Qt Essentials - Fundamentals of Qt Module

Qt Essentials - Training Course

Produced by Nokia, Qt Development Frameworks

Material based on Qt 4.7, created on December 15, 2010

http://qt.nokia.com

Module: Fundamentals of Qt

- The Story of Qt
- Developing a Hello World Application
- Hello World using Qt Creator
- Practical Tips for Developers

Module Learning Objectives

- Learn ...
  - ... about the history of Qt
  - ... about Qt's ecosystem
  - ... a high-level overview of Qt
  - ... how to create first hello world program
  - ... build and run a program cross platform
  - ... to use Qt Creator IDE
  - ... some practical tips for developing with Qt

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Meet Qt

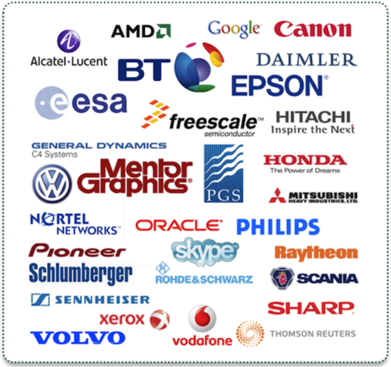
- **Qt Development Frameworks founded in 1994**
  - Trolltech acquired by Nokia in 2008
  - More than 250 employees in eight locations worldwide
  - Trusted by over 6,500 companies worldwide
- **Qt: a cross-platform application and UI framework**
  - For desktop, mobile and embedded development
  - Used by more than 350,000 commercial and open source developers
  - Backed by Qt consulting, support and training

See Service & Partners

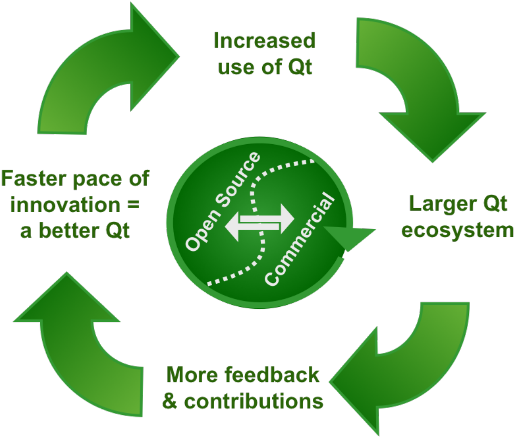
Qt is used everywhere

From embedded devices to desktop applications

By companies from many industries



The Qt virtuous cycle



Increased use of Qt

Larger Qt ecosystem

More feedback & contributions

Faster pace of innovation = a better Qt

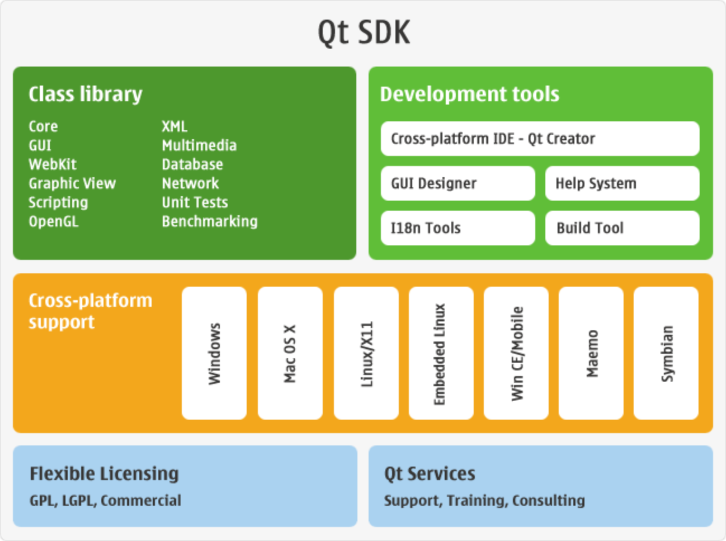
See Qt Business Model

Why Qt

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

15 years of customer success and community growth

Qt Architecture



Qt SDK

Class library

- Core
- GUI
- WebKit
- Graphic View
- Scripting
- OpenGL
- XML
- Multimedia
- Database
- Network
- Unit Tests
- Benchmarking

Development tools

- Cross-platform IDE - Qt Creator
- GUI Designer
- Help System
- I18n Tools
- Build Tool

Cross-platform support

- Windows
- Mac OS X
- Linux/X11
- Embedded Linux
- Win CE/Mobile
- Maemo
- Symbian

Flexible Licensing

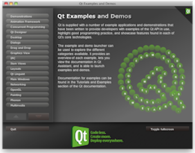
GPL, LGPL, Commercial

Qt Services

Support, Training, Consulting

Qt Demo

- Let’s have a look at the QtDemo Application
  - Demo $QTDIR/bin/qtdemo
- Comes with every Qt installation



Qt Examples and Demos

Qt is supplied with a number of example applications and demonstrations that have been written to provide developers with examples of the Qt API in use, highlight good programming practice, and showcase features found in each of Qt's core technologies.

The example and demo launcher can be used to explore the different categories available. It provides an overview of each example, lets you view the documentation in Qt Assistant, and is able to launch examples and demos.

Documentation for examples can be found in the Tutorials and Examples section of the Qt documentation.

Technology	**Demo**
Painting	*Demonstrations/Path Stroking*
Widgets	*Demonstrations/Books*
Widgets	*Demonstrations/TextEdit*
Graphics View	*Demonstrations/40.000 Chips*
OpenGL	*Demonstrations/Boxes*
WebKit	*Demonstrations/Browser*

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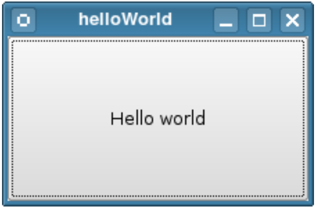
“Hello World” in Qt

```
// main.cpp

#include <QtGui>

int main(int argc, char *argv[])
{
  QApplication app(argc, argv);
  QPushButton button("Hello world");
  button.show();
  return app.exec();
}
```



- Program consists of
  - `main.cpp` - application code
  - `helloworld.pro` - project file

Demo fundamentals/ex-helloworld

Project File - `helloworld.pro`

- `helloworld.pro` file
  - lists source and header files
  - provides project configuration

```
# File: helloworld.pro
SOURCES  = main.cpp
HEADERS +=          # No headers used
```

- Assignment to variables
  - Possible operators `=, +=, -=`

See qmake tutorial Documentation

Using qmake

- qmake tool
  - Creates cross-platform make-files
- Build project using qmake

```
cd helloworld
qmake helloworld.pro # creates Makefile
make                 # compiles and links application
./helloworld         # executes application
```

- Tip: `qmake -project`
  - Creates default project file based on directory content

See qmake Manual Documentation

Qt Creator does it all for you

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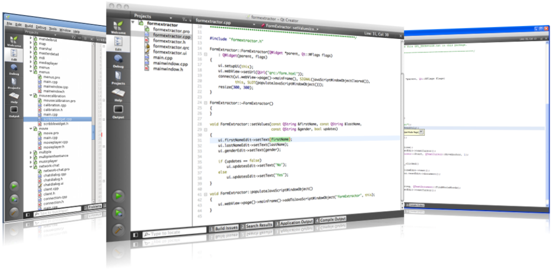
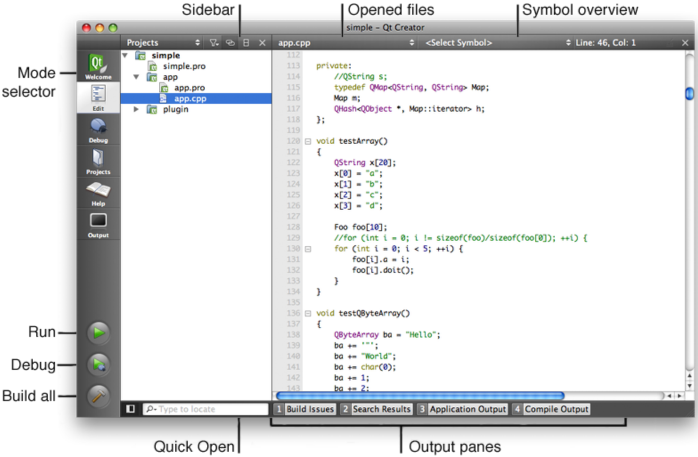
QtCreator IDE

- Advanced C++ code editor
- Integrated GUI layout and forms designer
- Project and build management tools
- Integrated, context-sensitive help system
- Visual debugger
- Rapid code navigation tools
- Supports multiple platforms



```
#include "formextractor.h"

FormExtractor::FormExtractor(QWidget *parent, Qt::WFlags flags)
    : QWidget(parent, flags)
{
    ui.setupUi(this);
    ui.webView->setUrl(QUrl("qrc:/form.html"));
    connect(ui.webView->page()->mainFrame(), SIGNAL(javaScriptWindowObjectCleared()),
            this, SLOT(populateJavaScriptWindowObject()));
    resize(300, 300);
}

FormExtractor::~FormExtractor()
{
}

void FormExtractor::setValues(const QString &firstName, const QString &lastName,
                              const QString &gender, bool updates)
{
    ui.firstNameEdit->setText(firstName);
    ui.lastNameEdit->setText(lastName);
    ui.genderEdit->setText(gender);

    if (updates == false)
        ui.updatesEdit->setText("No");
    else
        ui.updatesEdit->setText("Yes");
}

void FormExtractor::populateJavaScriptWindowObject()
{
    ui.webView->page()->mainFrame()->addToJavaScriptWindowObject("formExtractor", this);
}
```

Overview of Qt Creator Components

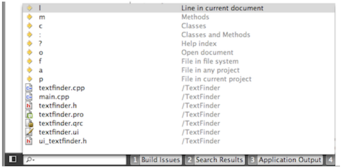


```cpp

private:
    //QString s;
    typedef QMap<QString, QString> Map;
    Map m;
    QHash<QObject *, Map::iterator> h;
};

void testArray()
{
    QString x[20];
    x[0] = "a";
    x[1] = "b";
    x[2] = "c";
    x[3] = "d";

    Foo foo[10];
    //for (int i = 0; i != sizeof(foo)/sizeof(foo[0]); ++i) {
    for (int i = 0; i < 5; ++i) {
        foo[i].a = i;
        foo[i].doit();
    }
}

void testQByteArray()
{
    QByteArray ba = "Hello";
    ba += '"';
    ba += "World";
    ba += char(0);
    ba += 1;
    ba += 2;
```

See Creator Quick Tour Documentation

Finding Code -Locator

- Click on Locator or press Ctrl+K (Mac OS X: Cmd+K)
- Type in the file name
- Press Return



l	Line in current document
m	Methods
c	Classes
:	Classes and Methods
?	Help index
o	Open document
f	File in file system
a	File in any project
p	File in current project
textfinder.cpp	/TextFinder
main.cpp	/TextFinder
textfinder.h	/TextFinder
textfinder.pro	/TextFinder
textfinder.qrc	/TextFinder
textfinder.ui	/TextFinder
ui_textfinder.h	/TextFinder

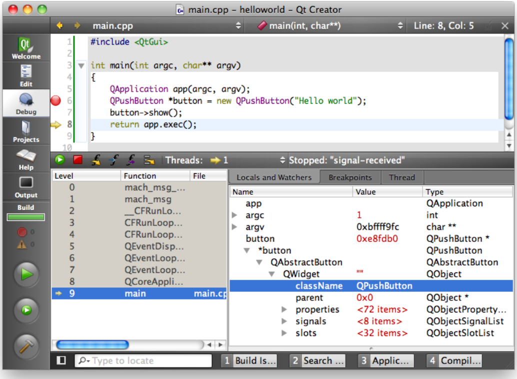
Locator Prefixes

- **: <class name>** - Go to a symbol definition
- **l <line number>** - Go to a line in the current document
- **? <help topic>** - Go to a help topic
- **o <open document>** - Go to an opened document

See Navigating Around Your Code with Locator Documentation

Debugging an Application

- Debug – > Start Debugging (or F5)



main.cpp – helloworld – Qt Creator

main.cpp | main(int, char**) | Line: 8, Col: 5

```
#include <QtGui>

int main(int argc, char** argv)
{
    QApplication app(argc, argv);
    QPushButton *button = new QPushButton("Hello world");
    button->show();
    return app.exec();
}
```

Threads: 1 | Stopped: "signal-received"

Level	Function	File
0	mach_msg_...	
1	mach_msg	
2	__CFRunLo...	
3	CFRunLoop...	
4	CFRunLoop...	
5	QEventDisp...	
6	QEventLoop...	
7	QEventLoop...	
8	QCoreAppli...	
9	main	main.cp

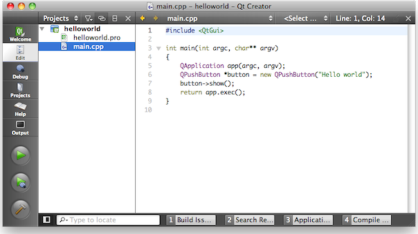
Name	Value	Type
app		QApplication
argc	1	int
argv	0xbffff9fc	char **
button	0xe8fdb0	QPushButton *
*button		QPushButton
QAbstractButton		QAbstractButton
QWidget	""	QObject
className	QPushButton	
parent	0x0	QObject *
properties	<72 items>	QObjectProperty...
signals	<8 items>	QObjectSignalList
slots	<32 items>	QObjectSlotList

See Qt Creator and Debugging Documentation

Qt Creator Demo "Hello World"

What we’ll show:

- Creation
  of an empty Qt project
- Adding the
  `main.cpp` source file
- Writing of the
  Qt Hello World Code
  - Showing Locator Features
- Running the application
- Debugging
  the application
  - Looking up the `text` property of our button



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- There is more to Qt Creator

  See Qt Creator Manual Documentation

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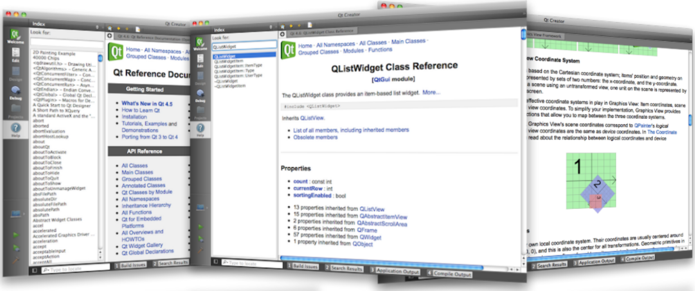
How much C++ do you need to know?

- Objects and classes
  - Declaring a class, inheritance, calling member functions etc.
- Polymorphism
  - That is virtual methods
- Operator overloading
- Templates
  - For the container classes only
- No ...
  - ... RTTI
  - ... sophisticated templates
  - ... exceptions thrown
  - ...

Qt Documentation

- Reference Documentation
  - All classes documented
  - Contains tons of examples
- Collection of Howto's and Overviews
- A set of Tutorials for Learners



Qt Reference Docu

Getting Started

- What's New in Qt 4.5
- How to Learn Qt
- Installation
- Tutorials, Examples and Demonstrations
- Porting from Qt 3 to Qt 4

API Reference

- All Classes
- Main Classes
- Grouped Classes
- Annotated Classes
- Qt Classes by Module
- All Namespaces
- Inheritance Hierarchy
- All Functions
- Qt for Embedded Platforms
- All Overviews and HOWTOs
- Qt Widget Gallery
- Qt Global Declarations

Home · All Namespaces · All Classes · Main Classes · Grouped Classes · Modules · Functions

QListWidget Class Reference

[QtGui module]

The QListWidget class provides an item-based list widget. More...

```
#include <QListWidget>
```

Inherits QListView.

- List of all members, including inherited members
- Obsolete members

Properties

- count : const int
- currentRow : int
- sortingEnabled : bool

- 13 properties inherited from QListView
- 15 properties inherited from QAbstractItemView
- 2 properties inherited from QAbstractScrollArea
- 6 properties inherited from QFrame
- 57 properties inherited from QWidget
- 1 property inherited from QObject

Finding the Answers

- Documentation in Qt Assistant (or QtCreator)
- Qt's examples: `$QTDIR/examples`
- Qt developer network: `http://developer.qt.nokia.com/`
- Qt Centre Forum: *`http://www.qtcentre.org/`*
- KDE project source code
  - `http://lxr.kde.org/` *(cross-referenced)*.
- Mailing lists see `http://qt.nokia.com/lists`
- IRC:
  - On *irc.freenode.org* channel: `#qt`

Use the source!

Qt's source code is easy to read, and can answer questions the reference manual cannot answer!

Modules and Include files

- Qt Modules
  - QtCore, QtGui, QtXml, QtSql, QtNetwork, QtTest ...

    See Qt Modules Documentation
- Enable Qt Module in qmake `.pro` file:
  - `QT += network`
- Default: qmake projects use QtCore and QtGui
  - Any Qt class has a header file.

```
#include <QLabel>
#include <QtGui/QLabel>
```

  - Any Qt Module has a header file.

```
#include <QtGui>
```

Includes and Compilation Time

Module includes

```
#include <QtGui>
```

- Precompiled header and the compiler
  - If **not** supported may add extra compile time
  - If supported may speed up compilation
  - Supported on: Windows, Mac OS X, Unix

See qmake precompiled headers Documentation

Class includes

```
#include <QLabel>
```

- Reduce compilation time
  - Use class includes (#include <QLabel>)
  - Forward declarations (`class QLabel;`)

Place module includes before other includes.

Questions And Answers

- What is Qt?
- Which code lines do you need for a minimal Qt application?
- What is a .pro file?
- What is `qmake`, and when is it a good idea to use it?
- What is a Qt module and how to enable it in your project?
- How can you include a `QLabel` from the `QtGui` module?
- Name places where you can find answers about Qt problems

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