Qt Essentials - Dialogs Module

Training Course

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Produced by Digia Plc.

Material based on Qt 5.0, created on September 27, 2012

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Module: Dialogs and Designer

- Dialogs
- Common Dialogs
- Qt Designer

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Module Objectives

- **Custom Dialogs**
  - Modality
  - Inheriting `QDialog`
  - Dialog buttons
- **Predefined Dialogs**
  - File, color, input and font dialogs
  - Message boxes
  - Progress dialogs
  - Wizard dialogs
- **Qt Designer**
  - Design UI Forms
  - Using forms in your code
  - Dynamic form loading

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- Dialogs
- Common Dialogs
- Qt Designer

Dialog Windows - `QDialog`

- Base class of dialog window widgets
- General Dialogs can have 2 modes
- Modal dialog
  - Remains in foreground, until closed
  - Blocks input to remaining application
  - Example: Configuration dialog
- Modeless dialog
  - Operates independently in application
  - Example: Find/Search dialog

- Modal dialog example

```
MyDialog dialog(this);
dialog.setMyInput(text);
if(dialog.exec() == Dialog::Accepted) {
  // exec blocks until user closes dialog
}
```

Modeless Dialog

- Use show()
  - Displays dialog
  - Returns control to caller

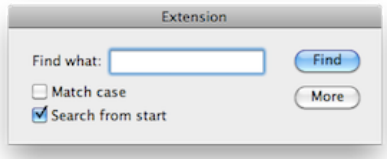
```
void EditorWindow::find() {
  if (!m_findDialog) {
    m_findDialog = new FindDialog(this);
    connect(m_findDialog, SIGNAL(findNext()),
      this, SLOT(onFindNext()));
  }
  m_findDialog->show(); // returns immediately
  m_findDialog->raise(); // on top of other windows
  m_findDialog->activateWindow(); // keyboard focus
}
```

- Inherit from `QDialog`
- Create and layout widgets
- Use `QDialogButtonBox` for dialog buttons
  - Connect buttons to `accept()`/`reject()`
- Override `accept()`/`reject()`

```
MyDialog::MyDialog(QWidget *parent) : QDialog(parent) {
  m_label = new QLabel(tr("Input Text"), this);
  m_edit = new QLineEdit(this);
  m_box = new QDialogButtonBox( QDialogButtonBox::Ok|
                                QDialogButtonBox::Cancel, this);
  connect(m_box, SIGNAL(accepted()), this, SLOT(accept()));
  connect(m_box, SIGNAL(rejected()), this, SLOT(reject()));
  ... // layout widgets
}
void MyDialog::accept() { // customize close behaviour
  if(isDataValid()) { QDialog::accept() }
}
```

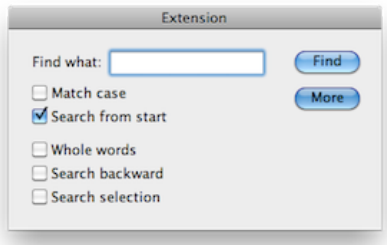
- Deletion of dialogs
  - No need to keep dialogs around forever
  - Call `QObject::deleteLater()`
  - Or `setAttribute(Qt::WA_DeleteOnClose)`
  - Or override `closeEvent()`

- Dialogs with extensions:
  - `QWidget::show()/hide()` used on extension




```
m_more = new QPushButton(tr("&More"));
m_more->setCheckable(true);
```

```
m_extension = new QWidget(this);
// add your widgets to extension
m_extension->hide();
connect(m_more, SIGNAL(toggled(bool)),
  m_extension, SLOT(setVisible(bool)));
```



- Demo $QTDIR/examples/dialogs/extension

- Dialogs
- Common Dialogs
- Qt Designer

Asking for Files - `QFileDialog`

- Allow users to select files or directories
- Asking for a file name

```
QString fileName =
  QFileDialog::getOpenFileName(this, tr("Open File"));
if(!fileName.isNull()) {
  // do something useful
}
```

- `QFileDialog::getOpenFileNames()`
  - Returns one or more selected existing files
- `QFileDialog::getSaveFileName()`
  - Returns a file name. File does not have to exist.
- `QFileDialog::getExistingDirectory()`
  - Returns an existing directory.
- `setFilter("Image Files (*.png *.jpg *.bmp)")`
  - Displays files matching the patterns

Showing Messages - `QMessageBox`

- Provides a modal dialog for ...
  - informing the user
  - asking a question and receiving an answer
- Typical usage, questioning a user

```
QMessageBox::StandardButton ret =
   QMessageBox::question(parent, title, text);
if(ret == QMessageBox::Ok) {
  // do something useful
}
```

- Very flexible in appearance
  - See QMessageBox Class Reference Documentation
- Other convenience methods
  - `QMessageBox::information(...)`
  - `QMessageBox::warning(...)`
  - `QMessageBox::critical(...)`
  - `QMessageBox::about(...)`

Feedback on progress - `QProgressDialog`

- Provides feedback on the progress of a slow operation

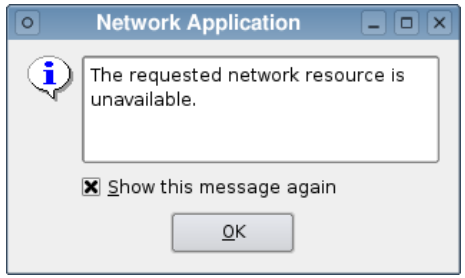
```
QProgressDialog dialog("Copy", "Abort", 0, count, this);
dialog.setWindowModality(Qt::WindowModal);
for (int i = 0; i < count; i++) {
  dialog.setValue(i);
  if (dialog.wasCanceled()) { break; }
  //... copy one file
}
dialog.setValue(count); // ensure set to maximum
```

- Initialize with `setValue(0)`
  - Otherwise estimation of duration will not work
- When operation progresses, check for cancel
  - `QProgressDialog::wasCanceled()`
  - Or connect to `QProgressDialog::canceled()`
- To stay reactive call `QApplication::processEvents()`
- For modeless operation: See QProgressDialog Documentation

Providing error messages - `QErrorMessage`

- Similar to QMessageBox with checkbox
- Asks if message shall be displayed again

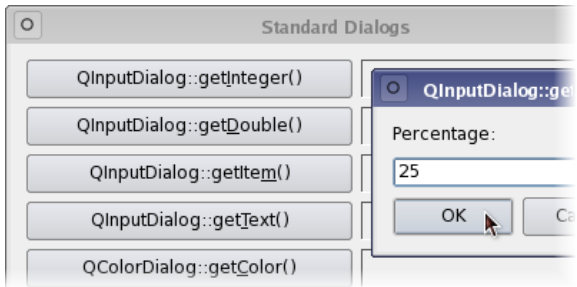
```
m_error = new QErrorMessage(this);
m_error->showMessage(message, type);
```



- Messages will be queued
- `QErrorMessage::qtHandler()`
  - installs an error handler for debugging
  - Shows `qDebug()`, `qWarning()` and `qFatal()` messages in QErrorMessage box

Other Common Dialogs

- Asking for Input - `QInputDialog`
  - `QInputDialog::getText(...)`
  - `QInputDialog::getInt(...)`
  - `QInputDialog::getDouble(...)`
  - `QInputDialog::getItem(...)`
- Selecting Color - `QColorDialog`
  - `QColorDialog::getColor(...)`
- Selecting Font - `QFontDialog`
  - `QFontDialog::getFont(...)`



- Demo $QTDIR/examples/dialogs/standarddialogs

Guiding the user - `QWizard`

- Input dialog
  - Consisting of sequence of pages
- Purpose: Guide user through process
  - Page by page
- Supports
  - Linear and non-linear wizards
  - Registering and using fields
  - Access to pages by ID
  - Page initialization and cleanup
  - Title, sub-title
  - Logo, banner, watermark, background
  - See QWizard Documentation
- Each page is a `QWizardPage`
- `QWizard::addPage()`
  - Adds page to wizard

Simple Wizard Example

```
QWizardPage *createIntroPage() {
  QWizardPage *page = new QWizardPage;
  page->setTitle("Introduction");
  // create widgets and layout them
  return page;
}
QWizardPage *createRegistrationPage() { ... }

int main(int argc, char *argv[]) {
  QApplication app(argc, argv);
  QWizard wizard;
  wizard.setWindowTitle("License Wizard");
  wizard.addPage(createIntroPage());
  wizard.addPage(createRegistrationPage());
  wizard.show();
  return app.exec();
}
```

- Demo $QTDIR/examples/dialogs/licensewizard

- When would you use a modal dialog, and when would you use a non-modal dialog?
- When should you call exec() and when should you call show()?
- Can you bring up a modal dialog, when a modal dialog is already active?
- When do you need to keep widgets as instance variables?
- What is the problem with this code:

```
QDialog *dialog = new QDialog(parent);
QCheckBox *box = new QCheckBox(dialog);
```

Questions And Answers

- When would you use a modal dialog, and when would you use a non-modal dialog?
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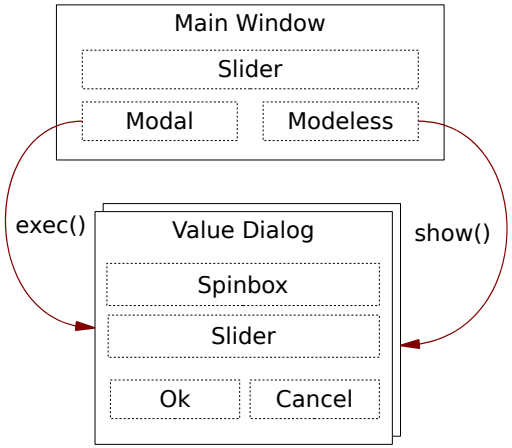
Lab: Custom Dialog

- We create a simple value dialog
  - Shows int value
  - As slider
  - As spin box
  - value must be < 50 to be accepted
- A main window will show result
  - Has a slider, connected to dialog
  - Two buttons to launch dialog in modal and modeless mode
- Lab dialogs/lab-dialog



- Dialogs
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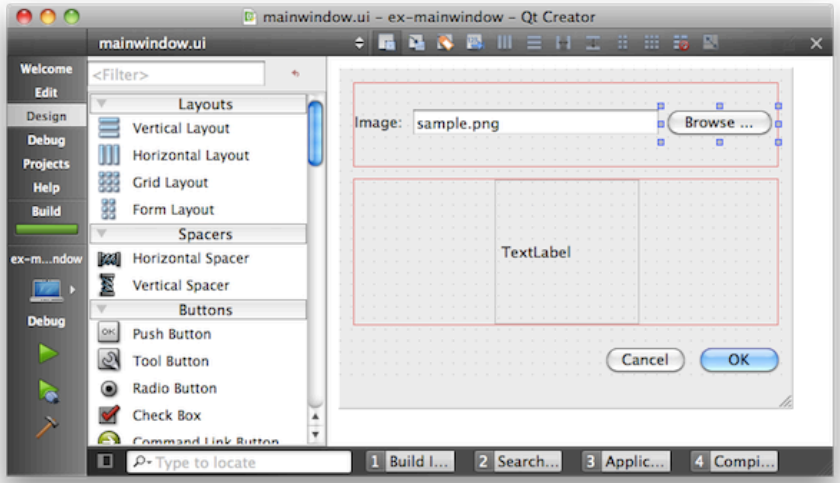
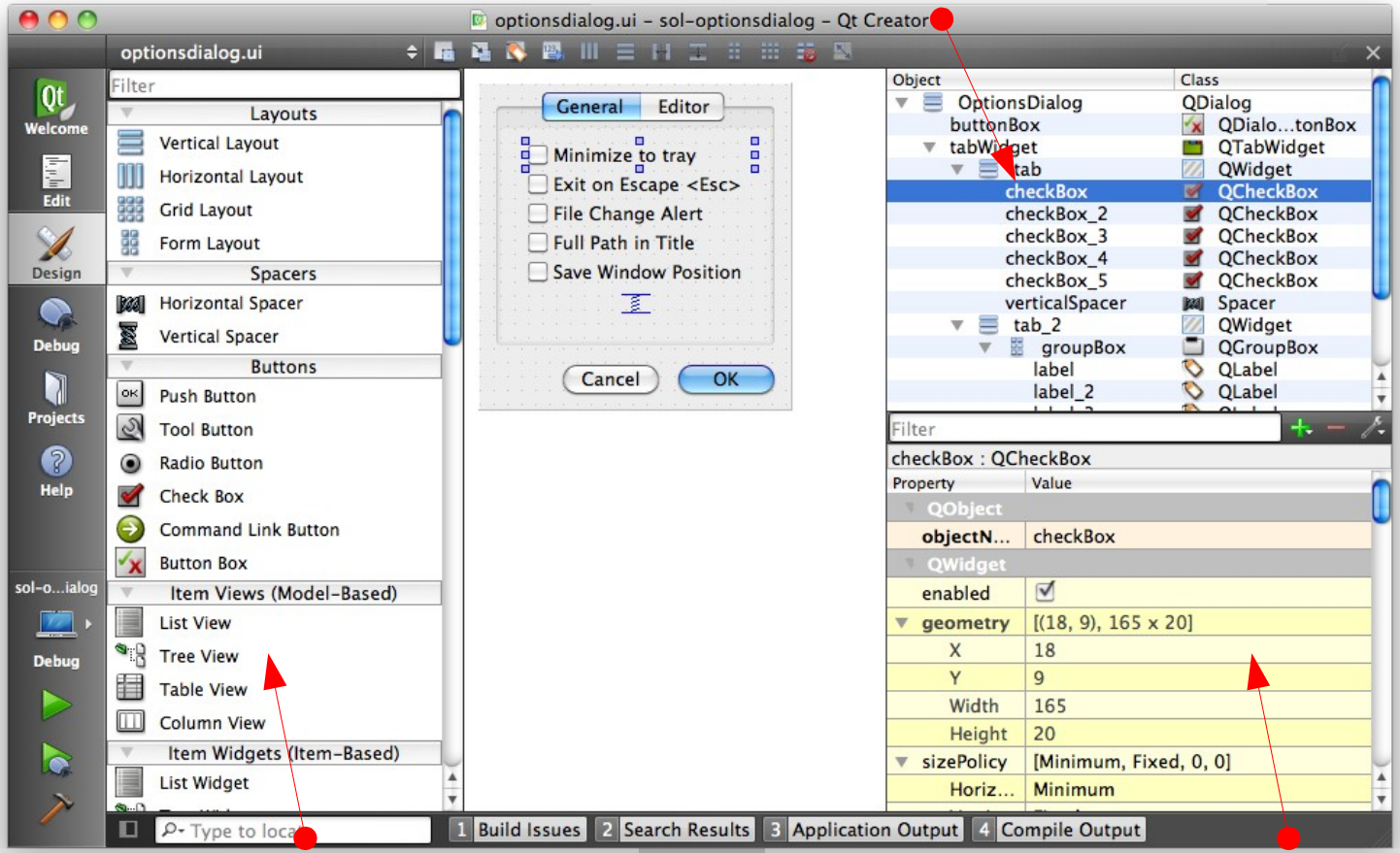
- Design UI forms visually



- Visual Editor for
  - Signal/slot connections
  - Actions
  - Tab handling
  - Buddy widgets
  - Widget properties
  - Integration of custom widgets
  - Resource files

Object Inspector
Displays hierarchy of objects on form



Widget Box
Provides selection of widgets, layouts

Property Editor
Displays properties of selected object

Designer's Editing Modes

-  Widget Editing
  - Change appearance of form
  - Add layouts
  - Edit properties of widgets
-  Signal and Slots Editing
  - Connect widgets together with signals & slots
-  Buddy Editing
  - Assign buddy widgets to label
  - *Buddy widgets help keyboard focus handling correctly*
-  Tab Order Editing
  - Set order for widgets to receive the keyboard focus

Designer UI Form Files

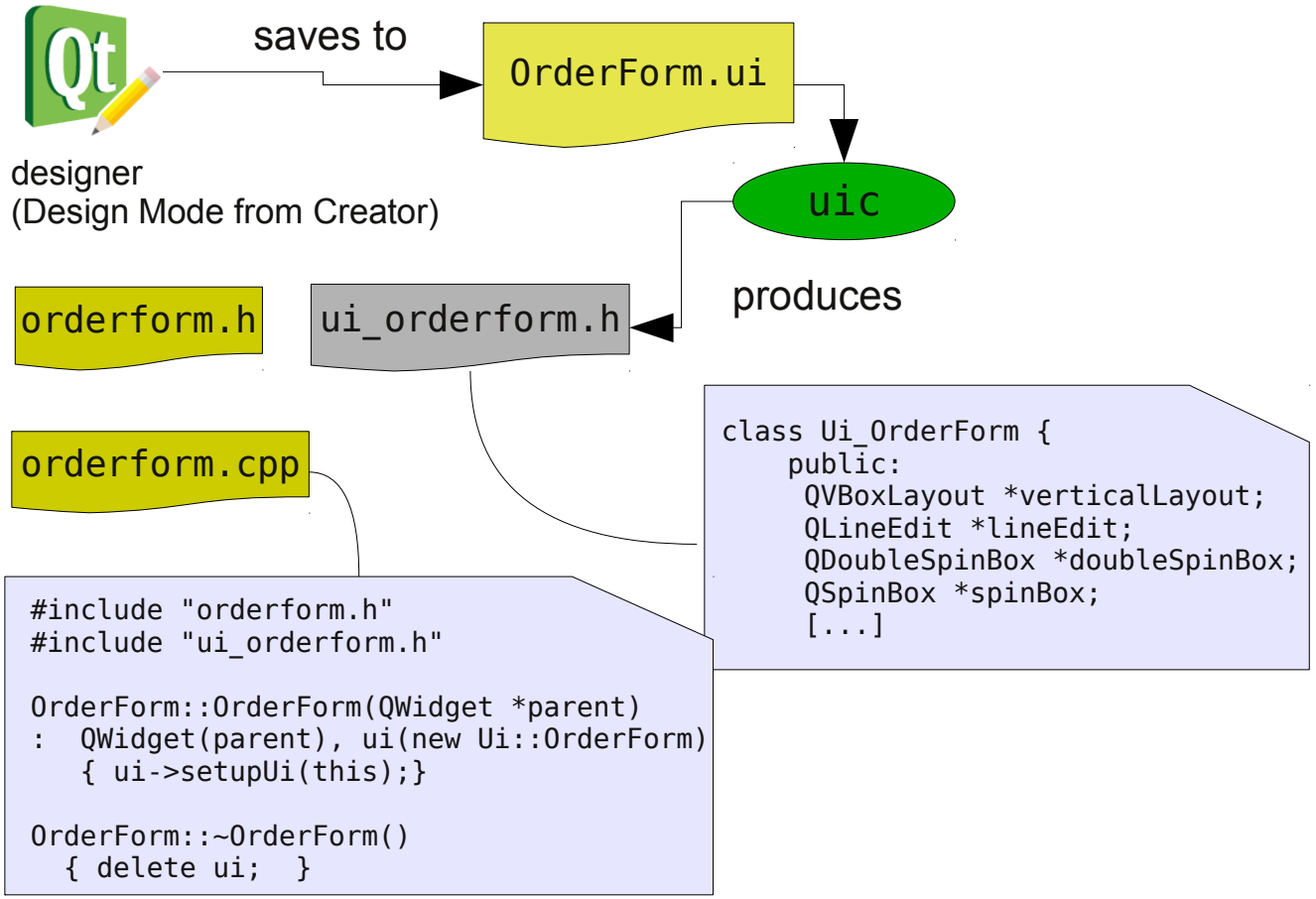
- Form stored in .ui file
  - format is XML
- uic tool generates code
  - From `myform.ui`
    - to `ui_myform.h`

```
// ui_mainwindow.h
class Ui_MainWindow {
public:
  QLineEdit *fileName;
  ... // simplified code
  void setupUi(QWidget *) { /* setup widgets */ }
};
```

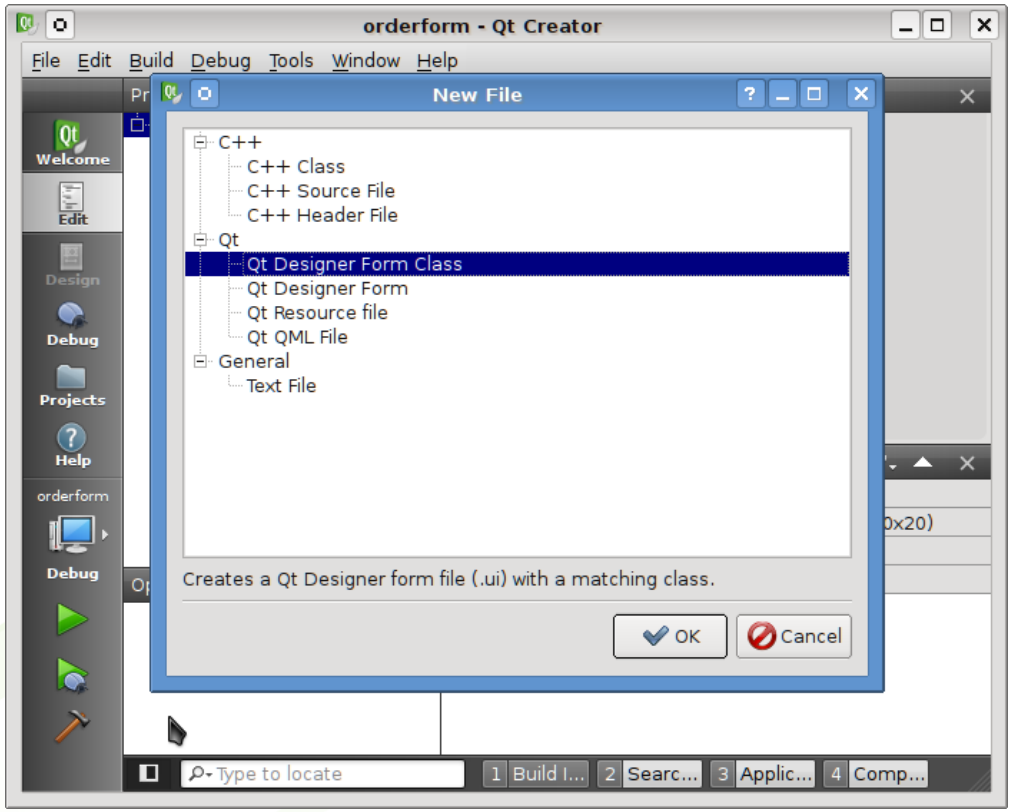
- Form ui file in project (`.pro`)

```
FORMS += mainwindow.ui
```

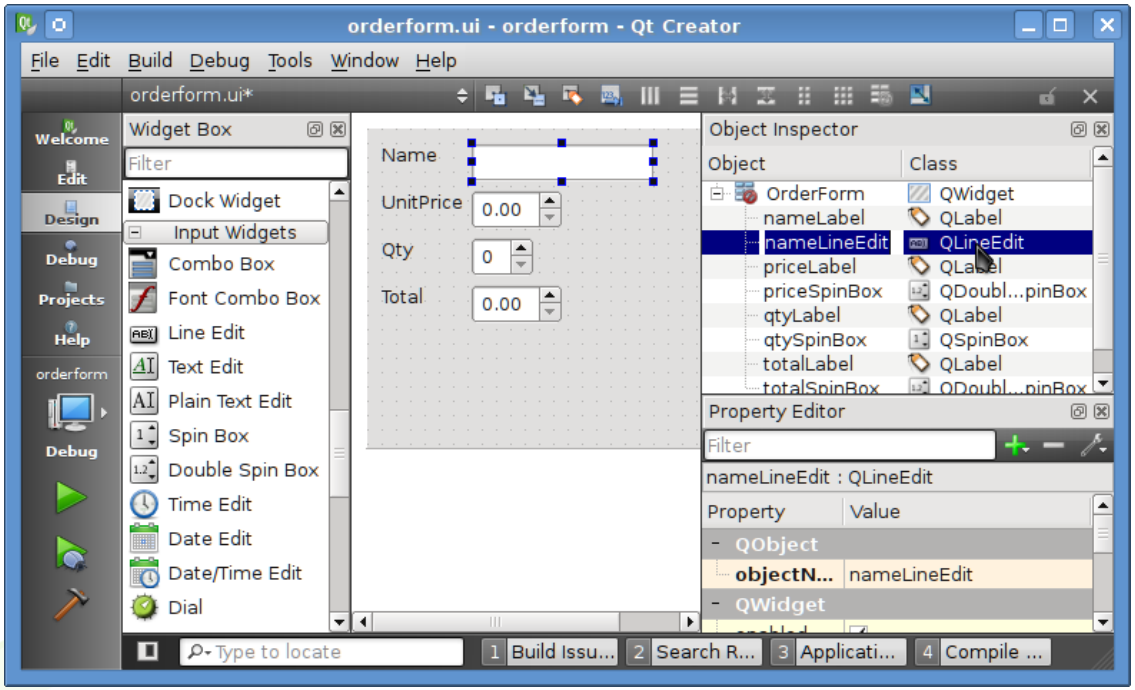
```
<?xml version="1.0" encoding="UTF-8"?>
<ui version="4.0">
 <class>MainWindow</class>
 <widget class="QMainWindow" name="MainWindow">
       <widget class="QLineEdit" name="fileName">
        <property name="text">
         <string>sample.png</string>
        </property>
       </widget>
</ui>
```


saves to
OrderForm.ui
designer
(Design Mode from Creator)
uic
produces
orderform.h
ui_orderform.h
orderform.cpp
class Ui_OrderForm {
public:
QVBoxLayout *verticalLayout;
QLineEdit *lineEdit;
QDoubleSpinBox *doubleSpinBox;
QSpinBox *spinBox;
[...]
#include "orderform.h"
#include "ui_orderform.h"
OrderForm::OrderForm(QWidget *parent)
: QWidget(parent), ui(new Ui::OrderForm)
{ ui->setupUi(this);}
OrderForm::~OrderForm()
{ delete ui; }

- **Add New...** "Designer Form"
  - or "Designer Form Class" (for C++ integration)

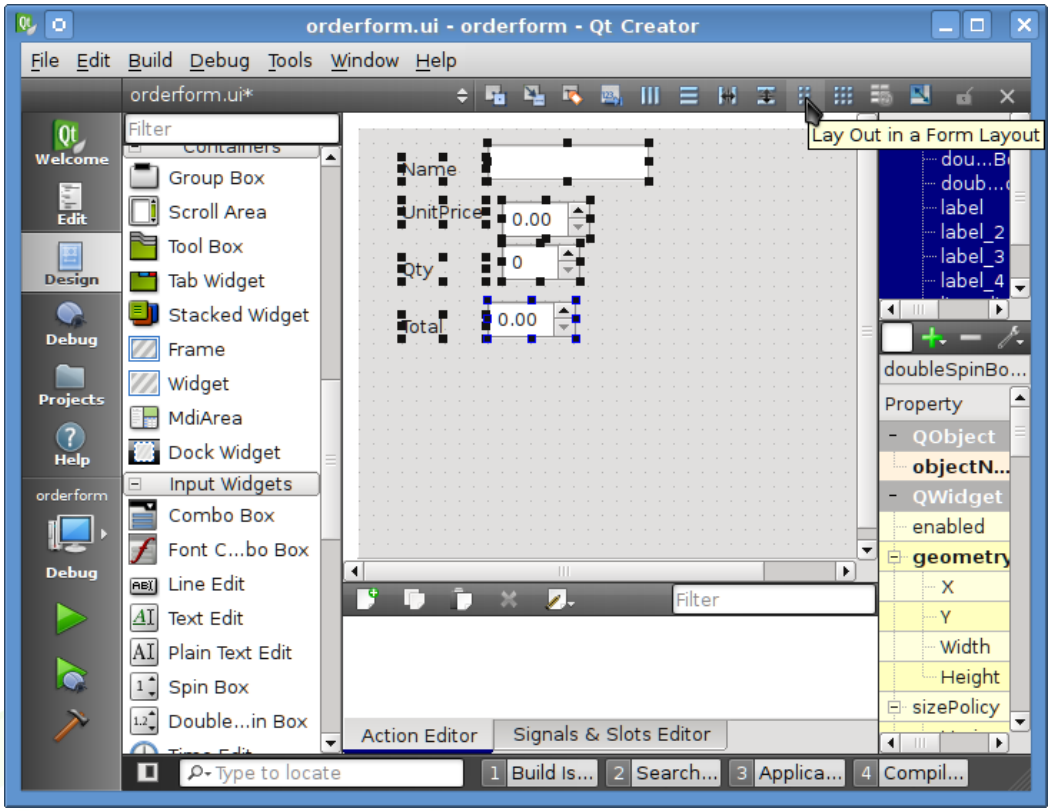


1. Place widgets on form
2. Edit `objectName` property

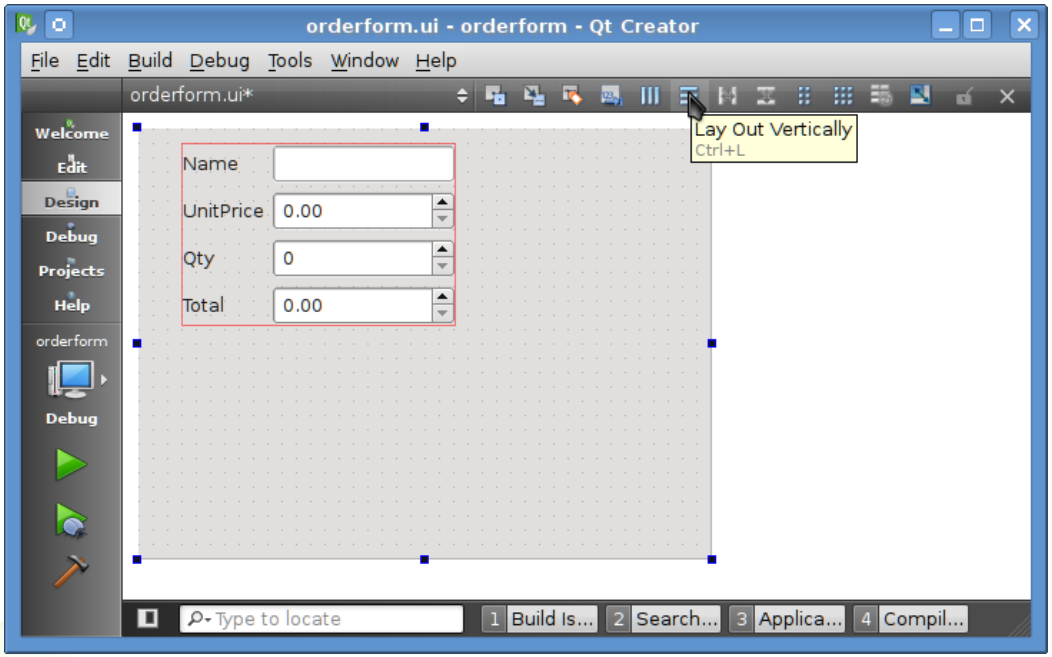


- *`objectName` defines member name in generated code*

- `QFormLayout`: Suitable for most input forms

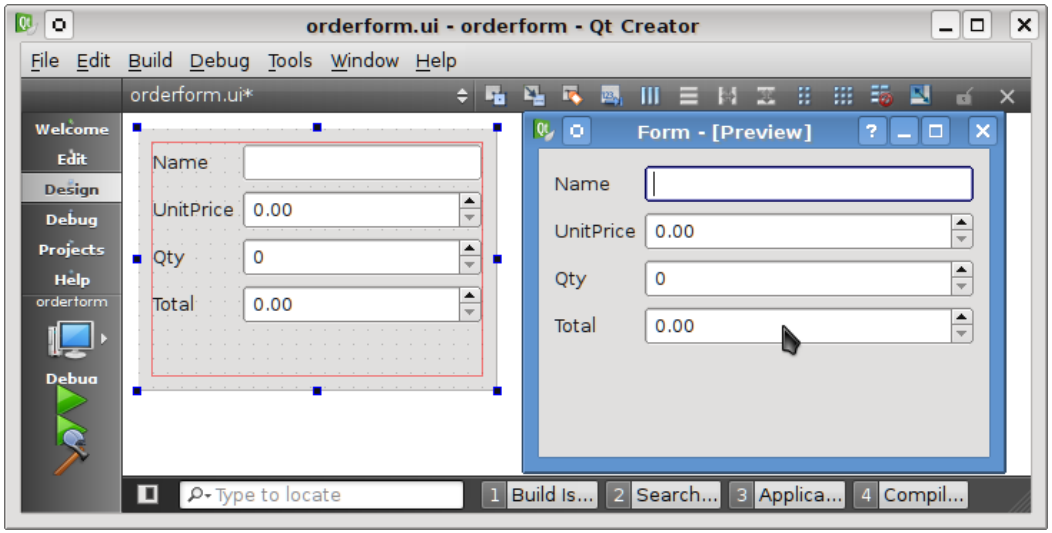


1. First layout child widgets
2. Finally select empty space and set top-level layout



Preview Widget in Preview Mode

- Check that widget is nicely resizable



Code Integration - Header File

```
// orderform.h
class Ui_OrderForm;

class OrderForm : public QDialog {
private:
   Ui_OrderForm *ui;    // pointer to UI object
};
```

- "Your Widget" derives from appropriate base class
- **`*ui`** member encapsulate UI class
  - Makes header independent of designer generated code

Code Integration - Implementation File

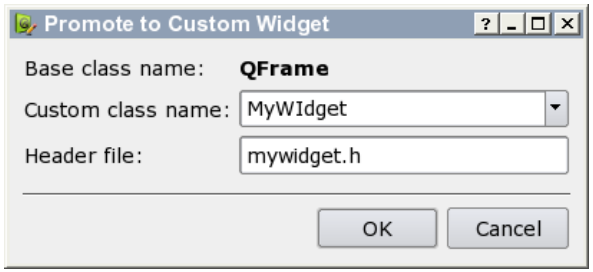
```
// orderform.cpp
#include "ui_orderform.h"

OrderForm::OrderForm(QWidget *parent)
: QDialog(parent), ui(new Ui_OrderForm) {
  ui->setupUi(this);
}

OrderForm::~OrderForm() {
  delete ui; ui=0;
}
```

- *Default behavior in Qt Creator*

Signals and Slots in Designer

- Widgets are available as public members
  - `ui->fileName->setText("image.png")`
    - *Name based on widgets object name*
- You can set up signals & slots traditionally...
  - `connect(ui->okButton, SIGNAL(clicked()), ...`
- Auto-connection facility for custom slots
  - Automatically connect signals to slots in your code
    - Based on object name and signal
  - `void on_objectName_signal(parameters);`
    - Example: `on_okButton_clicked()` slot
  - See Automatic Connections Documentation
- Qt Creator: right-click on widget and "Go To Slot"
  - Generates a slot using auto-connected name

Choices for Custom Widgets



1. *Promote to Custom Widget*
   - Choose the widget closest
   - From context menu choose *Promote to Custom Widget*
   - Code generated will now refer to given class name
2. *Implement a Designer plug-in*
   - Demo $QTDIR/qttools/examples/designer/customwidgetplugin
   - See Creating Custom Widgets for Qt Designer Documentation

Dynamically loading `.ui` files

- Forms can be processed at runtime
  - Produces dynamically generated user interfaces
- Disadvantages
  - Slower, harder to maintain
  - Risk: `.ui` file not available at runtime

See Run Time Form Processing Documentation

- Loading `.ui` file

```
QUiLoader loader;
QFile file("forms/textfinder.ui");
file.open(QFile::ReadOnly);
QWidget *formWidget = loader.load(&file, this);
```

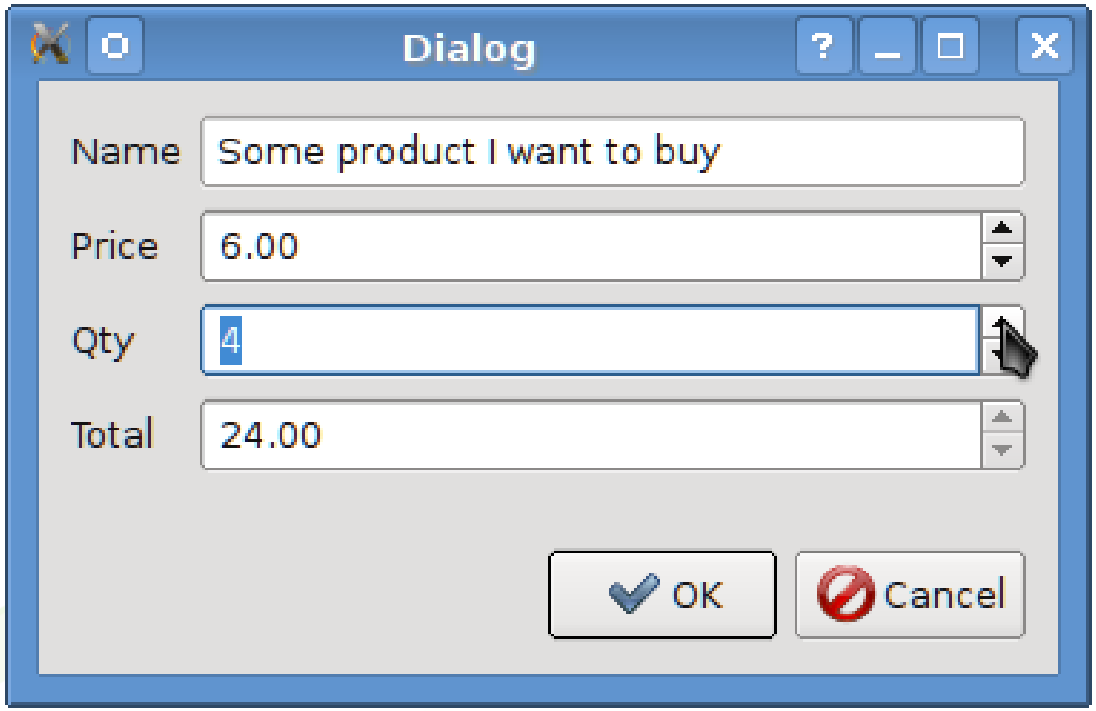
- Locate objects in form

```
ui_okButton = qFindChild<QPushButton*>(this, "okButton");
```

Demo $QTDIR/qttools/examples/designer/calculatorbuilder

- *Handle with care!*

- Create an order form dialog
  - With fields for price, quantity and total.
  - Total field updates itself to reflect quantity and price entered



Lab dialogs/lab-orderform