Qt for MCUs

Code Once. Deploy Everywhere.

www.qt.io
What is Qt?

- C++ based cross-platform application framework
- Provides a suite of libraries (over 70) and design and developer tools - https://www.qt.io/features
- Popular as GUI framework for embedded Linux systems
  - Available for various popular MPUs from NXP, Renesas, ST, Nvidia, Intel
- Now also available for MCUs
The Qt Group offices are located in Finland, China, Germany, Japan, South Korea, Norway, the USA, France and India. The HQ is in Espoo, Finland.
95% ROI expectations exceeded
70% find Qt easy to use
80%+ are more productive with Qt
Code once, deploy everywhere with Qt
Unified developer experience across all production line

BENEFITS
- Faster time to market
- Same code, less effort
- Cost reduction in development & maintenance
- Unified developer experience
- Unified user experience

Qt
C++ based cross-platform application framework

DEPLOY
Desktop  Mobile  MCU  MPU  WEB

One framework for all deployment
Cross product-line development

Retain a unified look & feel for your pixel-perfect UIs across an entire range of products, using the same core technology, and without increasing TTM or TCO.

- Low-end MCU – example resolution: 320x240
  - Qt for MCUs
  - Smartphone-like UX
  - Basic animations
  - Bare metal or freeRTOS

- Mid-range
  - Higher resolution
  - 2.5D Graphics
  - Full Qt Framework
  - Advanced animations
  - Linux or RTOS

- High-end MPU or low-end MPU – example resolution: 840x480
  - Highest resolution
  - Dual screen support
  - 2D/3D Graphics
  - Full Qt Framework
  - Linux or RTOS
  - Video

- High-end MPU – example resolution: 1920x720
  - Complex/simple apps
  - Win, Mac, Linux, Android, iOS
  - WEBASM
Remote UIs

Qt Quick WebGL
- Run the UI in a local or remote display
  - No re-compilation needed, just a plugin change
- Stream the Qt Quick UI over the network
- Show the UI in WebGL-enabled browser in a remote device

Qt for WebAssembly
- Build your applications for WebAssembly
- Run in the browser
- Zero installation
- Easy to distribute to any device with a browser
Collaborative product development

**OUR VISION**

The best innovations are crafted through team collaboration and rapid iterations.

The designs must be testable on real hardware in all phases in order to validate the feasibility of the designs.

**Design**
- Interaction Designers
  - UI flow & navigation
  - Wireframes
- Sensorial Designers
  - Visual assets
  - Motion designs
  - Audio assets

**Develop**
- Client Developers
  - Custom UI components
  - Data connections
  - Back-end logic
- Rapid iterations
- Visuals review
- Performance / UX testing

**Deploy**
- Cross Platform Maintenance
  - Desktop / Embedded / Mobile
  - MCU up to High Spec HW

**Maintain**
- Testers & Management
  - Rapid iterations
  - Visuals review
  - Performance / UX testing

In minutes
Qt Toolchain
From Design to Deploy

Qt Design Studio
Qt Template
Qt Creator
Live Preview
Deploy

UI Asset
QML

Sketch

Desktop
Mobile
MCU
WEB

One framework for all deployment
Qt for Device Creation is a commercial offering that provides the Qt development framework for multiple embedded platforms: embedded Linux, QNX, INTEGRITY, and VxWorks.

Qt for MCUs is a software toolkit to create high performance graphical user interfaces with low memory consumption on MCUs running either Bare Metal or RTOS such as FreeRTOS.
Why use Qt across MCU and MPU?

- **Re-use**: Re-use the same Qt tools and workflow to develop for MCUs and MPUs.
- **Save Costs**: Re-use same engineers and same technology across family of devices.
- **Low Memory Footprint**: Best user experience, across any hardware family.
- **Upgrade**: Upgrade to a modern, stable cross-platform graphical toolkit.
- **Code Re-use**: UI can be integrated with existing C/C++ backend.
- **Scalable UI**: Flexible layout mechanism allows the UI to scale to screen sizes and aspect ratios, even to Linux, Android, etc.
Qt for MCUs on Ambiq Apollo4

- **Low Power device on Qt for MCUs 2.0**: Showcases wearable application, 2.5D GPU usage

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<table>
<thead>
<tr>
<th>Key Metrics</th>
<th>Ambiq Apollo4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Display</strong></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>390x390px</td>
</tr>
<tr>
<td>Pixel Depth</td>
<td>16-bit color</td>
</tr>
<tr>
<td><strong>RAM Usage</strong></td>
<td></td>
</tr>
<tr>
<td>Qt runtime</td>
<td>163 kB</td>
</tr>
<tr>
<td>Framebuffer</td>
<td>304 kB</td>
</tr>
<tr>
<td>(single buffering)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>467 kB</td>
</tr>
<tr>
<td><strong>Flash Usage</strong></td>
<td></td>
</tr>
<tr>
<td>Application</td>
<td>420 kB</td>
</tr>
<tr>
<td>Assets</td>
<td>389 kB</td>
</tr>
<tr>
<td>Total</td>
<td>809 kB</td>
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<tr>
<td><strong>Frame rate</strong></td>
<td>Average</td>
</tr>
<tr>
<td></td>
<td>40</td>
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</tbody>
</table>

*Qt for MCUs on Apollo4 EVB Rev.3 with Display Shield*

- Screen Resolution: 454x454
- Color: 16 bit (RGB565)
- Application Code Size: 356KB
- Frame Buffer: 455KB
- RAM: 86KB
- RAM with Assets: 372KB
UX
Provide a smartphone-like user experience with Qt Quick Control

Reuse
Reuse source code across ARM architectures

Speed Up
Fast, effective development with QML and Qt Tools

Community
Benefit from a large developer community
Qt Quick Control Provides Mobile-like User Experience
Build and deploy complete interface with rich library of UI controls
Graphic Reuse on Powerful Platforms
Code Once, Deploy Everywhere

Reuse the UI frontend
Extend backend logic with Qt C++ APIs

Reuse source code across ARM architectures

GUI Application
Qt UI Frontend
C++ Backend

Graphics Runtime
utilizing on-chip 2D graphics accelerator

Qt Framework
utilizing OpenGL-ES/Vulkan

ARM Cortex-M

ARM Cortex-A
Boost your process by QML and Qt Tools
Easy, intuitive QML for UI frontend, C++ logic backend and straightforward tools simplify development process.

**Boost by QML**

QML is declarative language, objective code, compiled to a binary machine code

QML allows easy development process – JSON-like syntax

**Boost by Tool**

Designers produce QML based "UI Specification" directly usable by developers

Client Designers
- UI flow & navigation
- Wireframes
- Visual assets

Client Developers
- Custom UI components
- Data bindings
- Application logic
Reuse your Qt Skilled Engineers
Use your Qt engineers again along with the developers in open source community.

“What was amazing was that there was already a body of work done by the Qt Community. Had that open source community not been there we would have taken a much longer time to deliver.”

Thanks to its roots in the Open-Source community, Qt constantly evolves through contributions from helpful developers around the world.

Benefit from a large developer community

Sufficient number of available engineers

>1M Developers using Qt

Well-cultivated open source community
Get Qt

www.qt.io/download

Buy Qt
Get the full Qt experience with a licensing plan designed to support your business goals plus access to the official Qt Support Helpdesk and a close strategic relationship with The Qt Company.

Try Qt
New to Qt and want to try before you buy? Download a free trial of the Qt framework, tools for desktop, and embedded development on MCUs and MPUs, plus other enterprise add-ons.

What’s in Qt?

http://www.qt.io/qt-for-mcus
## Qt Service Catalog

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</thead>
<tbody>
<tr>
<td>Adapt Qt Platform code to customer’s setup/custom HW platform</td>
</tr>
<tr>
<td>Create Demo / PoC specific to customer’s use case</td>
</tr>
<tr>
<td>Bug fixing / LTS on custom HW platform</td>
</tr>
<tr>
<td>Architecture advisory services</td>
</tr>
<tr>
<td>• covering Graphics Monitoring for Functional Safety</td>
</tr>
<tr>
<td>• covering optimal use of memory / CPU</td>
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<tr>
<td>Integration with external peripherals</td>
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<tr>
<td>Conduct Trainings / Workshops</td>
</tr>
<tr>
<td>Provide Turn-Key Solutions</td>
</tr>
<tr>
<td>Port to a niche RTOS</td>
</tr>
</tbody>
</table>
Thank you

The future is written with Qt

www.qt.io