Qt at NA-MIC Summer 2010

- Adam Weinrich – Nokia QtDf
- Jeff LeBlanc - ICS

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Qt Development Frameworks:

Qt Development Frameworks founded in 1994
- Norwegian Trolltech acquired by Finish Nokia in 2008
- More than 250 employees in eight locations worldwide
- Trusted by over 6,000 customers worldwide

Qt: a cross-platform application and UI development framework
- For desktop, embedded and mobile development
- Intuitive C++ class libraries w/Javascript
- Integrated development tools

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Qt licenses support all business models

	Commercial	LGPL v. 2.1	GPL v. 3
License Cost	License fee charged	No cost	No cost
Must provide source code for changes to Qt	No, modifications can be closed	Source code must be provided	Source code must be provided
Can create proprietary application	Yes—no obligation to disclose source code	Yes, if dynamically linked to Qt library	No, application is subject to the GPL
Support	Yes, with valid maintenance agreement	Not included, available separately	Not included, available separately
Charge for Runtimes	Yes—in some instances*	No, distribution is royalty free	No, distribution is royalty free

*Runtime charges apply when the Qt-based application is part of a joint hardware and software distribution and the main UI of the device is controlled by Qt.

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Qt is used everywhere

From embedded devices to desktop applications

By companies from many industries

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Qt Empowers Medical Software

➢ **Medical Business**
➢ **Medical Devices**
➢ **Medical Imaging**

MeVis

"Qt improved our productivity but it didn't force us to reinvent our development process. Now we have a cross-platform application with no more effort than we needed for a single platform. Debugging is easier and the quality of our code is better. We are very happy with Qt."

Florian Link, Director of Software Engineering, MeVis

BRAIN INNOVATION

"It's clear for me that one of the best decisions in my programming career was to move to Qt after almost 10 years of experience with Microsoft APIs. Switching to Qt means that I have a clearer API now while targeting all major computer platforms. That Qt makes this feasible for small companies at reasonable costs makes me indeed happy."

Ranier Boebel, General Manager, Brain Innovation

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Why Qt?

- Write code once to target multiple platforms
- Produce compact, high-performance applications
- Focus on innovation, not infrastructure coding
- Choose the license - Commercial, LGPL or GPL - that fits you
- Count on professional services, support and training
- Take part in an active Qt Open Source ecosystem

15 years of customer success and community growth

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Supported Platforms – Tier 1

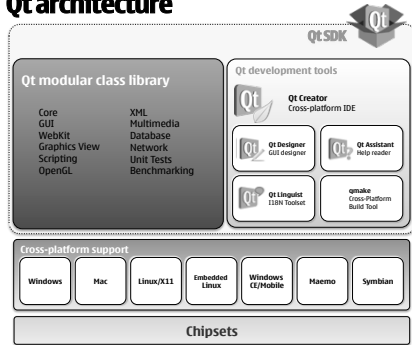| Platform	Compilers
Linux (32 and 64-bit)	gcc 4.2
Microsoft Windows XP	gcc 4.4 (MinGW) (32-bit), 2005 (32 and 64-bit)
Microsoft Windows Vista	MSVC 2005, 2008
Microsoft Windows Vista 64bit	MSVC 2008
Windows 7	MSVC 2008
Apple Mac OS X 10.6 "Snow Leopard"	As provided by Apple
Apple Mac OS X 10.5 "Leopard" x86_64 (Carbon, Cocoa 32 and 64bit)	As provided by Apple
Embedded Linux QWS (ARM)	gcc (Codesourcery version)
Windows CE 5.0 (ARMv4i, x86, MIPS)	MSVC 2005 WinCE? 5.0 Standard (x86, pocket, smart, mipsii)
Symbian (Symbian/S60 3.1, 3.2 and 5.0)	RVCT 2.2 [build 686 or later], WINSCW 3.2.5 [build 482 or later], GCCE (for applications)

Supported Platforms – Tier 2

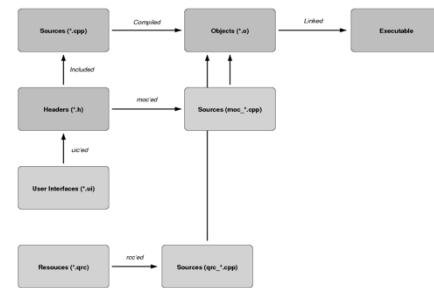| Platform	Compilers
Windows 7	VC++2010
Apple Mac OS X 10.4 "Tiger"	As provided by Apple
HPUXI 11.23	aCC 6.10
Solaris 10 UltraSparc?	Sun Studio 12
AIX 6	Power5 xlC 7
Microsoft Windows XP	Intel Compiler
Linux	Intel Compiler
Embedded Linux QWS (Mips, PowerPC?)	gcc (Codesourcery version)
Embedded Linux X11 (ARM)	gcc (Scratchbox)
Windows CE 6.0 (ARMv4i, x86, MIPS)	MSVC 2008 WinCE? 6.0 Professional
Maemo 5 (Linux, ARM, X11)	gcc (Scratchbox)

Qt architecture

Qt Meta Object System extends C++

Qt Core Classes

• Qt core modules and utility classes
  • Qt kernel: Object model, event handling, application infrastructure
  • Basic input / output: File, IO, Streams
  • Threading
    • Signals and slots support, atomic reference counting, per-thread event loops, concurrency support
  • Container classes
    • For storing, sorting and retrieving groups of data
    • Robust, easy to use, low memory overhead, highly optimized
    • Alternative to STL (but Qt and STL work well together)
  • Fast XML stream reader and writer
  • IPC classes
    • shared memory, local domain sockets, memory mapped files
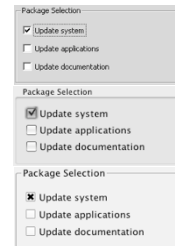 • Supporting tools: qmake, rcc, configure, moc

Qt GUI Classes

• Provides rich set of GUI components and supporting functionality
  • User interface components
    • Simple to complex widgets and controls, dialogs
  • Model-View-Controller (MVC) Itemviews
  • Styles – ensuring native or custom look and feel on target platform(s)
  • Font-aware layout system
  • Accessibility classes
  • Canvas component with Widget support

Qt OpenGL Classes

- Allows you to build your user interface in Qt, display and manipulate 3D model in OpenGL®
- Integrates OpenGL canvas with Qt
- Provides frame buffer and pixel buffer abstraction
- Supports accelerating 2D painting with OpenGL
- Mix 2D painting and 3D scenes
- OpenGL graphics system draws everything using OpenGL

Development Tools: Overview

- Qt Creator: Cross-platform IDE
- Qt Designer: GUI layout and forms builder
- Qt Linguist: Internationalization toolset
- Qt Assistant: Customizable documentation reader
- qmake: Cross-platform build tool
- Integration with Visual Studio® and Eclipse® IDEs

Qt Creator: Cross Platform IDE

- Lightweight cross-platform IDE for Qt
  - An advanced C++ code editor
  - Integrated, context sensitive help system
  - Integrated visual debugger (based on gdb)
  - Integrated source code management
  - Project and build management tools
  - Qt developer tools integrated
- Benefits
  - New developers get up and running faster
  - Boosts developer productivity
  - Tailored to the needs of Qt developers

Qt Designer

- Qt Designer is a powerful, drag-and-drop GUI layout and forms builder
- Features
  - Supports forms and dialog creation with instant preview
  - Integrates with Qt layout system
  - Extensive collection of standard widgets
  - Support for custom widgets and dialogs
  - Seamless integration with Microsoft® Visual Studio .NET and Eclipse
  - Allows preview with embedded profiles
- Benefits
  - Greatly speeds the interface design process
  - Enables native look and feel across all supported platforms
  - Developers work within the environment of their choice, leveraging existing skills

Qt Linguist

- Qt Linguist is a set of tools that smooth the internationalization workflow
- Features
  - Collects all UI text and presents it to a human translator in a simple window
  - Support for all languages, including CJK
  - Simultaneous support for multiple languages and writing systems from within a single application binary
  - Load and edit multiple translations at once
  - Support for .po and .xliff
- Benefits
  - Greatly speeds the translation/localization process
  - Works with Qt's language-aware layout engine for clean, consistent interface no matter the language
  - Easily target international markets

Qt Assistant

- Qt Assistant is a fully customizable, redistributable help file/documentation browser
- Features
  - Simple, web-browser-like navigation, bookmarking and linking of documentation files
  - Support for rich text and HTML
  - Full text and keyword lookup
  - Can be customized and shipped with Qt applications
- Benefits
  - No longer have to build a help system from scratch
  - Leverage existing HTML skills
  - Deliver documentation in an easily searchable and navigable format to your end users

qmake

- A cross-platform application build tool
- Features
  - Reads project source, generates dependency tree, generates platform specific project and makefiles
  - Integrates with Visual Studio and Xcode
- Benefits
  - Takes the pain out of cross-platform builds
  - Eliminates the need for makefile generation

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Evolution and History

Minor version	Feature Overview
4.0 – A new beginning	New API, improve backend implementation to better adapt to platform change
4.1 – Graphics	SVG, Transparency, OpenGL, PDF
4.2 – Desktop Experience	GraphicsView, Stylesheets, D-Bus, Improved desktop integration, embedded painting performance
4.3 – Infrastructure	QtScript, Desktop integration, Direct3D, Networking, OpenGL ES
4.4 – Advanced UI	WebKit, Multimedia/Phonon, XML, Widgets in Graphicsview, Concurrency,IPC, Windows CE
4.5 – Qt Everywhere	Mac Cocoa, S60, NPAPI, XSLT, Script Debugging
4.6 – User eXperience	Animation, State Machine, Multi-touch & Gestures, Performance!!!
4.7 – Apps	Qt Quick, Mobility API.

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Qt 4.5

WebKit improvements
- QtWebKit can load any NPAPI-compatible plugin
- HTML5 multimedia tag support through Phonon

Qt Everywhere
- Qt for Mac OS X ported to Cocoa Framework
- Applications can now make use of all 64-bit benefits

Performance
- Major improvements in overall performance
- Special focus on new graphics system
- Benchmarking library added to Qt

Tools
- Qt Creator 1.0
- Usability improvements in Linguist and Designer
- Qt SDK

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Qt 4.6

User experience
- New animation framework
- Gestures & Multitouch support
- Improved Graphical Capabilities

Other
- XML Schema Validation
- WebKit DOM access API
- JavaScript Engine Unification
- Freedesktop.org Icon Theming

Performance
- OpenVG graphics engine
- Optimizations to resource use
- Architecture-specific improvements to ARM devices

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Qt Everywhere
- Qt ported to Symbian
- Qt for Windows 7
- Qt for Mac OS X 10.6

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Qt 4.7

Qt Quick
- Complete UI creation Kit for developers and designers
- Extremely fast learning curve with support in Qt Creator and the Qt Meta-Object Language (QML)
- Ideal for iterative development of expressive, animated, modern UIs with high performance

Performance
- Continue strong focus on performance improvements
- Dedicated performance team
- New benchmark based development culture that guarantees that Qt can only get faster

New APIs
- Bearer management with automatic HTTP level roaming
- Numerous small improvements e.g. in the QtOpenGL library and QtWebKit library

Quality
- Internal software process improvements that will improve the quality of Qt and make drop-in upgrades of Qt less risky
- Introduced continuous integration system
- Increased focus on bug triaging and bug related metrics during development

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Research Projects

Web and Hybrid Development
- Enhance the hybrid development capabilities of Qt and Qt Tools, combining web technologies and Qt technologies
- SOAP and WSDL-to-C++ code generation
- SCXML state chart compiler

Tools Research Qt LABS
- New build system with enhanced support for cross-platform application development on mobile/embedded and desktop platforms.
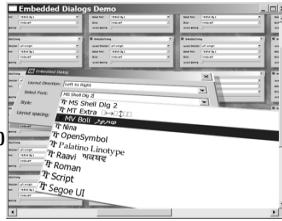- Tools for enhancing multi-user and/or multi-site project collaboration.

Mobility Project Qt LABS
- New Qt APIs for use cases that are common in mobile development (may be relevant for embedded and desktop, too)
- First APIs: Service Framework, Bearer Management, and Contacts API

UI and Visualization Qt LABS
- 3D user interfaces
- Next generation widgets
- Multi-threaded painting

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GraphicsView

Scene-based Graphics View

• **View stores all items and propagates events**

• **Scene is a surface for mapping items**

• **Items & widgets represent a specific object**

• **Scene uses binary space partitioning for fast item access**

• **Widget placement uses floating-point numbers (transforming the view)**

Widgets on Canvas

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Qt WebKit Integration

• An open source HTML rendering component integrated with Qt

• Web standards compliant
  • support for HTML, XHTML, XML, stylesheets, JavaScript, HTML editing, HTML canvas, AJAX, XSLT, XPath, some SVG.
  • Acid3 Test compliance – Score 100

• Deployable wherever Qt is: cross-platform/cross-version/cross-device

• Interact with Web environment, expose native objects

• NPAPI (Flash) support

• HTML 5 media element

• Various technologies from webkit.org
  • Full page zoom, css effects and animations, SquirrelFish JavaScript engine, client side storage

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States and Transitions

• A robust state chart implementation

• Harel state-charts and SCXML

• Key benefits:

  – Simplify application semantics

  – Use states to improve maintainability

  – Solidify event-driven programming
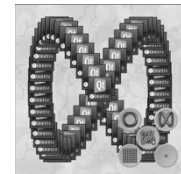
  – Write verifiable application logic

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Animation API

• Allow users to create dynamic UIs

• Integrates with States and Transitions

• Key features:

  – Animate any QObject property

  – Combine animations in groups

  – Use easing curves

  – Synchronized timer for better CPU utilization

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Qt-3D enablers

• Math primitives for matrix multiplication, vectors, quaternicons (client-side)

• API for vertex and fragment Shaders, GLSL/ES

• Future research on
  • Stencils
  • Vertex buffers and arrays
  • Texture manipulation
  • Geometry Shaders

• New QGLBuffer class
  • Create and manage vertex, index, pixel pack, and pixel unpack buffer objects
  • http://doc.qt.nokia.com/4.7-snapshot/qglbuffer.html

• Improvements in OpenGL Shader API
  • See http://doc.qt.nokia.com/4.7-snapshot/qt4-7-intro.html for details
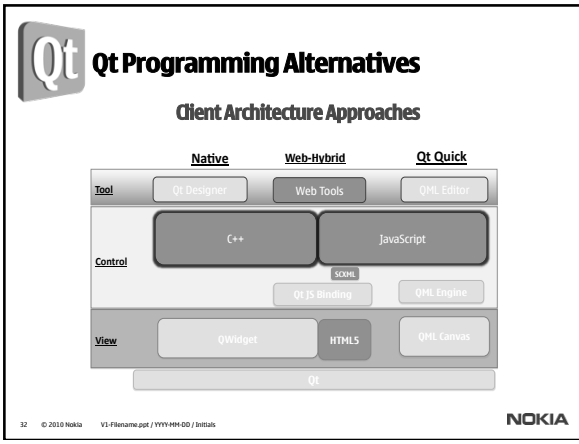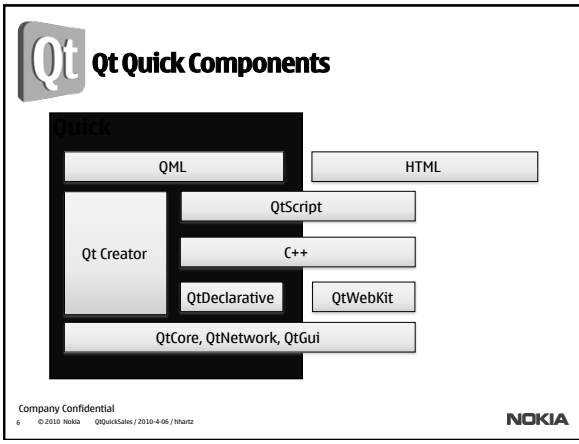

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Qt Quick

• **Qt Declarative**
  • A Qt module which can create a canvas-based (QGraphicsView) UI from a declarative description (QML)

• **QML**
  • The Qt Meta-Object Language allows describing a tree of objects with properties in an extremely intuitive and productive way. It also allows easy integration to native code where any meta-object (QObject) information is made available.

• **CSS Influenced with Javascript**

• **Creator**
  • Full Qt Creator Integration, including New Project Wizards, Syntax Highlighting, Intellisense, Error Lookup, Documentation Integration and QML inspector
  • drag-and-drop visual editing of QML files.(Preview)

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Qt Quick Components

Quick

QML	HTML

Qt Creator	QtScript
	C++
	QtDeclarative	QtWebKit

QtCore, QtNetwork, QtGui

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Qt Programming Alternatives

Client Architecture Approaches

	Native	Web-Hybrid	Qt Quick
Tool	Qt Designer	Web Tools	QML Editor
Control	C++	JavaScript	
		SCXML	
		Qt JS Binding	QML Engine
View	QWidget	HTML5	QML Canvas
		Qt	

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Qt for Nokia platforms

maemo.org
MeeGo™

Maemo/Meego devices

Devices such as the Nokia N900.
Qt optimized for the upcoming Qt-based Maemo 6 UI.

SYMBIAN

Qt for millions of Symbian smart phones

Symbian, the world's most popular software for smart phones is now supported by Qt.

Qt applications are commercially deployable now. Qt will be preinstalled in devices later in 2010.

Nokia services

ovi

Nokia's Internet services

Qt and Webkit based common web runtime

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Open Source Contribution Model

• Our SCM is now hosted at http://qt.gitorious.org
• All changes and commits public (24hr delay)
• Infrastructure for cloning and merging
• Review infrastructure in the works
• Guidelines
  • Code style and conventions
  • Good documentation
  • Compiles cross platform!
  • Good test coverage
  • No regression in Qt's tests

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Recipe for Next Generation Qt

Basic ingredients

SDK
Complete end-to-end developer offering

Performance
Native. Blazingly fast

Good housekeeping
Stable, backwards compatible

Advanced UIs and visualization
Beauty and power

New flavors

Contributions
Code from community

API completeness
Expanding to new use cases

New platforms
Qt Everywhere

Sugar on the top

WebKit
Embrace the web

Script and hybrid
Combine the best of both worlds

QML
Fluid UIs

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Qt in Higher Education

• C++ and Qt in University Courses
• Need more Programmers
• CS courses/Engineering Courses/Medical IT ?
• More Jobs than Programmers
• Ecosystems

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Qt Books

- Qt An Introduction to Design Patterns in C++ with Qt 4, Alan and Paul Ezust
- Foundations of Qt Development, Johan Thelin
- C++ GUI Programming with Qt 4 Jasmin Blanchette, Mark Summerfield
- Advanced Qt Programming: Creating Great Software with C++ and Qt 4
- Programming with Qt by Matthias Kalle Dalheimer
- The Book of Qt 4: The Art of Building Qt Applications, Daniel Molkentin