & drop
- Visual programming with WYSIWYG and instant prototyping of UI look and feel
- Simple programming model incl. object-oriented programming support, generating ANSI C
- Platform independent implementation of GUI logic
- Ready-to-use widgets, Effects (rotation, scaling & perspective transformation each with Hi- and Low-Quality), Animations, Layout Functions, etc.
- (Multi-)Touch, Gestures, hardware buttons support
- No (RT)OS (i.e. tasks, semaphores, etc.) is required, GUIs can run on bare metal
- UNICODE based
- Supporting various color depths/formats: RGBA8888, RGB888, RGBA4444, RGB565, Index8, LumA44

Widget Sets





- Ready-to-use and easy customisable
- Can be used as templates to implement individual look & feel
- Well documented with inline annotations and notes
- Low-latency update only if observed data changes
- Deployed as full source code, royalty free

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Our GUI Services

Training

- Workshops
- Architecture Training

Support

- Platform Integration
- Technical Support

Development

- Prototype
- Framework
- Application
- Custom Widgets

Consulting

- Code Review
- Automated GUI Testing
- Performance Optimisation

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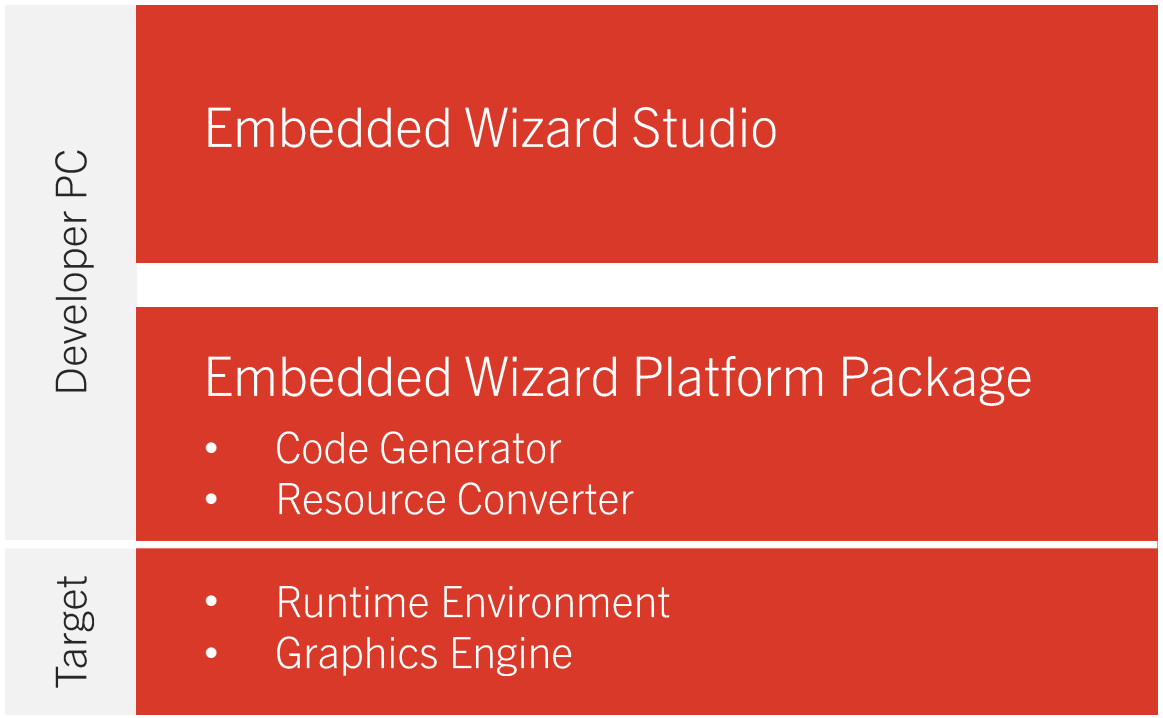
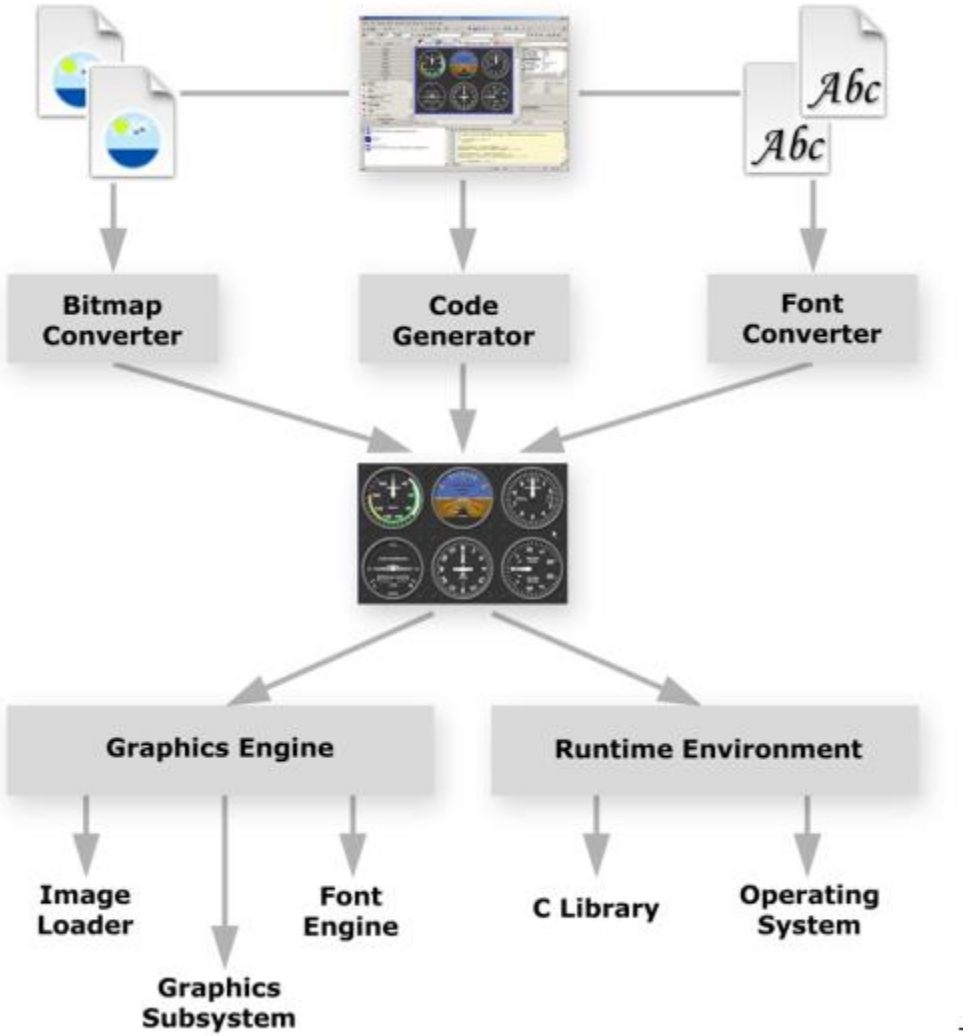
Architecture



Platform Packages (I)



Platform Packages (II)

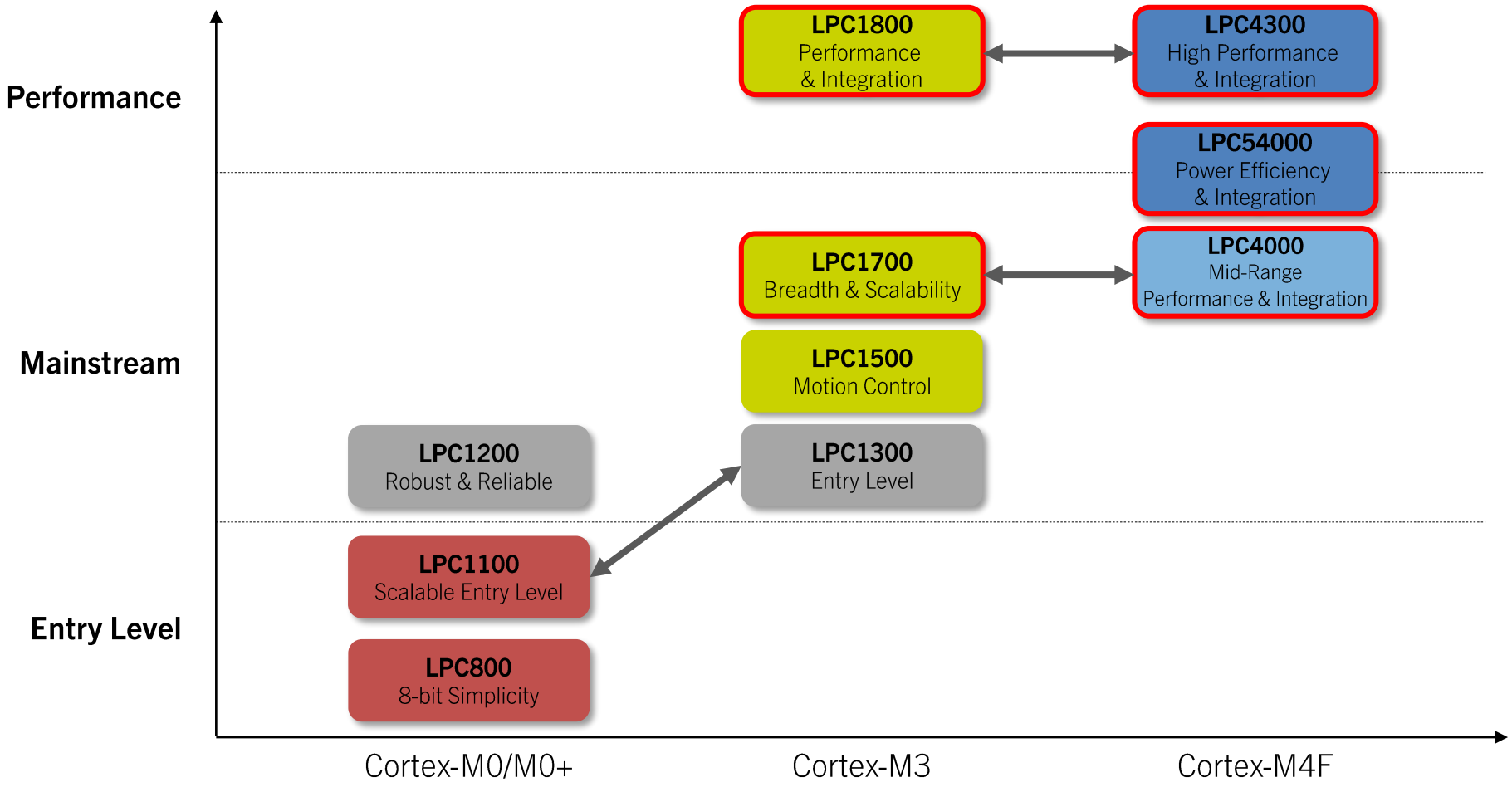
- Provided to customers as full source code
- Supporting different colour depth/formats:
  - E.g. RGBA8888, RGB888, RGBA4444, RGB565, Index8, LumA44
- Can be adapted to utilize HW graphics accelerator as best as possible
- Optional support of external TrueType Font Rendering Engine (e.g. FreeType)
- Runs with any (RT)OS or on bare metal, following a cooperative model
- Resources (i.e. bitmaps and strings) can be used in two flavours – compressed or raw:
  - Compressed: Lower ROM, but higher RAM (buffer to store decompressed resource data during runtime)
  - Raw (aka DirectAccess): Higher ROM (e.g. raw bitmaps), but less RAM (accessing resources directly)

Why Developers Select LPC Microcontrollers

1. Product Innovation
2. Broad Ecosystem
3. Quality & Longevity
4. Local Support
5. Extensive Software & Tools

Investing in Innovative & Differentiated Technologies
to Maintain our Global Leadership in the Broad Market

LPC Microcontroller Portfolio



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Support available now

(also available for Kinetis K64, K70 and i.MX)

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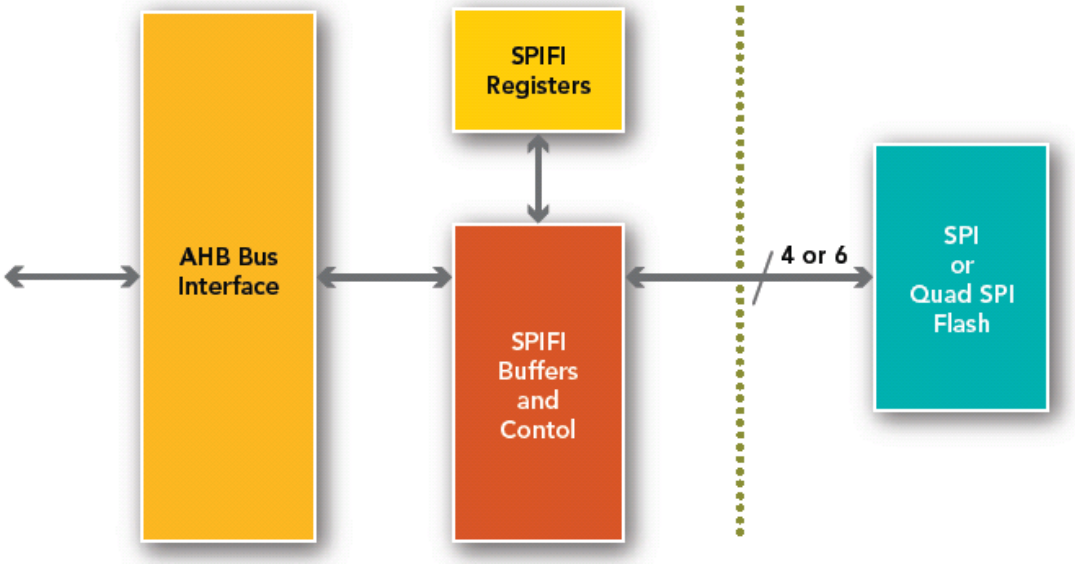
LPC SPIFI (SPI Flash Interface)

- Enables Flash to appear in MCU memory map and be read like other on-chip memory (incl. DMA)
- Why use SPIFI?
  - Cost: small, inexpensive serial Flash
  - Performance: ~70% of internal Flash
  - Space: Saves board space and pins
  - App size: Ideal for storing image/data



LPC Graphic LCD Interface

Key features

- Support for STN and TFT panels
- Up to 1024x768 resolution
- 24-bit LCD interface supports 24bpp (16M colors)
- Palette table allows display of up to 256 of 64K colors
- Adjustable LCD bus size supports various panel bus configuratio
- Dedicated LCD DMA controller
  Hardware cursor support

Full supported by MCUXpresso SDK

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Introducing LPC54000 Series of Power Efficient Microcontrollers

LPC5410x

entry level

Cortex-M4F at 100 MHz
1.62 V to 3.6 V
256-512 KB Flash
104 KB RAM

Two product families
Optional coprocessor

Available Now

LPC5411x

mass market appeal

Cortex-M4F at 100 MHz
1.62 V to 3.6 V
128-256 KB Flash
96-192 KB RAM
FRO, FS USB, DMIC

Two product families
Optional coprocessor

Available Now

LPC546xx

added performance & integration

Cortex-M4F at 180 MHz
1.62 V to 3.6 V
256-512 KB Flash
136-200 KB RAM
FRO, FS/HS USB, DMIC

Six product families,
Optional TFT-LCD Controller,
Ethernet, CAN FD

Available Now

LPC546xx Series

Power-efficiency, Advanced HMI & Flexible Connectivity

Gemac product designed using Embedded Wizard on LPC

Extremely Low Active Power with 180MHz Performance

- ARM Cortex-M4 core running up to 180MHz with active modes of 120 µA/MHz

Advanced HMI & Flexible Communication Peripherals

- Up to 21 flexible communication peripherals to interface with memory, connectivity modules, and a variety of sensors
- Numerous wake-up sources, ample timers
- Integrated TFT control allows to keep the overall cost and complexity to a minimum

Comprehensive enablement

- Complimentary MCUXpresso IDE and Software Development Kit (SDK)
- Faster time to market with comprehensive development hardware and reference designs

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LPC546xx Target Applications

Industrial, Control & General Embedded

- Industrial gateway
- HVAC control
- Building control & automation
- Diagnostic equipment
- Electronic instruments
- Multi-node comms hubs
- Multi-protocol bridge
- Various HMI/GUI apps
- Scanners
- Mini printers

Smart Home & General Consumer

- White Goods HMI
- Smart Small Appliance
- Thermostat
- Security monitoring & alarm
- Fitness equipment
- Audio accessories / Musical instruments

Automotive Aftermarket

- OBD-II
- Data collectors, Infotainment/navigation
- Telematics
- Tachograph
- Fleet Management

Smart Energy

- Smart Electric Meter
- In Home Display (IHD)
- Data Aggregator
- Communications Hub
- PLC, inverters, circuit breakers

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LPCXpresso54608 Development Board

- LPC54608 MCU running at 180MHz
- 4.3” TFT LCD (272x480) cap touch display
- 128Mb Micron SDRAM
- 128Mb Micron quad SPI flash
- Built-in CMSIS-DAP/J-link debug probe
- Ethernet, DMIC, SD card, USB HS/FS ports
- Stereo audio codec
- Arduino UNO R3 compatible expansion ports

- Embedded Wizard port available now

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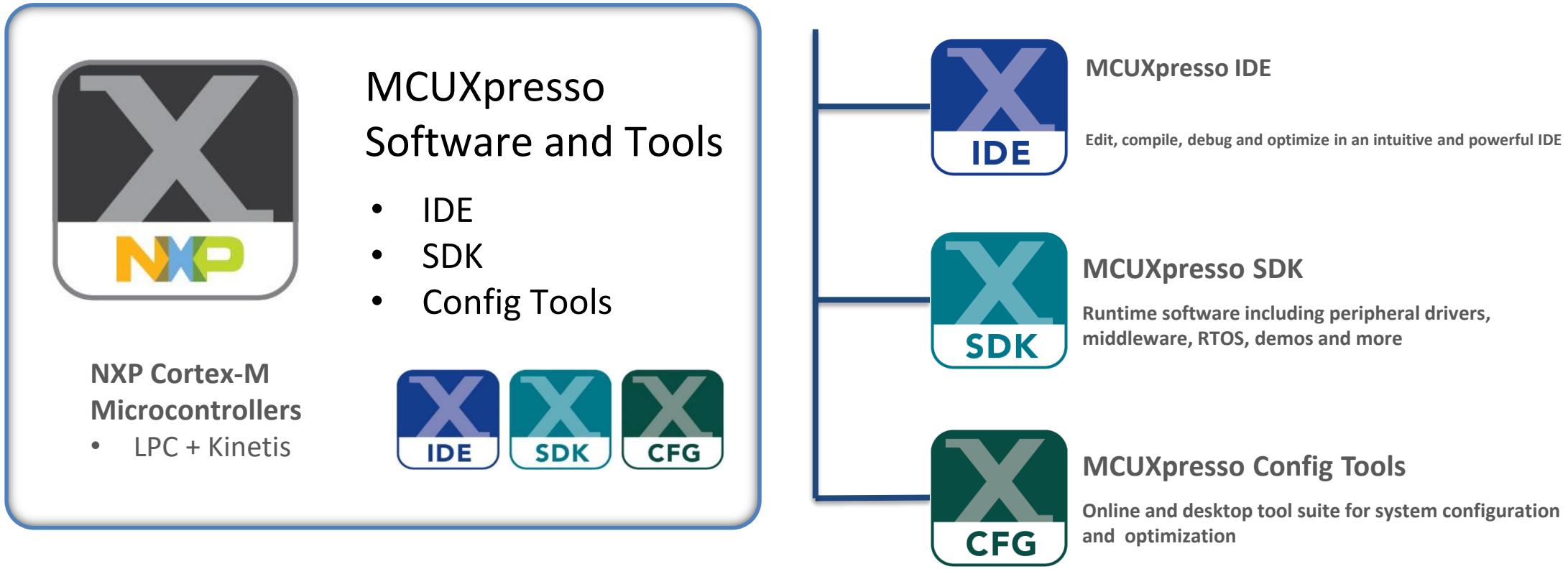
MCUXpresso Software and Tools



- Embedded Wizard board support for LPC546xx based on MCUXpresso SDK

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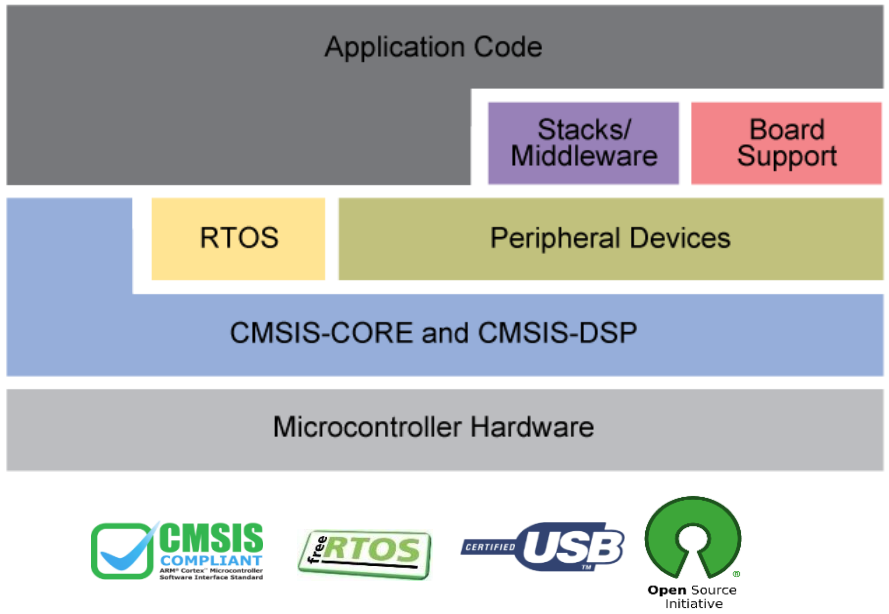
MCUXpresso SDK

Software framework and reference for LPC & Kinetis MCU application development



Features

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

Integrated RTOS support (optional):
- FreeRTOS
- RTOS-native driver wrappers

Integrated Stacks and Middleware
- USB Host, Device and OTG, lwIP, FatFS
- Crypto acceleration wolfSSL & mbedTLS
- SD card support

Reference Software:
- Peripheral driver usage examples
- Application demos
- FreeRTOS usage demos

License:
- BSD 3-clause for startup/drivers/USB

Toolchains:
- IAR®, Keil®, MCUXpresso IDE*

Quality
- Production-grade software
- MISRA 2004 compliance
- Checked with Coverity® static analysis tools

*Support for MCUXpresso IDE in March 2017

Learn more at: www.nxp.com/mcuxpresso/sdk

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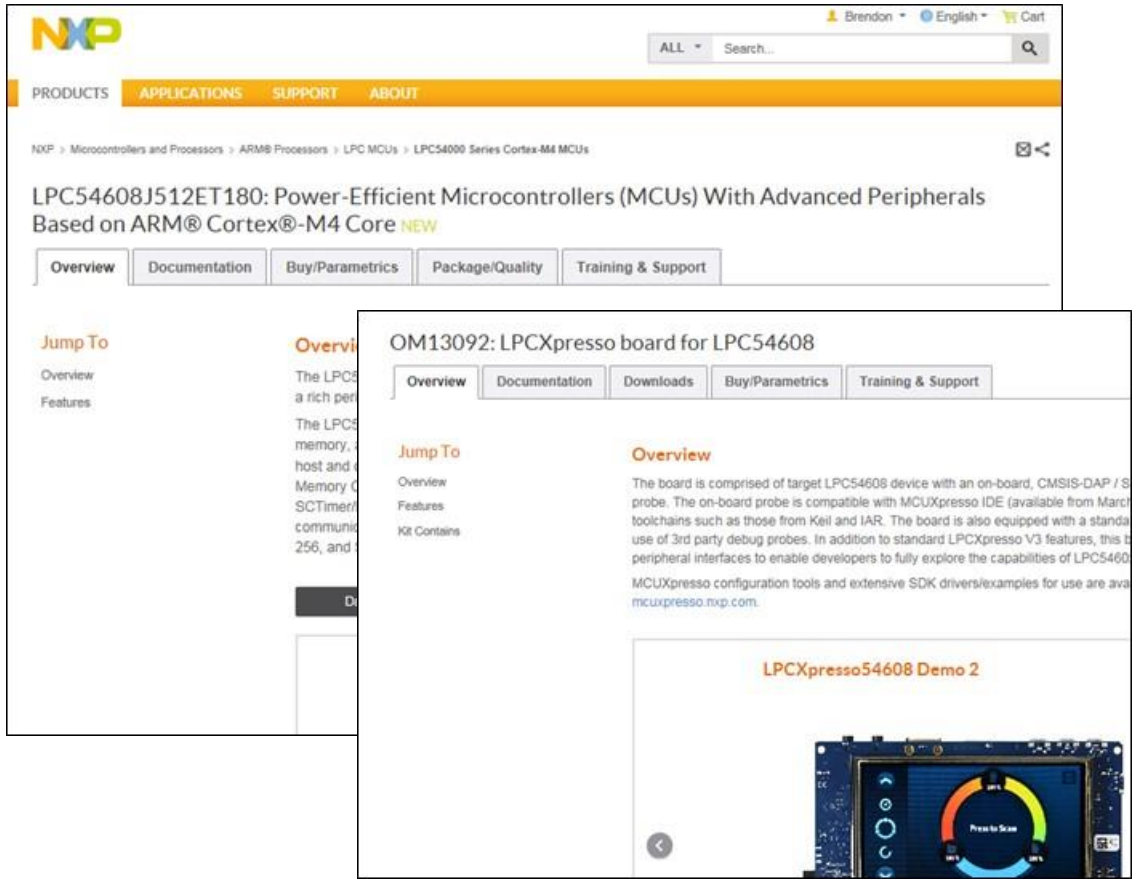
Where to find information on NXP MCUs

- Visit nxp.com for information…
  - LPC range of MCUs at nxp.com/lpc
  - LPCXpresso54608 board at nxp.com/demoboard/om13092
- Download a demo of an Embedded Wizard example application to your LPCXpresso54608
- Visit www.embedded-wizard.de/tryout to get a free evaluation copy



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Let’s Do Some Magic...

Professional Edition

- Embedded Wizard Studio License
  - 5000 EUR per developer seat
  - Perpetual license
  - Covers unlimited number of projects or products
  - No additional maintenance or subscription fees
  - Includes 8 hours of TARA support
- Embedded Wizard Platform Package License
  - One-time perpetual customer-wide license fee, depending on yearly volumes:
    - Level 1: max. 10000 units/year: 2400 EUR
    - Level 2: max. 100000 units/year: 7200 EUR
    - Level 3: max. 500000 units/year: 12400 EUR
    - Level 4: unlimited units/year: 19800 EUR

    *) If volume of units increase and amount of units enters next level, a new license fee has to be purchased accordingly (one time)
  - No Royalties; Does not include sub-licensing, re-selling or re-distribution
  - Supports one platform with one color format/depth (e.g. RGB565)
  - Delivered with full source code

Evaluation Edition

- Limited version to
  - elaborate Embedded Wizard's workflow,
  - load the deployed examples,
  - process the available tutorials and
  - generate source code for PC and embedded systems
- Directly downloadable from Embedded Wizard’s website after click-through registration at www.embedded-wizard.de/tryout
- Possibility to evaluate on target hardware
- Possibility to save GUI projects
- Limited to simple GUI projects, no time restrictions
- Free of charge

Technical Support

- Full-Licenses from TARA include 8 hours of technical support per Studio license
- Additional support is available as professional services in blocks of 8 hours for 840 EUR
- A variety of tutorials, examples, demos, docs, etc. are available free of charge
- Dedicated open community and forum at ask.embedded-wizard.de
- Online Knowledge Base at doc.embedded-wizard.de

Distributors

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Trico
CHINA

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Links

- Showcases and demos
  www.embedded-wizard.de/demo
- Evaluation Edition
  www.embedded-wizard.de/tryout
- Open Community Support Forum
  ask.embedded-wizard.de
- Online Knowledge Base
  doc.embedded-wizard.de
- YouTube Channel
  www.youtube.com/c/EmbeddedWizard
- Follow us on Twitter
  www.twitter.com/EmbeddedWizard

Questions?

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