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.
95% ROI expectations exceeded

70% find Qt easy to use

80%+ are more productive with Qt
Companies use Qt to build powerful software and graphical user interface for connected devices.
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

<table>
<thead>
<tr>
<th>SoC</th>
<th>GPU</th>
<th>Vendor / Part Name</th>
<th>Operating System</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.MX RT1170</td>
<td>VeriSilicon GC355</td>
<td>NXP</td>
<td>FreeRTOS</td>
</tr>
<tr>
<td>i.MX 6Q / 6D</td>
<td>Vivante GC2000</td>
<td>Toradex Apalis iMX6</td>
<td>Embedded Linux</td>
</tr>
<tr>
<td>i.MX 7Solo / Dual Core</td>
<td>Integrated</td>
<td>Toradex Colibri iMX7</td>
<td>Embedded Linux</td>
</tr>
<tr>
<td>i.MX 8QuadMax</td>
<td>Vivante GC7000</td>
<td>Toradex Apalis iMX8</td>
<td>QNX</td>
</tr>
</tbody>
</table>
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
SUPPORTS DYNAMIC, FULLY SCALABLE FONTS. NO NEED TO SACRIFICE TEXT QUALITY.

Beautiful Text – font engine optimized for low end hardware
WOW effect - Rich UI controls for a smartphone like UX
Speed Up - Tools for Designers and Developers

**Design**
- Visual Designer
- Interaction Designer

**Develop**
- Developer

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

- Design and implement pixel-perfect UIs immediately usable for developers

- Validate designs
  - Prototype

**Notes:**
- Driving Down Automotive Costs for Richer HMIs
- 20/04/2021
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

ECU

CAN bus

HVAC user interface
building the solution

NXP MIMXRT1170 + Qt for MCUs
Drawing the architecture
The ui
Alpha maps
Alpha maps

```json
ColorizedImage {
  source: "qrc:/assets/leaf.png"
  color: temperature > 20 ? red : blue

  Behavior on color {
    ColorAnimation { duration: 300 }
  }
}
```
transformations
Transformations

```javascript
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 \texttt{cortex-m4}
Wrapping the binary
Importance of MCMGR & RPMSG
Importance of MCMGR & RP MSG

```c
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.
     */

    /*
     * 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

Data sent through CAN → FlexCAN driver → Receiving CAN frames → RPMSG library → Inter Core Communication → RPMSG library → Receiving CAN frames → Qt Event Queue → Rendering UI
Thank you
Offer for webinar attendees –
100% off $350 Early bird pricing, $400 regular

› 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
- https://resources.qt.io/qt-mcus
- https://doc.qt.io/QtForMCUs/index.htm
- https://www.qt.io/microcontrollers-nxp
Questions
Free trial qt.io/download

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