Creating Exceptional UIs through Valuable Real-time Behavioral Insight Gained from Percepio and Crank Software

JUNE 9, 2020

SECURE CONNECTIONS FOR A SMARTER WORLD

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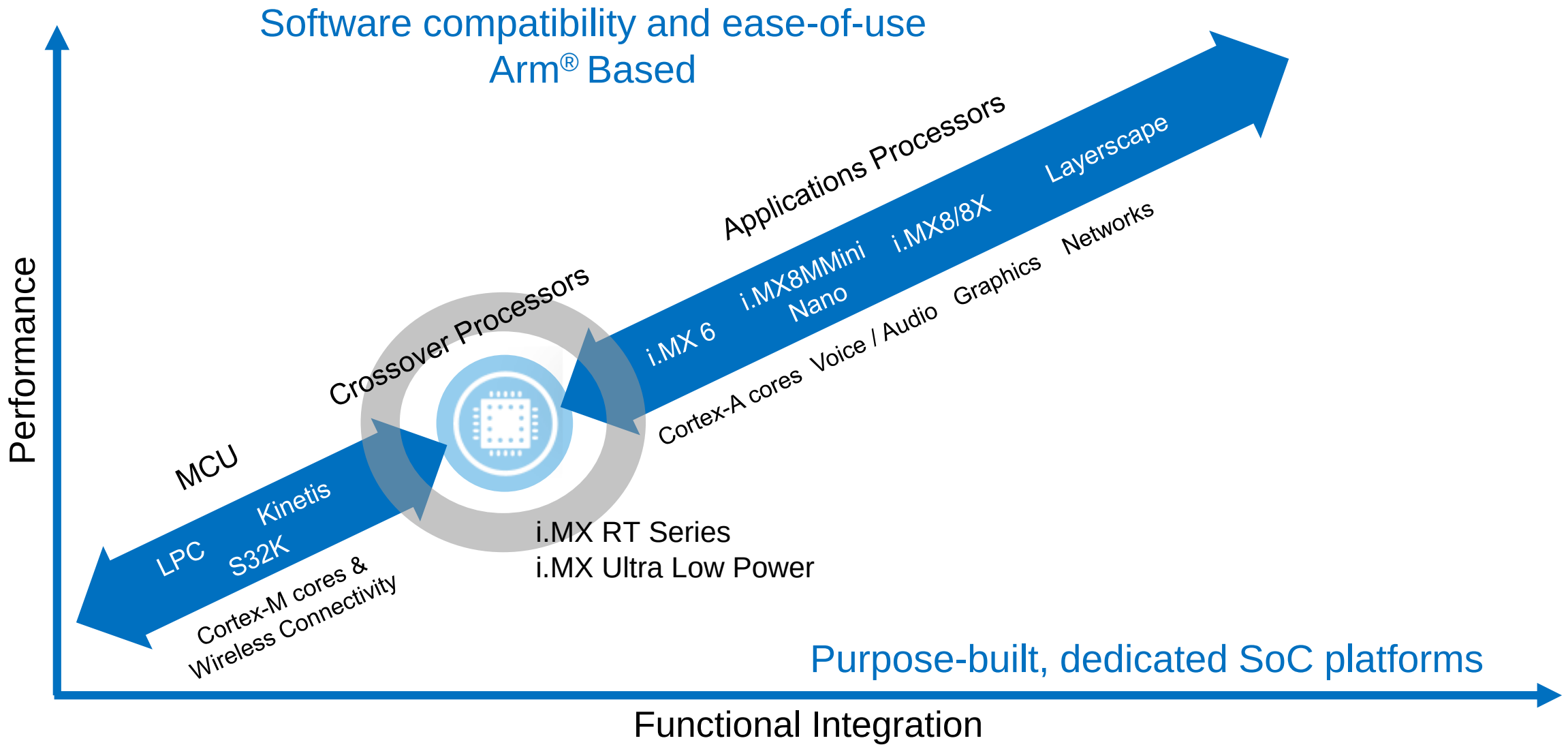
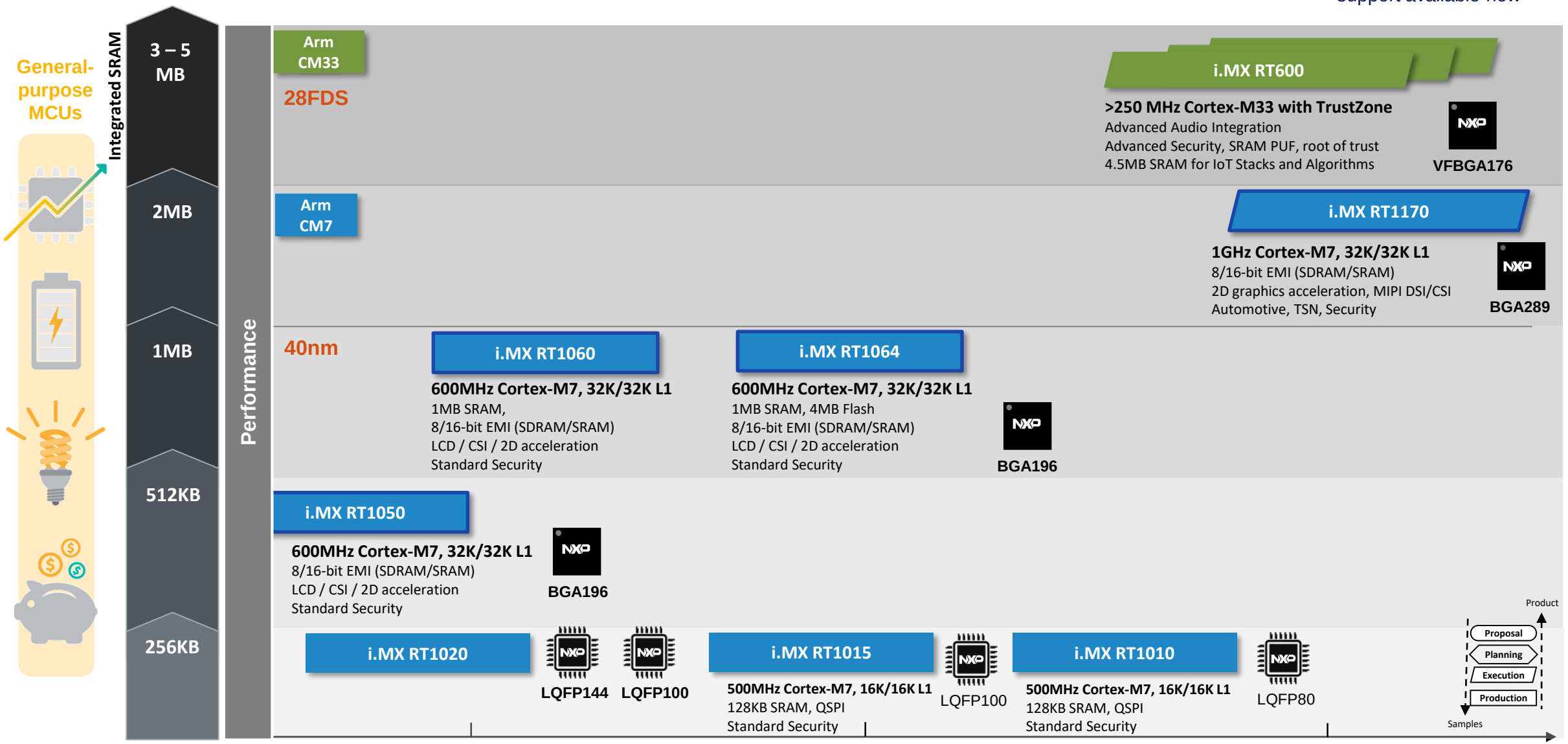
NXP SCALABLE PROCESSING CONTINUUM

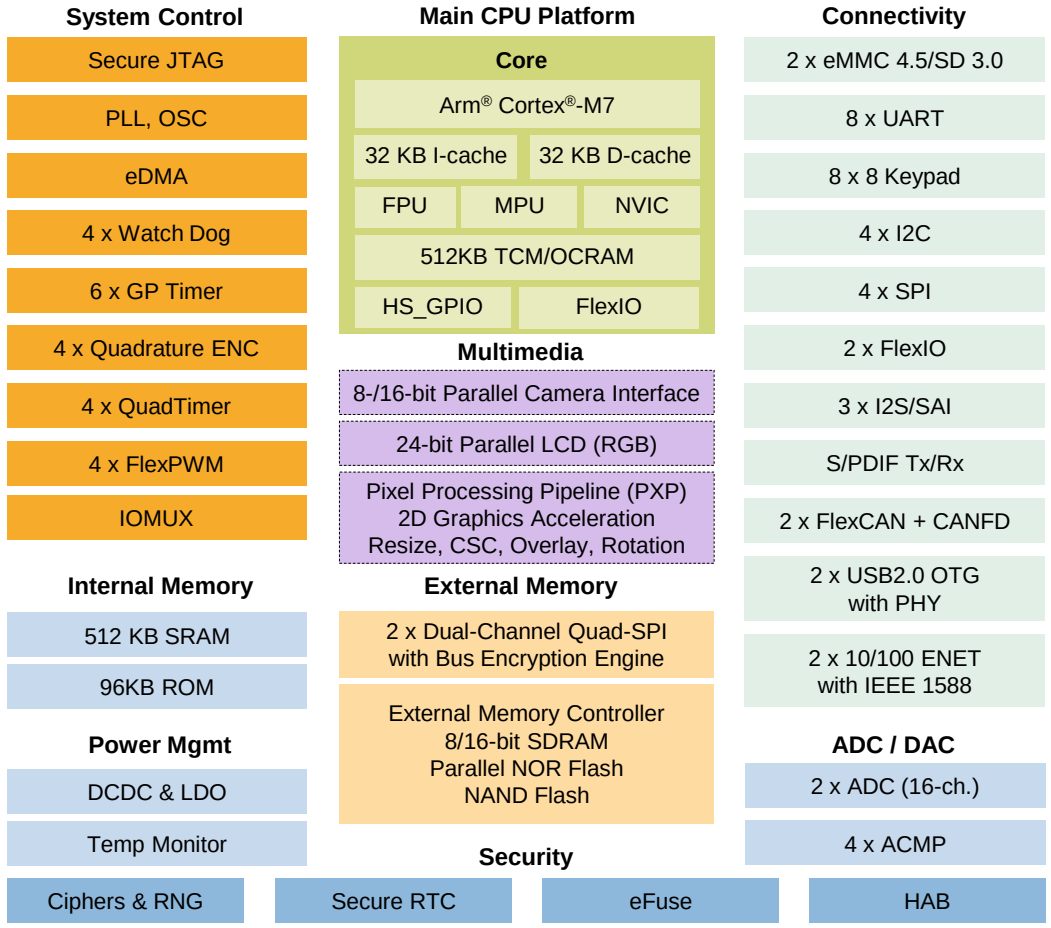


I.MX SERIES MCU ROADMAP

CRANK SOFTWARE
support available now



i.MX RT1060 MCU BLOCK DIAGRAM



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 + 512KB TCM/OCRAM

Rich Peripheral

- Motor Control: Flex PWM X 4, Quad Timer X 4, ENC X 4
- 2x USB, 2x SDIO, 2x CAN + 1x CANFD, 2x ENET with 1588, 8xUART, 4x SPI, 4X I2C
- **8/16-bit CSI interface and 8/16/24-bit LCD interface**
- **PXP 2D Graphics Acceleration**
- 2x Quad-SPI interface, with Bus Encryption Engine
- Audio interface: 3x SAI/ SPDIF RX & TX/ 1x ESAI

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

Low BOM Cost

- Competitive Price
- Fully integrated PMIC with DC-DC
- Low cost package, 10x10 BGA with 0.65mm Pitch
- SDRAM interface

THE MCUXPRESSO ECOSYSTEM

Core Technologies from NXP

- MCUXpresso IDE
- MCUXpresso SDK
- MCUXpresso Config Tools
- MCUXpresso Secure Provisioning Tool

Enabling Software Technologies

- Run time software libraries and middleware
- Enable customers to focus on differentiation
- From NXP and partners

Enabling Tools Technologies

- Partner IDEs
- Debug Probes
- Development Boards
- From NXP and partners

MCUXPRESSO SOFTWARE AND TOOLS
ADDITIONAL WEB RESOURCES

MCUXpresso Software and Tools Overview Page:
https://www.nxp.com/mcuxpresso

MCUXpresso Software and Tools Community Site:
https://community.nxp.com/community/mcuxpresso

IDE
Website / Community

SDK
Website / Community

CFG
Website / Community

SEC
Website / Community

Support devices

Supported Devices Table (Community Doc)

Graphics overview

GUIs on NXP Microcontrollers

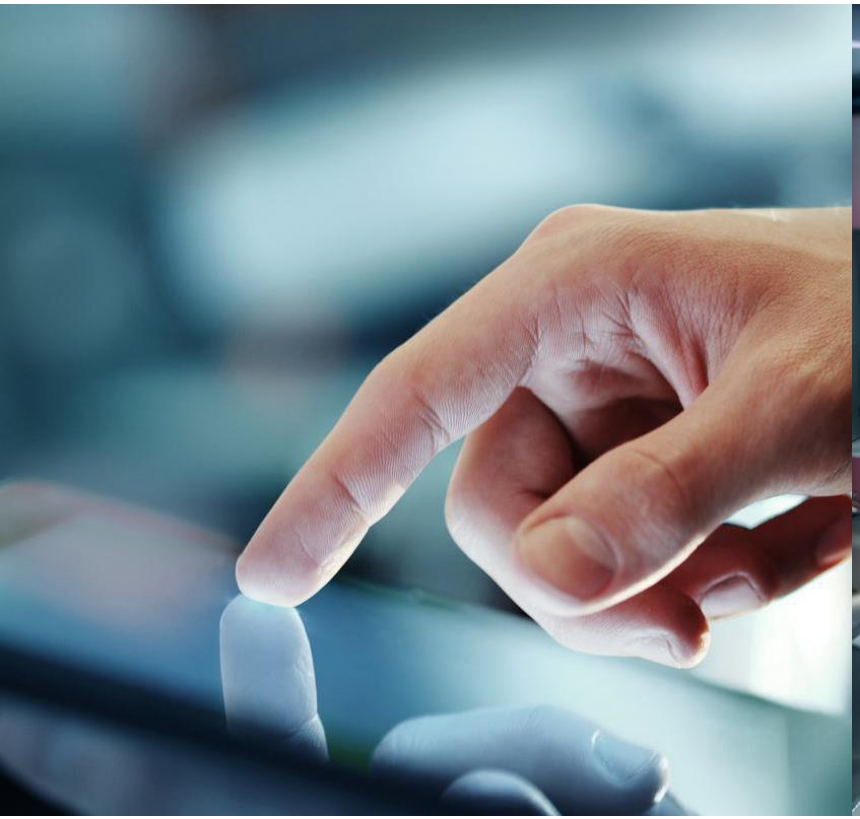
ACCELERATING TOMORROW'S EMBEDDED UI EXPERIENCES
CRANK
SOFTWARE

TODAY'S SPEAKERS

Scott Snider
Product Marketing Manager
Crank Software

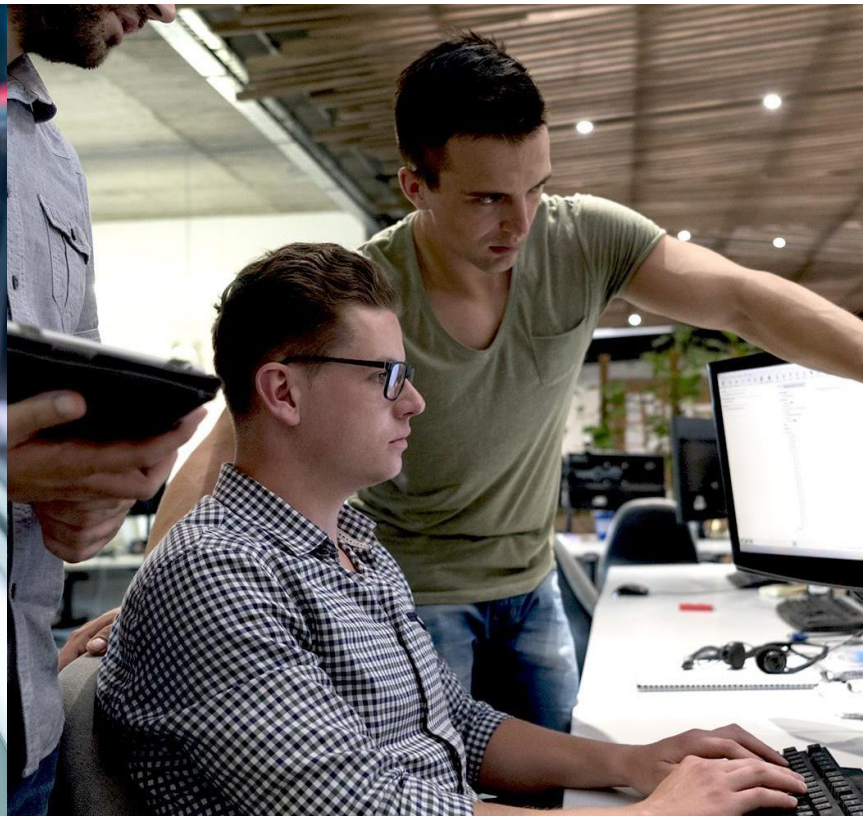
Garry Clarkson
Field Application Engineer
Crank Software

Challenge: Consumer GUI expectations are higher than ever



Smartphone experiences have elevated expectations

Hardware technology constantly evolving



Project assigned short deadlines

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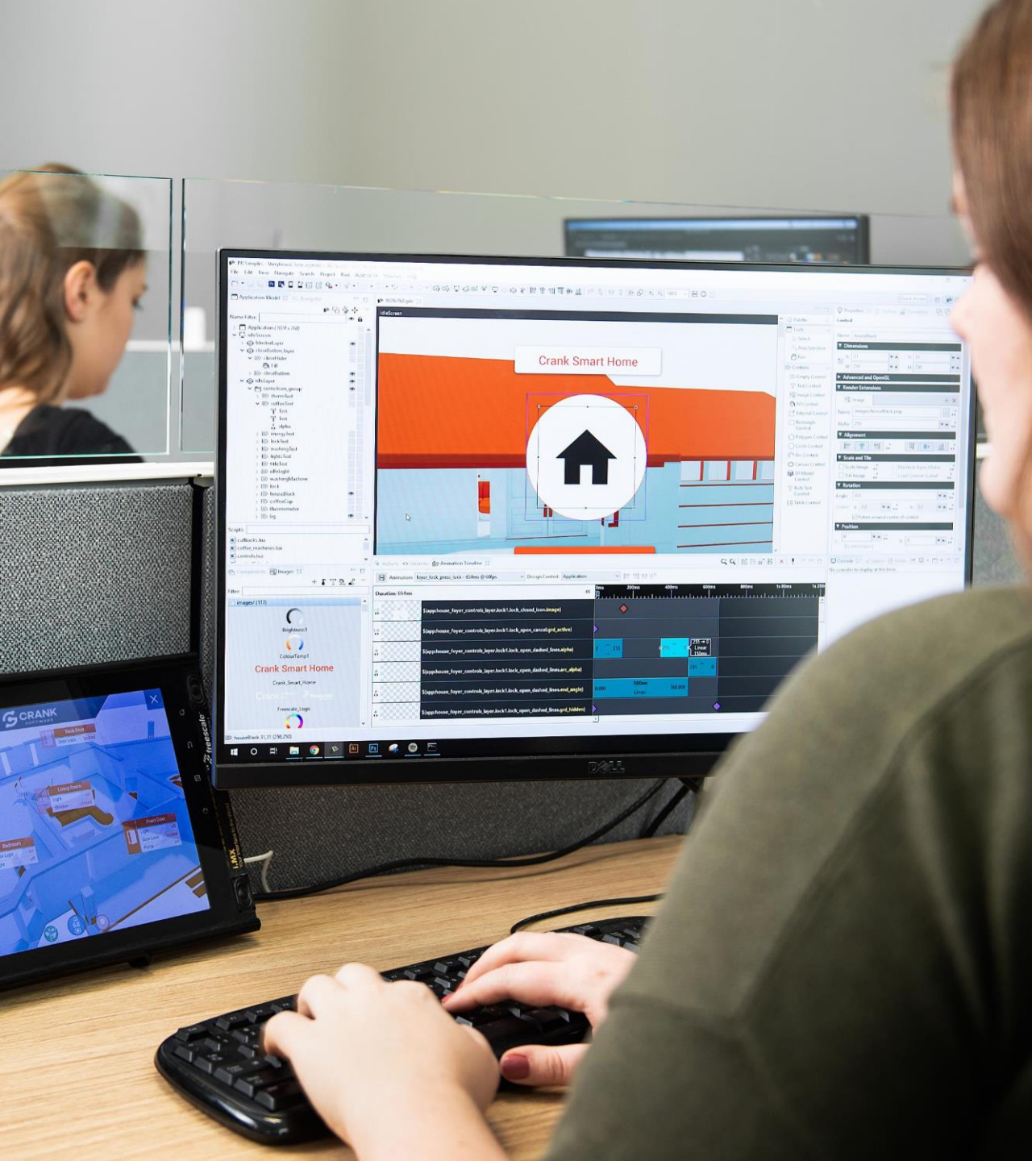

SOLUTION

Storyboard software

- Built upon two decades of UI design and development experience
- Decouples front-end UI from back-end logic
- Well-defined data model and events API connecting them together
- Provides hardware agnostic framework – working across MCUs and MPUs
- Enables collaborative (parallel) workflow for designers and developers

CRANK SOFTWARE

MEDICAL

INDUSTRIAL

AUTOMOTIVE

SMARTHOME

ABOUT CRANK SOFTWARE

Built Upon
20+ YEARS
GUI Design & Development Experience

Global Partner Network

Extensive
Partnership
Ecosystem

Privately Held
Canadian
Company

Awarded
Company of the Year

Best Ottawa Business Awards
COMPANY OF THE YEAR
2019-2020

Most
Innovative Software
2020

embeddedaward

Industry Recognized
Award-winnng UIs

reddot design award

How Storyboard helps

ACCELERATE DEVELOPMENT

EMBRACE ITERATIONS

UI FLEXIBILITY

How Storyboard helps

ACCELERATE DEVELOPMENT

- Import from Design tools
- Integrated animation tool
- Prototype simulate without hardware

EMBRACE ITERATIONS

- Make changes without impacting progress
- Re-import modified Photoshop design files
- Compare, select, & merge changes

UI FLEXIBILITY

- Scalable from low-power MCUs to powerful MPUs
- Portable to a switched-out hardware and OS
- Reuse UI development across different product lines

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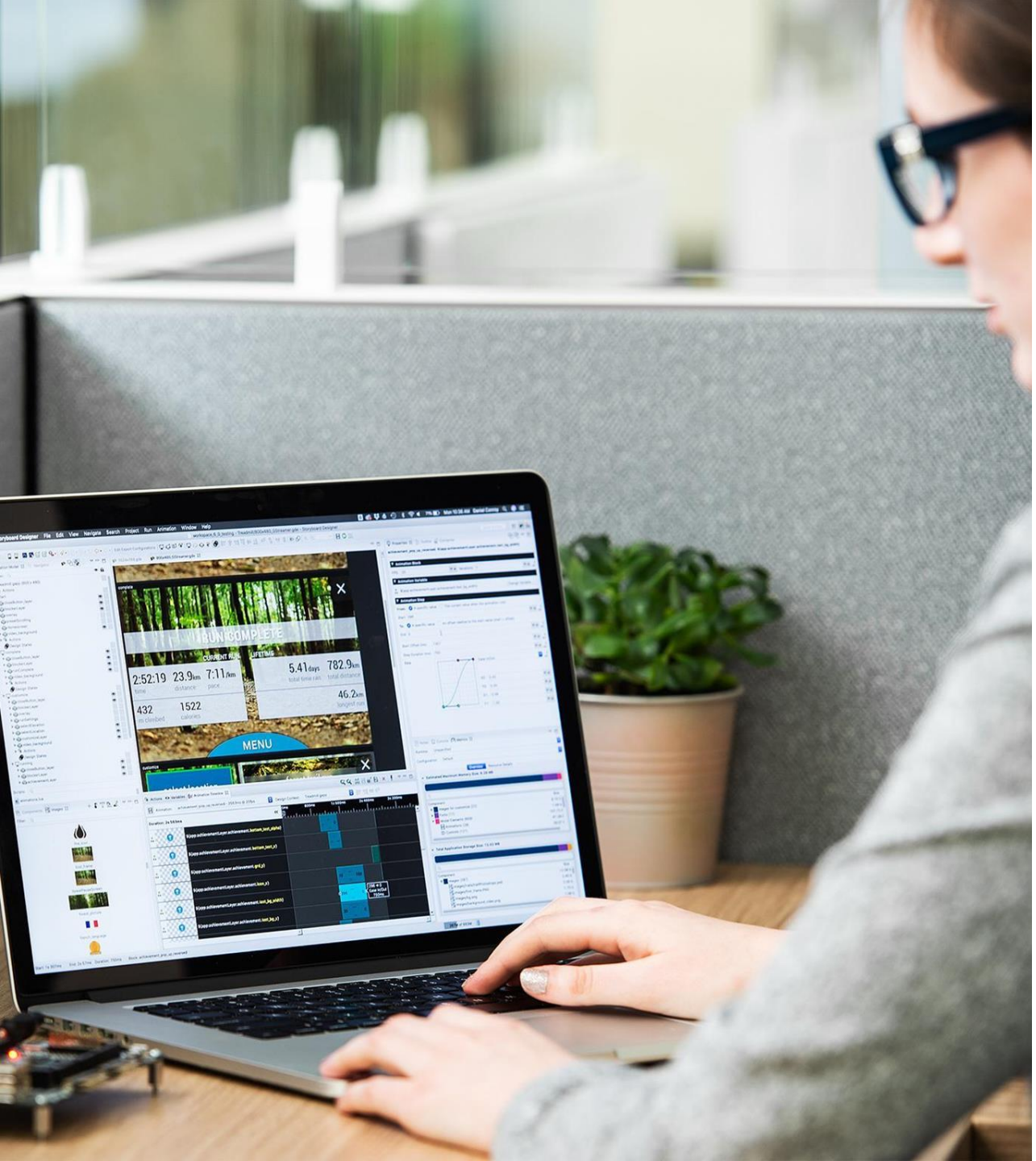

What makes Storyboard different

- Not a code generation framework
- Low barrier to entry for software development
- Front-end UI design is decoupled from the back-end logic
- Embraces design change and eases iterative development
- Rendering technologies for acceleration
- Built to leverage board features that drive performance

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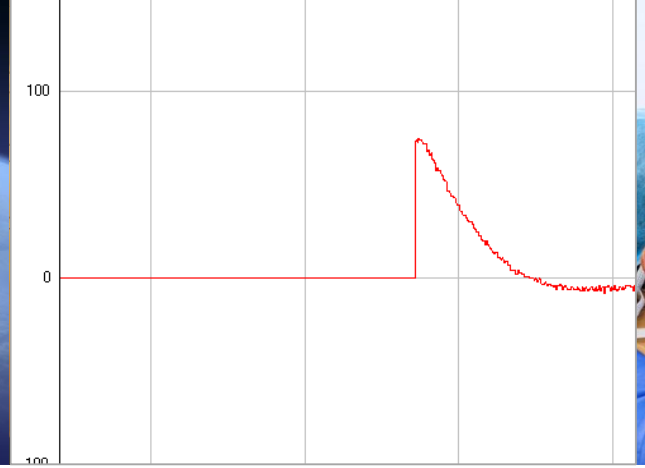
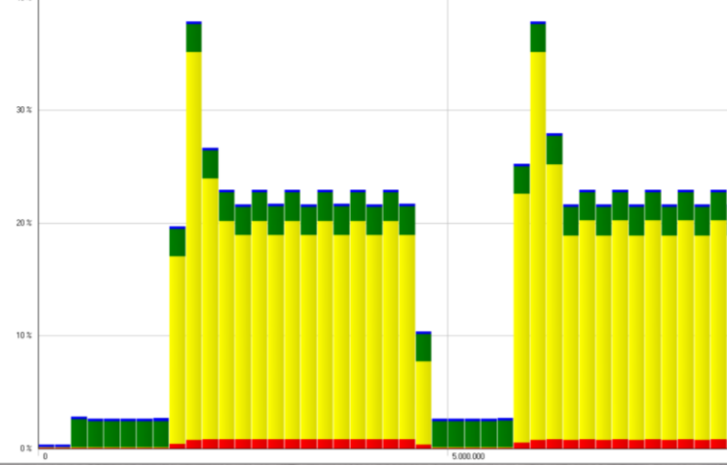
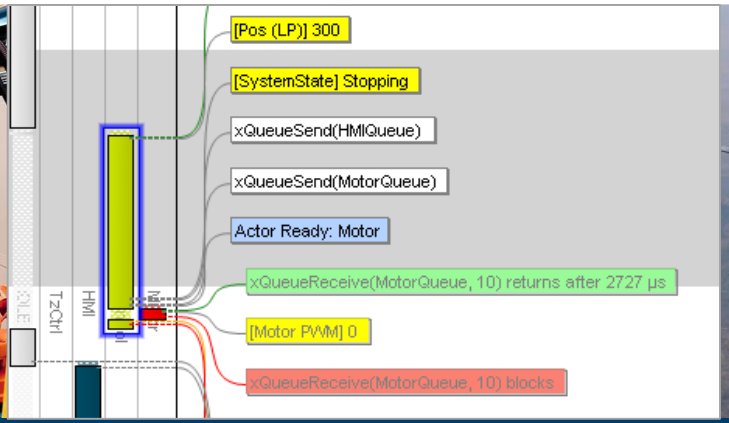
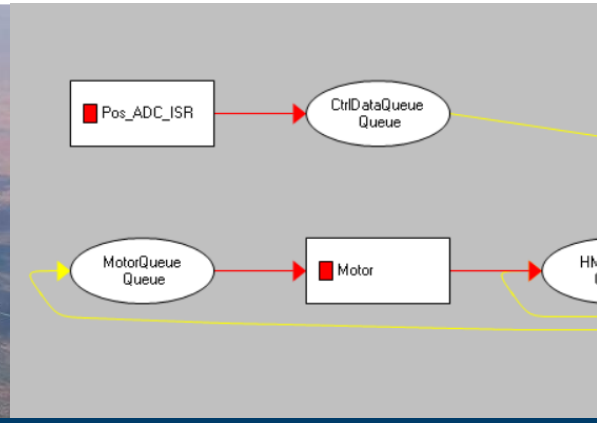




Visual Trace Diagnostics

Tracealyzer In the Lab, DevAlert In the Field





Dr. Johan Kraft
CEO, CTO, founder, Percepio AB

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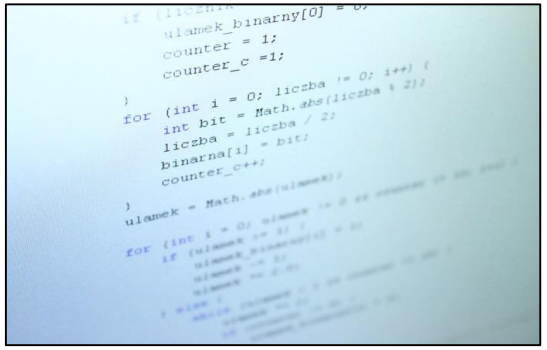
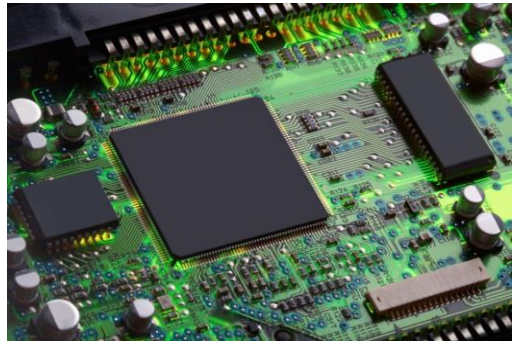
Source code is not the full picture





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The runtime behavior is what ultimately counts

Depends on dynamic effects, e.g. variations in timing and interference between tasks

Not visible in the source code! Runtime monitoring is needed…

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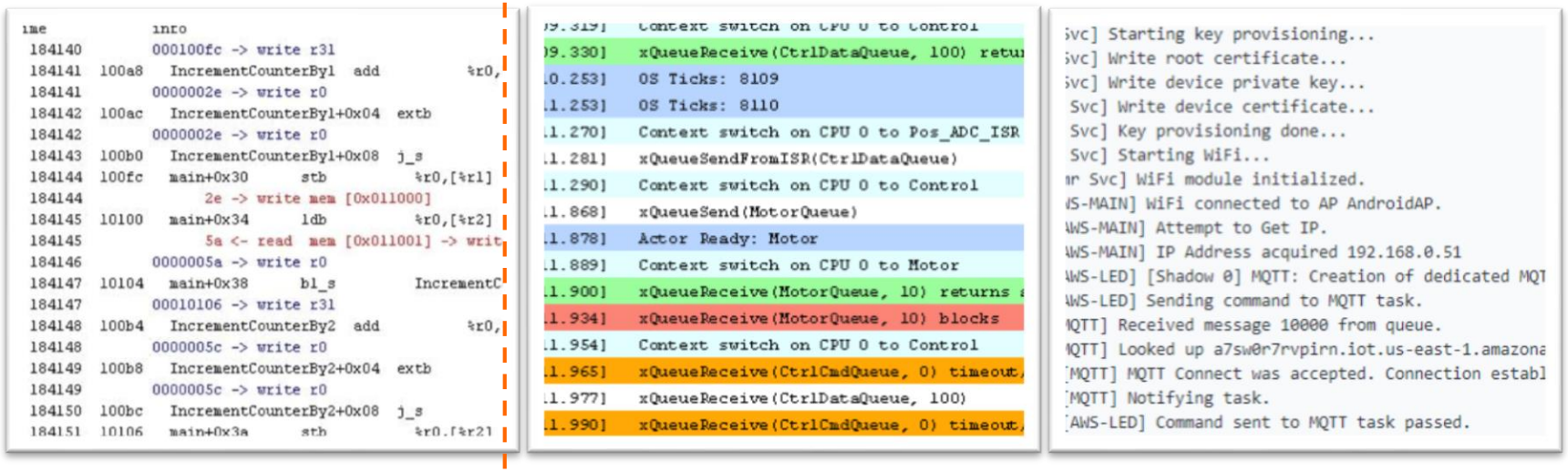
Runtime Monitoring



	Instruction Trace	**Software Event Trace**	**Application Logging**
Producer	Processor core	Software	Software
Abstraction Level	Low	Medium	High
Overhead	None	Minor	Depends on method
Special HW needed	Yes	No	No

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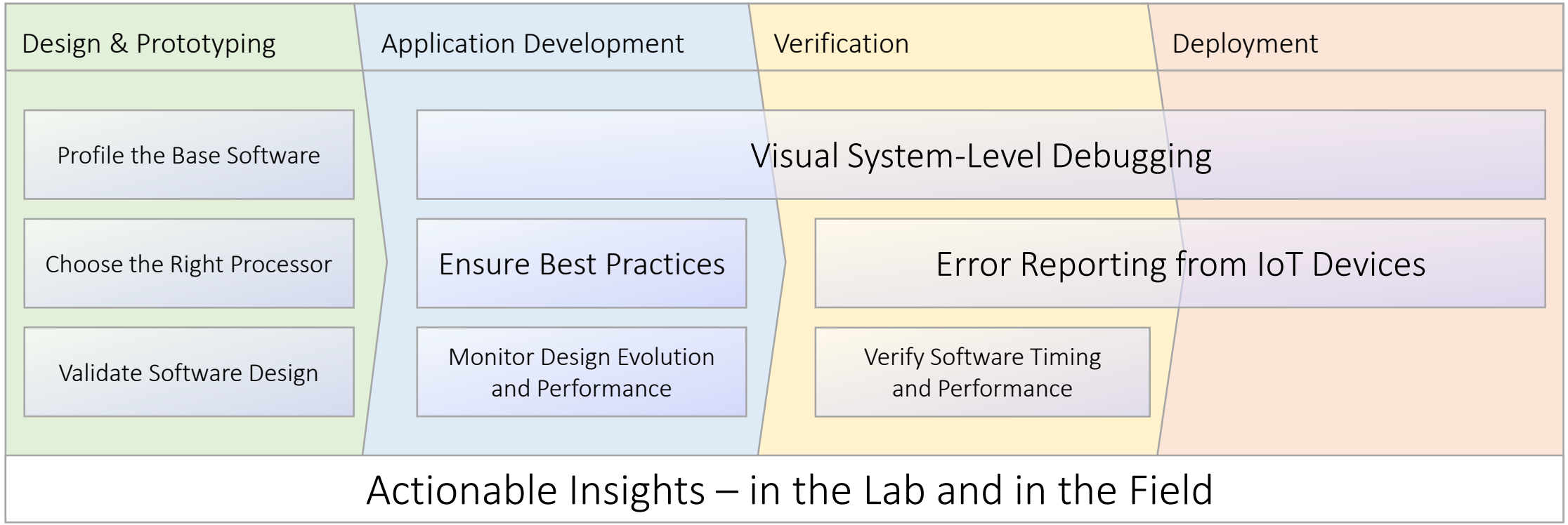
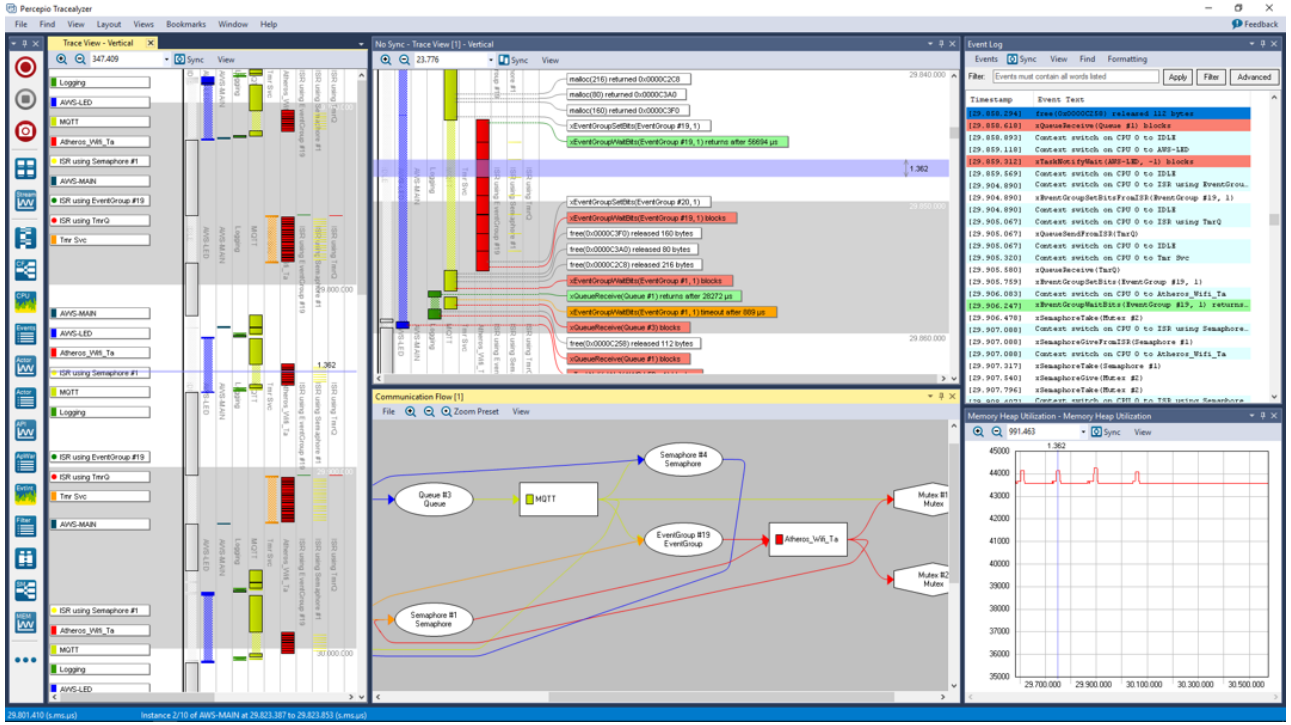
Visual Trace Diagnostics (VTD)

Runtime Monitoring -> OS-Aware Data Model -> Bespoke Visualization enables…

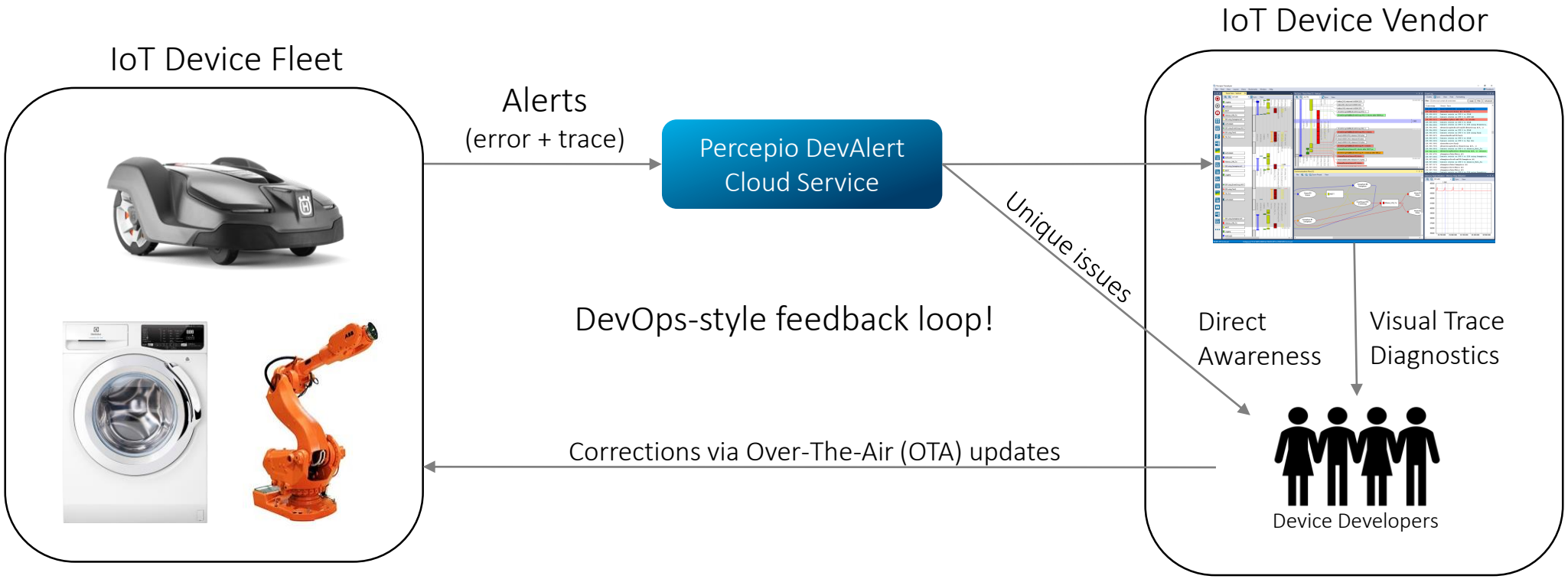


Percepio Tracealyzer® – VTD in the Lab

- Developed since 2004, 4th generation
- 30+ views at multiple abstraction levels
  - Spot issues in overviews
  - Detailed views reveals the cause
- Live streaming or snapshots
- Supported operating systems
  - FreeRTOS, SafeRTOS, µC/OS-III
  - Arm Keil RTX5
  - ThreadX /Azure RTOS
  - Linux
  - VxWorks
  - IntervalZero RTX64
  - …



Percepio DevAlert™ – VTD in the Field



Connected devices allows for automatic error reporting

- Direct awareness allows for quick reaction (OTA update) before most users even notice
- Tracealyzer makes it easier to analyze and fix the problem
- Feedback to testing, to avoid that similar bugs are missed in the future

Asserts
Hard faults
Stack overflow
Out of memory
Proactive warnings

Storyboard Demo

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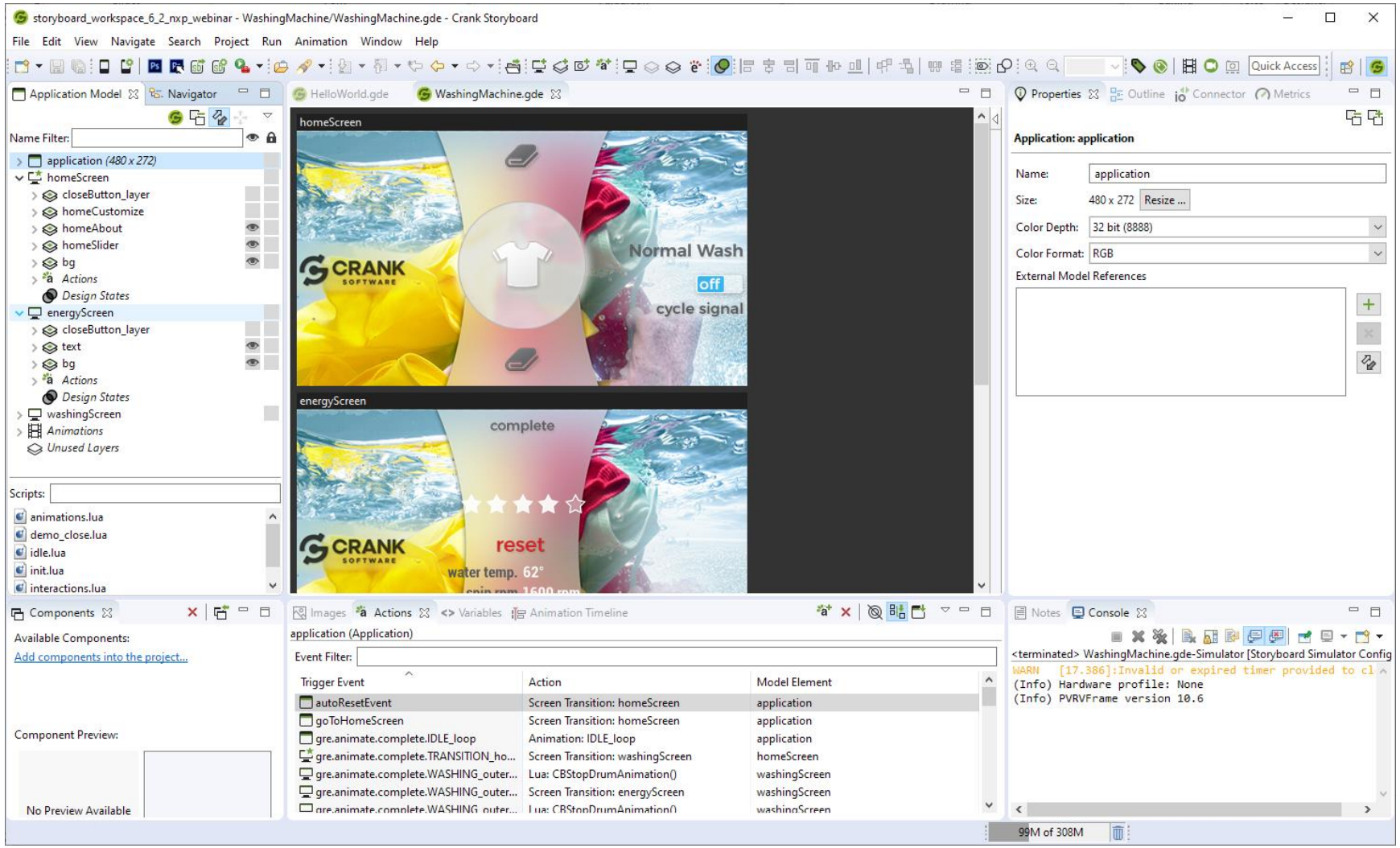
Demo Application



Overview

- White Goods demo – Washing Machine
- Resolution 480x272 RGB565
- Capacitive Touchscreen
- FreeRTOS
- MCUXpresso IDE
- Smooth animations with PXP hardware acceleration
- Storyboard Virtual Flash Filesystem
- C/C++ Resource Header Export

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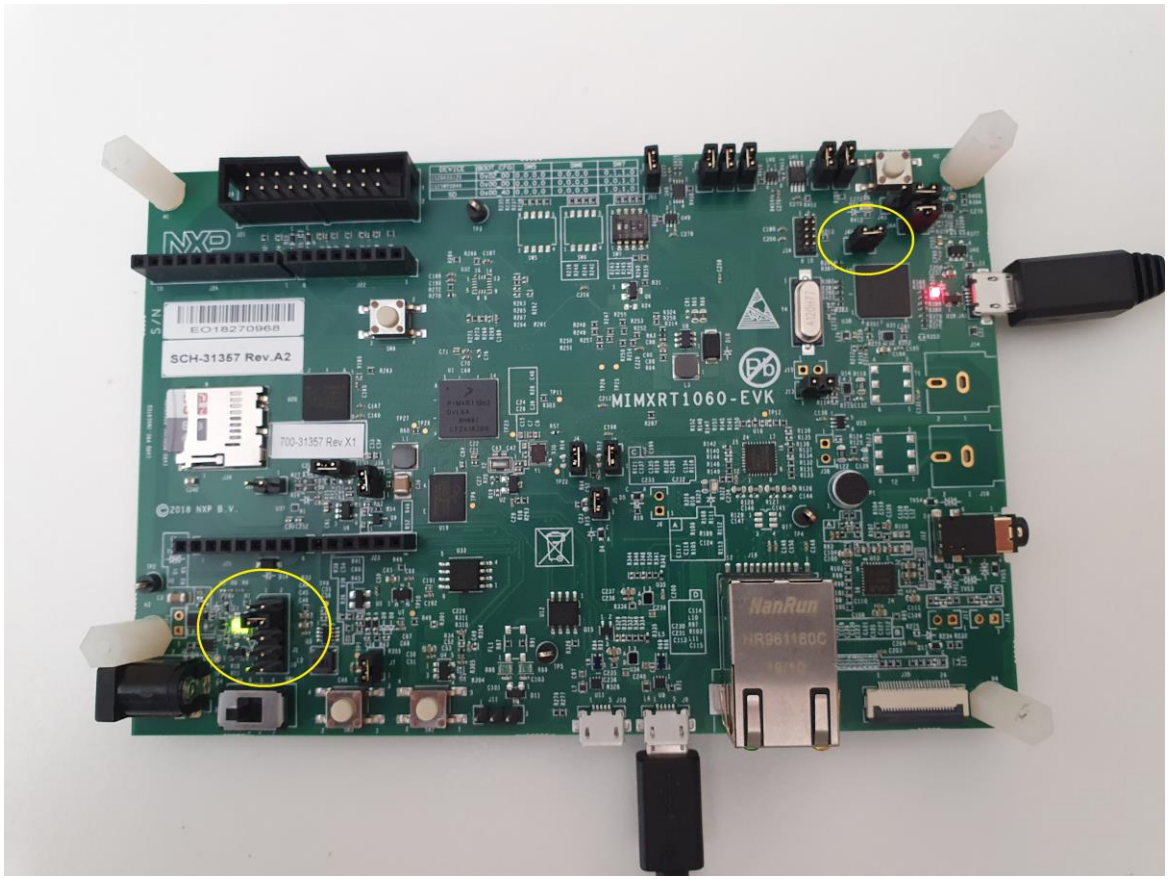
Storyboard on the NXP i.MXRT1060EVK



- Checkout the LPC-Link2 Configuration : Add high speed flashing and advanced debugging with real-time SWO trace

https://support.cranksoftware.com/hc/en-us/articles/360042093231-RT1060-Enabling-faster-flashing

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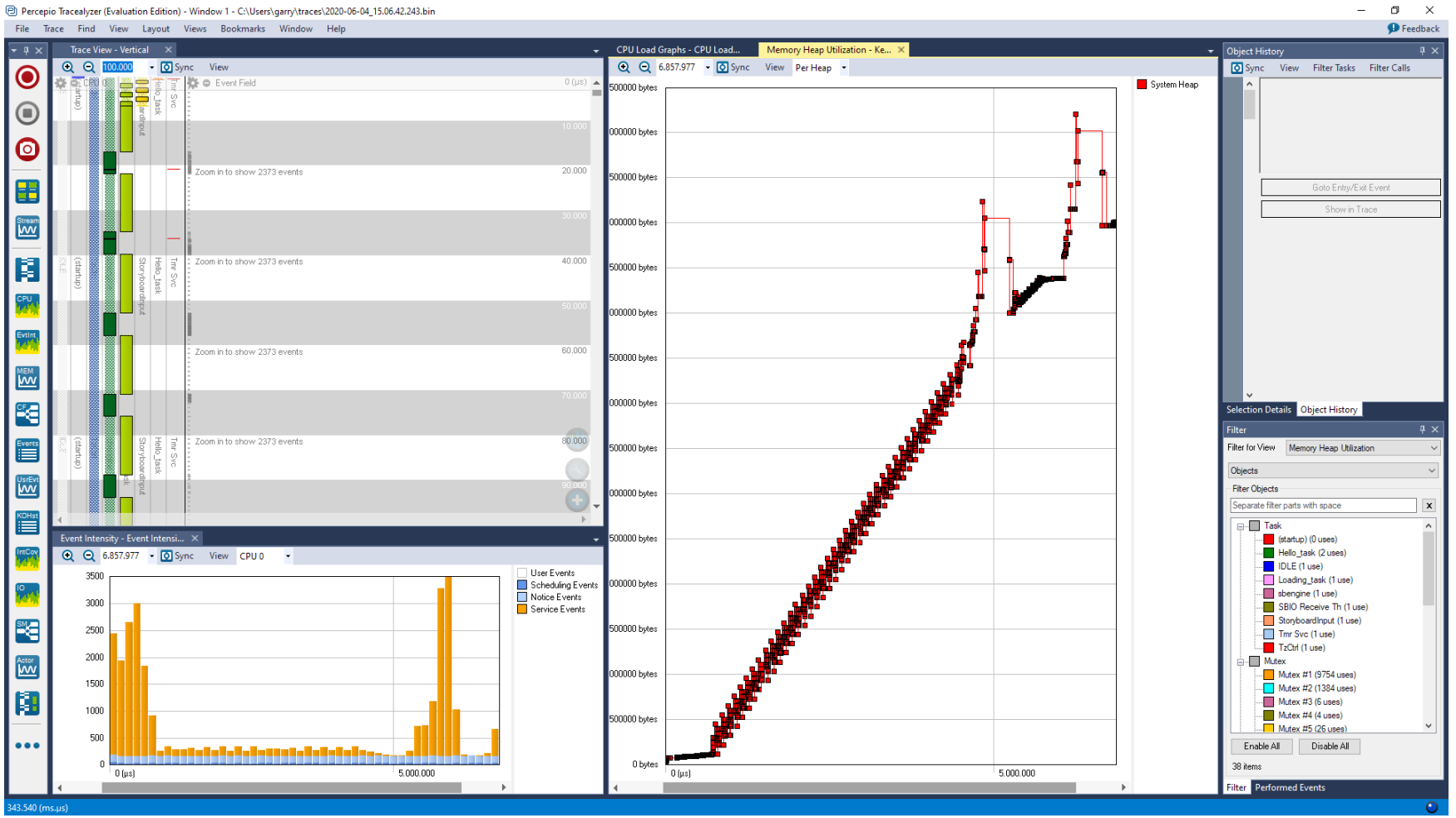
Taking debug analysis to the next level with Tracealyzer 4

- **Optimize boot and start-up**
- **Analyze UI animation and performance**
- **Fine tuning touch responsiveness**



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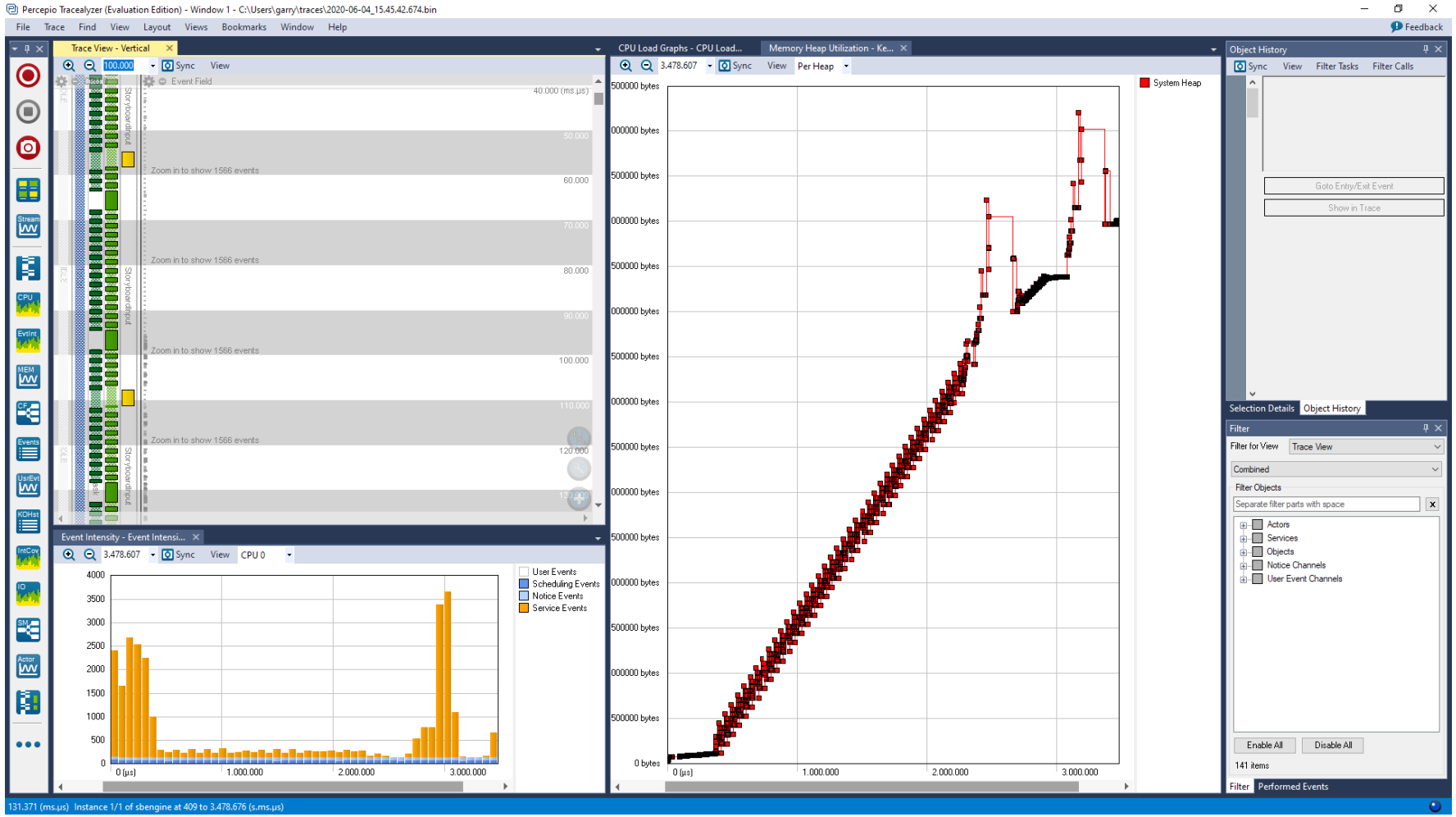
Implementing improvements highlighted by Tracealyzer 4

Startup much faster

Smooth animations and flow

Smooth scrolling and fast touch response



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KEY TAKEAWAYS & NEXT STEPS

Order an i.MX RT1060 EVK: www.nxp.com/imxrt1060

Download Storyboard (free trial version): www.cranksoftware.com/**free-trial**

Download Tracealyzer (free eval version): https://percepio.com

Thanks for joining

Accelerating Tomorrow's Embedded UI Experiences

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