CS241 Principles and Practice of Problem Solving

Lecture 20: GUI Programming with Qt III

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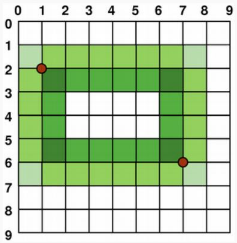
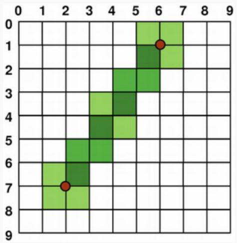
Anti-aliasing

We could improve the “rendering” by turning on anti-aliasing



```
QPainter painter(this);
painter.setRenderHint(
    QPainter::Antialiasing);
painter.setPen(Qt::darkGreen);
// Using the (x  y  w  h) overload
painter.drawRect(1, 2, 6, 4);
```



```
QPainter painter(this);
painter.setRenderHint(
    QPainter::Antialiasing);
painter.setPen(Qt::darkGreen);
painter.drawLine(2, 7, 6, 1);
```

Question: what might be the problem for this type of practice?

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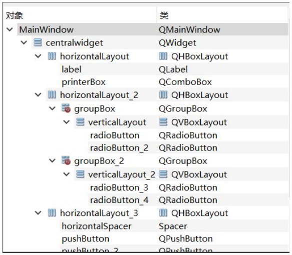

对象	类
MainWindow	QMainWindow
centralwidget	QWidget
horizontalLayout	QHBoxLayout
label	QLabel
printerBox	QComboBox
horizontalLayout_2	QHBoxLayout
groupBox	QGroupBox
verticalLayout	QVBoxLayout
radioButton	QRadioButton
radioButton_2	QRadioButton
groupBox_2	QGroupBox
verticalLayout_2	QVBoxLayout
radioButton_3	QRadioButton
radioButton_4	QRadioButton
horizontalLayout_3	QHBoxLayout
horizontalSpacer	Spacer
pushButton	QPushButton
pushButton_2	QPushButton

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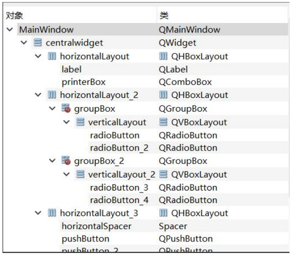

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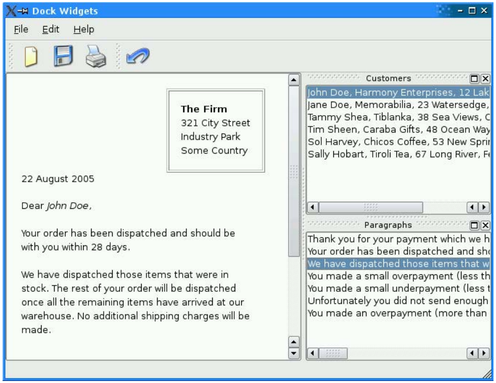
- What if a widget has no parent?
- It will become a standalone window.

A typical Main Window



The Firm
321 City Street
Industry Park
Some Country

22 August 2005

Dear *John Doe*,

Your order has been dispatched and should be with you within 28 days.

We have dispatched those items that were in stock. The rest of your order will be dispatched once all the remaining items have arrived at our warehouse. No additional shipping charges will be made.

John Doe, Harmony Enterprises, 12 Lak
Jane Doe, Memorabilia, 23 Watersedge,
Tammy Shea, Tiblanka, 38 Sea Views, C
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Thank you for your payment which we h
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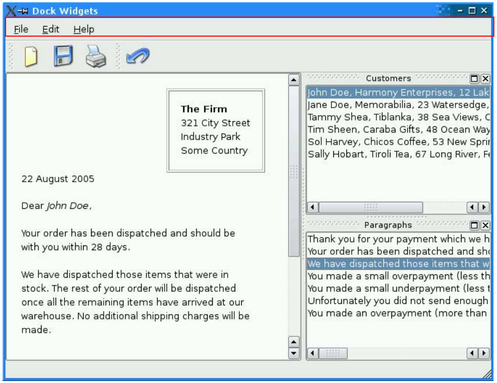
You made a small overpayment (less th
You made a small underpayment (less t
Unfortunately you did not send enough
You made an overpayment (more than

A typical Main Window

- Manu bar



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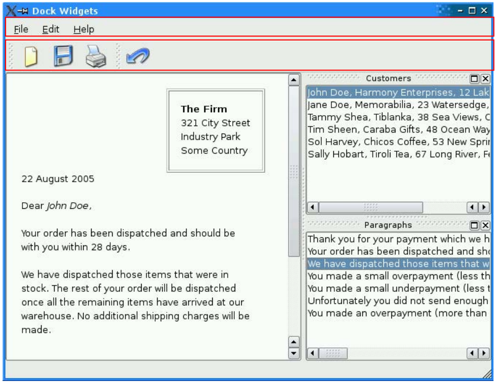
A typical Main Window

- Manu bar
- Tool bar



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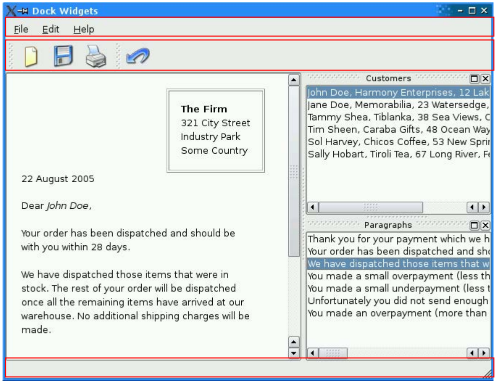
- Manu bar
- Tool bar
- Status bar



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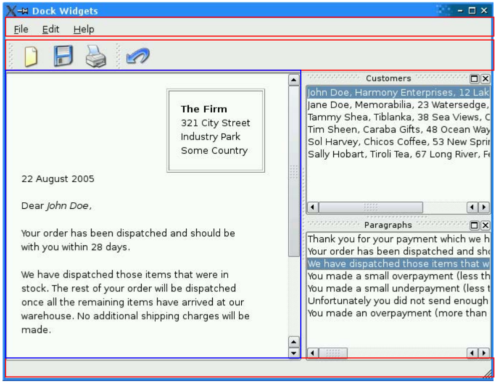
- Manu bar
- Tool bar
- Status bar
- Central widget



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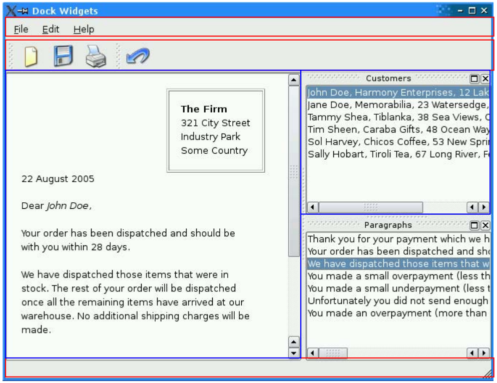
A typical Main Window

- Manu bar
- Tool bar
- Status bar
- Central widget
- Dockable window



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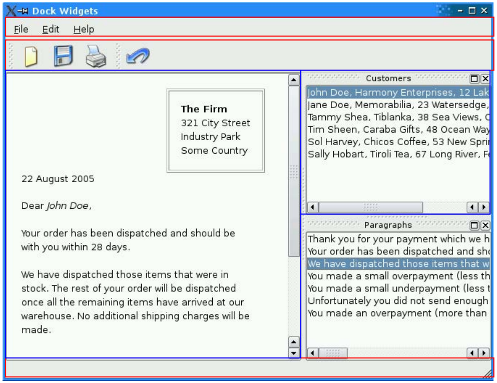

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In Qt, `QMainWindow` class provide a one-stop template for all the gradients mentioned above.

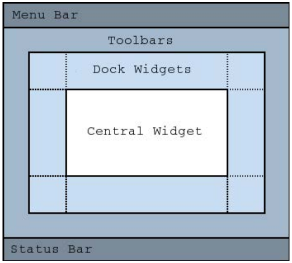
QMainWindow

Has its own layout

- Central Widget

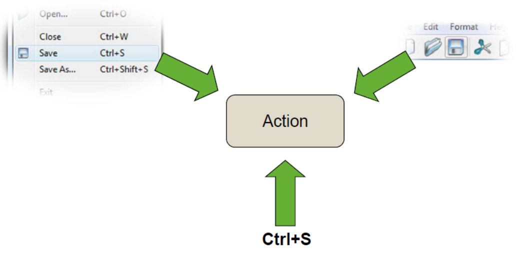
```
QMainWindow::setCentralWidget(
      widget)
```

- `QMenuBar`
- `QToolBar`
- `QDockWidget`
- `QStatusBar`



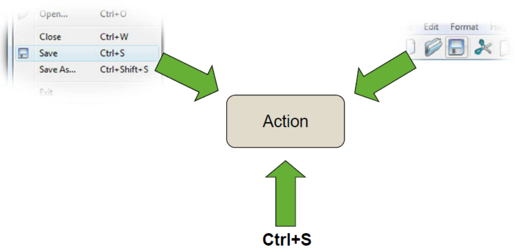
Introducing QAction

- Many UI elements refer to the same user action



Introducing QAction

- Action is an abstract user interface command
- Many UI elements refer to the same user action



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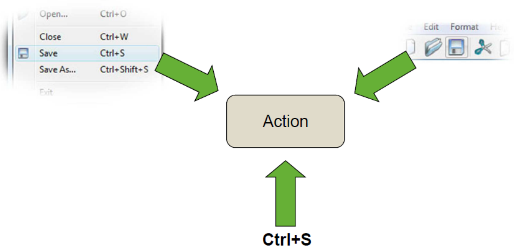

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  - and hold tool tips, status bar hints, etc

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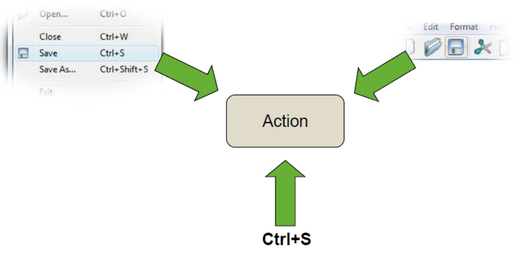

- A `QAction` object can represent all these access ways
  - and hold tool tips, status bar hints, etc
- Question: why do we want to do this?

Creating QAction

- Recall the problem we were confronted in last lecture (“disable on the GUI”)

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- Connected slot performs action defined by `QAction`

Creating QAction

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- A `QAction` encapsulates all settings needed for menus, tool bars and keyboard shortcuts. You couldn't add it to a random push button!
- Emits signal triggered on execution
- Connected slot performs action defined by `QAction`

```
void MainWindow::setupActions() {
    QAction* action = new QAction(tr("Open ..."), this);
    action->setIcon(QIcon(":/images/open.png"));
    action->setShortcut(QKeySequence::Open);
    action->setStatusTip(tr("Open file"));
    connect(action, SIGNAL(triggered()), this, SLOT(onOpen()));
    menu->addAction(action);
    toolbar->addAction(action);
    ...

```

QAction capabilities

- `setEnabled(bool)`
  - Enables and disables actions in menu and toolbars.

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QAction capabilities

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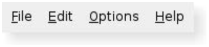
- `setCheckable(bool)`
  - Switches checkable state (on/off)
  - `setChecked(bool)` toggles checked state

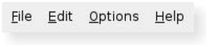
Creating menu bar

- `QMenuBar`: a horizontal menu bar



Creating menu bar

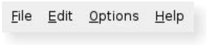
- `QMenuBar`: a horizontal menu bar



- `QMenu`: represents a menu

Creating menu bar

- QMenuBar: a horizontal menu bar



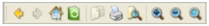
- QMenu: represents a menu
- QAction: menu items added to QMenu

```
void MainWindow::setupMenuBar() {
    QMenuBar* bar = menuBar();
    QMenu* menu = bar->addMenu(tr("&File"));
    menu->addAction(action);
    menu->addSeparator();
    QMenu* subMenu = menu->addMenu(tr("Sub Menu"));
    ...

```

Creating tool bar

- Tool bar is a *movable panel* ...
  - Contains set of controls



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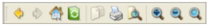

  - Can be horizontal or vertical

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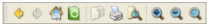

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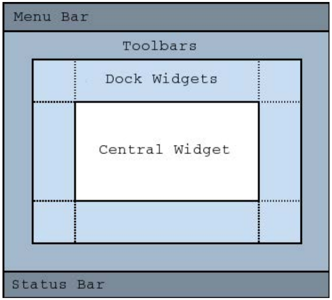

Tool bar implementation

Implemented in Qt by QToolBar class

- `QMainWindow::addToolbar(toolbar)`
  - Adds toolbar to main window

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```
void MainWindow::setupToolBar() {
    QToolBar* bar = addToolBar(tr("File"));
    bar->addAction(action);
    bar->addSeparator();
    bar->addWidget(new QLineEdit(tr("Find ...")));

```

QToolButton

Question: do you think the codes in the last slide would work?

QToolButton

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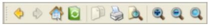

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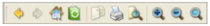

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- Yes and no.

QToolButton

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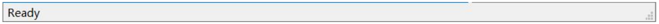
- We need to use `QToolButton` to get access to the `action` we just defined
- Question: can we use `QPushButton` instead?
- Yes and no.

```
QToolButton* button = new QToolButton(this);
button->setDefaultAction(action);
// Can have a menu
button->setMenu(menu);
// Shows menu indicator on button
button->setPopupMode(QToolButton::MenuButtonPopup);
// Control over text + icon placements
button->setToolButtonStyle(Qt::ToolButtonTextUnderIcon);

```

The status bar

- Horizontal bar: Suitable for presenting status information


Ready

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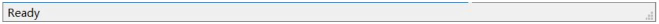

Ready

- `showMessage(message, timeout)`
  - Displays temporary message for specified milli-seconds

The status bar

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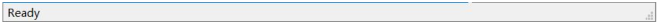
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- `clearMessage()`
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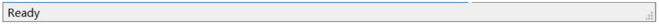

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  - Displays temporary message for specified milli-seconds
- `clearMessage()`
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- `addWidget()` or `addPermanentWidget()`
  - Normal, permanent messages displayed by widget

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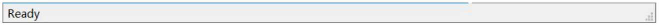
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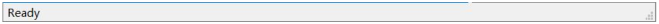
  - For example: progress bar

The status bar

- Horizontal bar: Suitable for presenting status information



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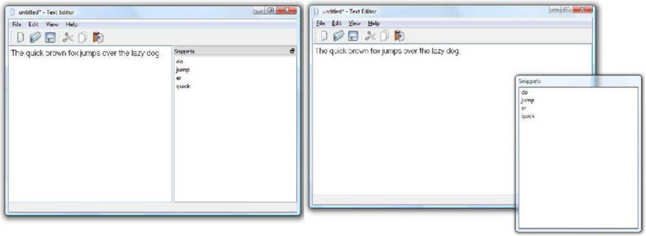
  - Removes any temporary message
- `addWidget()` or `addPermanentWidget()`
  - Normal, permanent messages displayed by widget
  - For example: progress bar

```
void MainWindow::createStatusBar() {
    QStatusBar* bar = statusBar();
    bar->showMessage(tr("Ready"));
    bar->addWidget(new QLabel(tr("Label on StatusBar")));

```

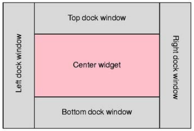
Dock widgets



- Dock widgets are detachable widgets placed around the edges of a `QMainWindow`
- Simply place your widget inside a `QDockWidget`
- `QMainWindow::addDockWidget` adds the docks to the window

Creating Dock Windows

- Window docked into main window
- `Qt::DockWidgetArea` enum
  - Left, Right, Top, Bottom dock areas
- `QMainWindow::setCorner(corner,area)`
  - Sets area to occupy specified corner
- `QMainWindow::setDockOptions(options)`
  - Specifies docking behavior (animated, nested, tabbed, ...)



```
void MainWindow::createDockWidget() {
    QDockWidget *dock = new QDockWidget(tr("Title"), this);
    dock->setAllowedAreas(Qt::LeftDockWidgetArea);
    QListWidget *widget = new QListWidget(dock);
    dock->setWidget(widget);
    addDockWidget(Qt::LeftDockWidgetArea, dock);
}

```

There is an excellent tutorial available online (in Chinese)

Files and file systems

Challenges

Referring to files and directories in a cross platform manner poses a number of problems.

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- Are paths separated by "/" or "\"?
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- Where is the application stored?

Path

- Use the `QDir` class to handle paths

```
QDir d = QDir("C:/");

```

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```
QDir d = QDir("C:/");

```

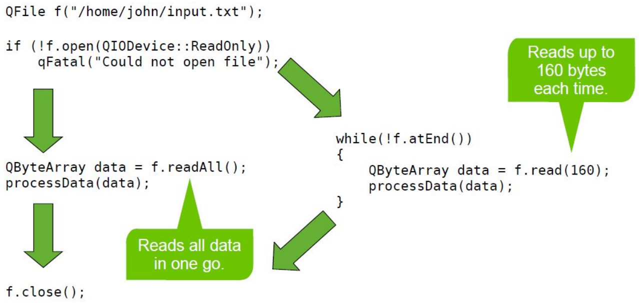
- Or, use the static methods to initialize

```
QDir d = QDir::root(); // C:/ on windows
QDir::current() // Current directory
QDir::home() // Home directory
QDir::temp() // Temporary directory
// Executable directory path
QDir(QApplication::applicationDirPath())

```

Opening and reading files

The `QFile` is used to access files



```
QFile f("/home/john/input.txt");

if (!f.open(QIODevice::ReadOnly))
    qFatal("Could not open file");

QByteArray data = f.readAll();
processData(data);

f.close();
```

```
while(!f.atEnd())
{
    QByteArray data = f.read(160);
    processData(data);
}
```

Writing to files

- When writing files, open it in `WriteOnly` mode and use the write method to add data to the file

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- Question: what else can we rely on to interact with files?

Resource system

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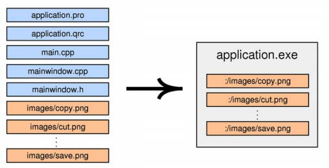

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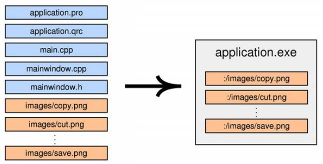

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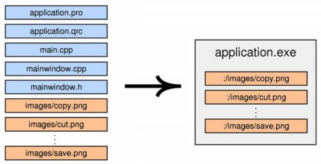

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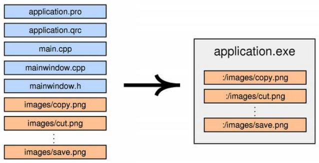
  - You can add anything into resources, not only icons



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Shared Libraries: Qt has to be pre-installed

+ Can deploy plugins
+ Qt libs shared between applications
+ Smaller, more flexible executables
- More files to deploy

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  - Example: Find/Search dialog

Qt provides a base class `QDialog`

Modal dialog

- There are two ways to set a dialog modal

Modal dialog

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  - Use `exec()`

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

Modal dialog

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  - Use `exec()`

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

```

  - Use `show()`, and set the `modal` property of the dialog

Modeless dialog

- Only use `show()`
  - Displays dialog
  - Returns control to caller

Modeless dialog

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  - 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
}

```

Asking for Files – QFileDialog

Allow users to select files or directories

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Allow users to select files or directories – include `<QFileDialog>`

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- Asking for a file name

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

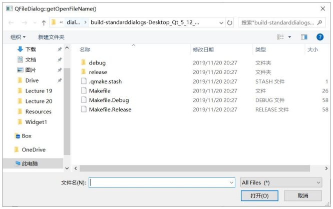

名称	修改日期	类型	大小
debug	2019/11/20 20:27	文件夹	
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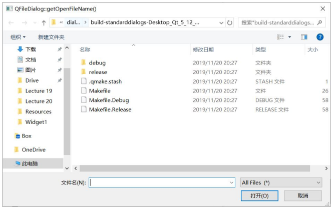

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- `QFileDialog::getOpenFileNames()`

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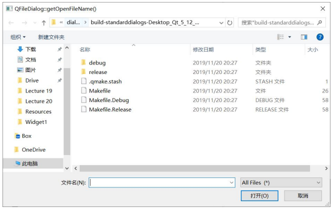

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- `QFileDialog::getOpenFileNames()` Returns one or more selected existing files

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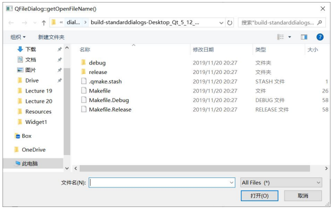

QFileDialog::getOpenFileName()

dial... › build-standarddialogs-Desktop_Qt_5_12_...

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文件名(N):
All Files (*)

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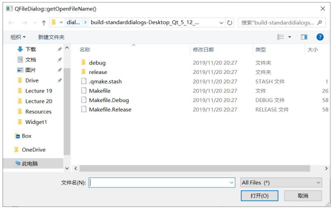

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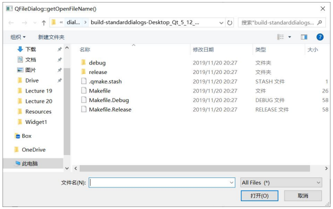
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打开(O) 取消

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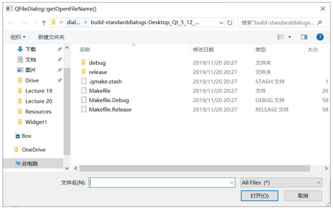

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Showing Messages – QMessageBox

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- informing the user

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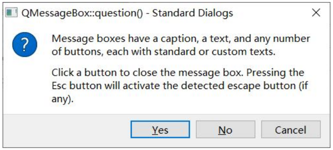
- Include <QMessageBox>

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


QMessageBox::question() - Standard Dialogs

Message boxes have a caption, a text, and any number of buttons, each with standard or custom texts.

Click a button to close the message box. Pressing the Esc button will activate the detected escape button (if any).

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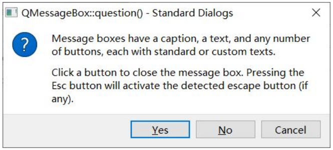
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- Other convenience methods

```
QMessageBox::information(...)
QMessageBox::warning(...)
QMessageBox::critical(...)
QMessageBox::about(...)
```

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Provides feedback on the progress of a slow operation.

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Example:

```
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

```

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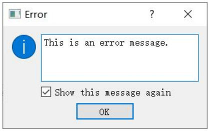
Modal vs modeless

Providing error messages - QErrorMessage

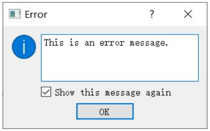


This is an error message.

☑ Show this message again

- Similar to QMessageBox

Providing error messages - QErrorMessage

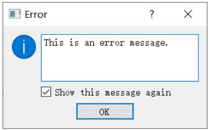


This is an error message.

☑ Show this message again

- Similar to QMessageBox but with a checkbox

Providing error messages - QErrorMessage



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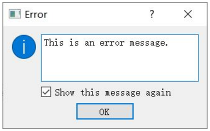
Providing error messages - QErrorMessage



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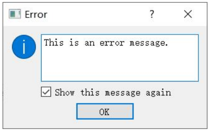
Providing error messages - QErrorMessage



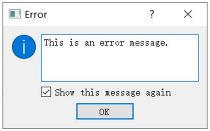
This is an error message.

- Similar to QMessageBox but with a checkbox and is modeless
- Asks if message shall be displayed again

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

```

Providing error messages - QErrorMessage


Error
This is an error message.

- Similar to QMessageBox but with a checkbox and is modeless
- Asks if message shall be displayed again

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

```

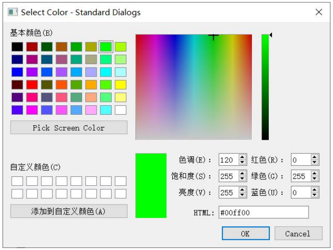
- Messages will be queued
  - Very useful, if there is no dedicated console to save the error messages

Other common dialogs

- Asking for Input - `QInputDialog`
  - `QInputDialog::getText(...)`
  - `QInputDialog::getInt(...)`
  - `QInputDialog::getDouble(...)`
  - `QInputDialog::getItem(...)`

Other common dialogs

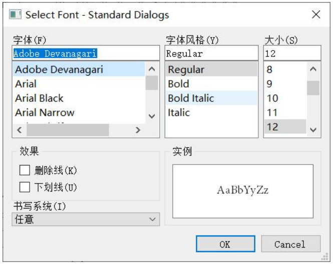
- Asking for Input - `QInputDialog`
  - `QInputDialog::getText(...)`
  - `QInputDialog::getInt(...)`
  - `QInputDialog::getDouble(...)`
  - `QInputDialog::getItem(...)`
- Selecting Color - `QColorDialog`
  - `QColorDialog::getColor(...)`



色调(H): 120 红色(R): 0
饱和度(S): 255 绿色(G): 255
亮度(V): 255 蓝色(U): 0
HTML: #00ff00

Other common dialogs

- Selecting Font - `QFontDialog`
  - `QFontDialog::getFont(...)`



Custom dialogs

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

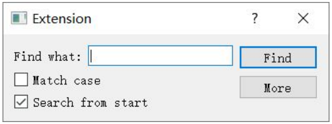
Custom dialogs

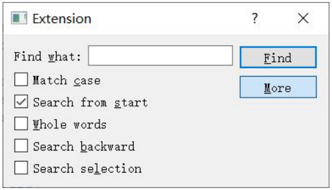
- Inherit from `QDialog`
- Create and layout widgets
- Use `QDialogButtonBox` for dialog buttons
  - Connect buttons to accept()/reject()

```
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() }
}

```

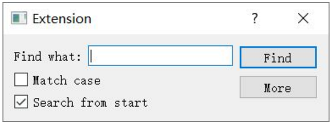
Dialogs with extensions

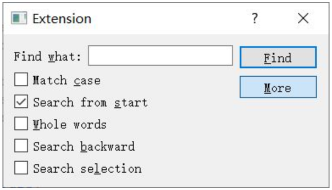




Dialogs with extensions

Use `QWidget::show()/hide()`



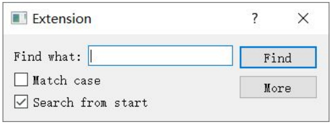


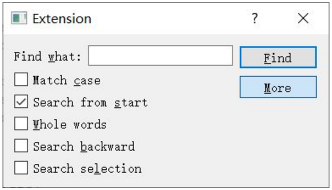
Dialogs with extensions

Use `QWidget::show()/hide()`

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

```





Dialogs with extensions

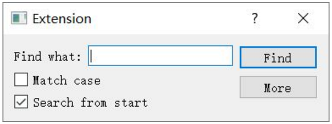
Use `QWidget::show()/hide()`

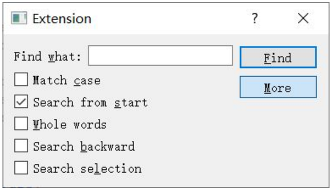
```
m_more = new QPushButton(tr("&More"));
m_more->setCheckable(true);

```

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

```





Qt Designer

In the past couple lectures, we have discussed how to create

- Widgets
- Layouts
- Main window
- Dialog
- Signal and slots

by coding.

Qt Designer

In the past couple lectures, we have discussed how to create

- Widgets
- Layouts
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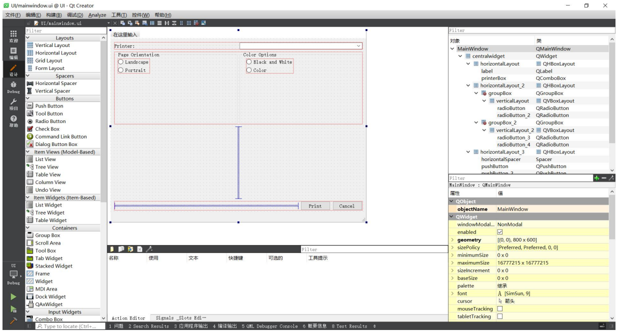
by coding.
We could also design the UI forms visually via Qt Designer

Designer views



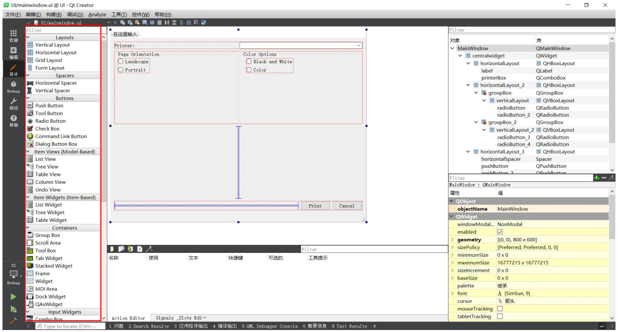
对象	类
MainWindow	QMainWindow
centralwidget	QWidget
horizontalLayout	QHBoxLayout
label	QLabel
printerBox	QComboBox
horizontalLayout_2	QHBoxLayout
groupBox	QGroupBox
verticalLayout	QVBoxLayout
radioButton	QRadioButton
radioButton_2	QRadioButton
groupBox_2	QGroupBox
verticalLayout_2	QVBoxLayout
radioButton_3	QRadioButton
radioButton_4	QRadioButton
horizontalLayout_3	QHBoxLayout
horizontalSpacer	Spacer
pushButton	QPushButton
pushButton_2	QPushButton

MainWindow : QMainWindow

属性	值
QObject	
objectName	MainWindow
QWidget	
windowModal...	NonModal
enabled	☑
geometry	[(0, 0), 800 x 600]
sizePolicy	[Preferred, Preferred, 0, 0]
minimumSize	0 x 0
maximumSize	16777215 x 16777215
sizeIncrement	0 x 0
baseSize	0 x 0
palette	继承
font	[SimSun, 9]
cursor	箭头
mouseTracking	☐
tabletTracking	☐

Designer views

- Widget box



对象	类
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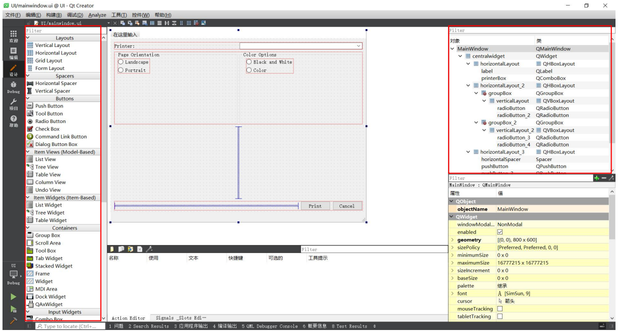
Designer views

- Widget box
- Object inspector



对象	类
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groupBox	QGroupBox
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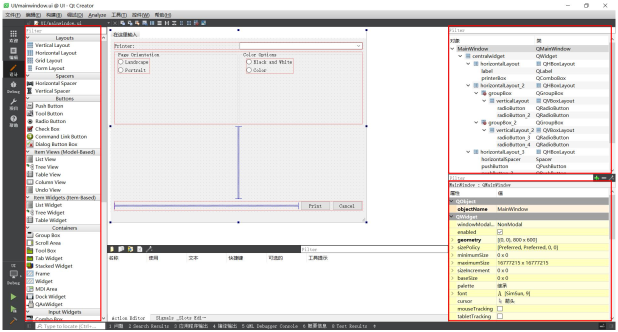
horizontalLayout_3	QHBoxLayout
horizontalSpacer	Spacer
pushButton	QPushButton

MainWindow : QMainWindow

属性	值
QObject	
objectName	MainWindow
QWidget	
windowModal...	NonModal
enabled	✓
geometry	[(0, 0), 800 x 600]
sizePolicy	[Preferred, Preferred, 0, 0]
minimumSize	0 x 0
maximumSize	16777215 x 16777215
sizeIncrement	0 x 0
baseSize	0 x 0
palette	继承
font	[SimSun, 9]
cursor	箭头
mouseTracking	☐
tabletTracking	☐

Designer views

- Widget box
- Object inspector
- Property editor



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Designer's UI form files

Question: what's the difference between the conventional method and visual designment?

Designer's UI form files

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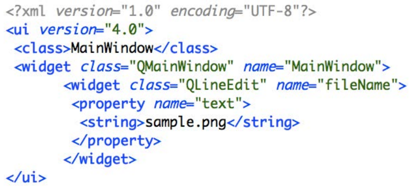
- Form stored in .ui file

Designer's UI form files

Question: what's the difference between the conventional method and visual designment?

- Form stored in .ui file in XML format

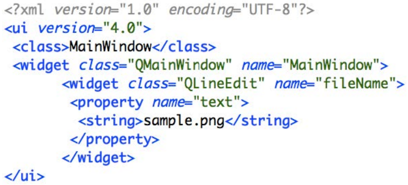


```xml
<?xml version="1.0" encoding="UTF-8"?>
<ui version="4.0">
 <class>MainWindow</class>
 <widget class="QMainWindow" name="MainWindow">
       <widget class="QLineEdit" name="fileName">
        <property name="text">
         <string>sample.png</string>
        </property>
       </widget>
</ui>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

Designer's UI form files

Question: what's the difference between the conventional method and visual designment?

- Form stored in .ui file in XML format
- `uic` tool is called to generate codes

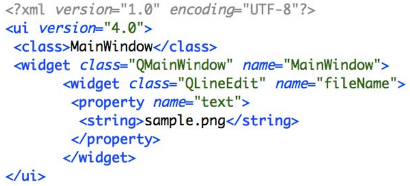


```
<?xml version="1.0" encoding="UTF-8"?>
<ui version="4.0">
 <class>MainWindow</class>
 <widget class="QMainWindow" name="MainWindow">
       <widget class="QLineEdit" name="fileName">
        <property name="text">
         <string>sample.png</string>
        </property>
       </widget>
</ui>
```

Designer's UI form files

Question: what's the difference between the conventional method and visual designment?

- Form stored in .ui file in XML format
- `uic` tool is called to generate codes from myform.ui to ui_myform.h



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Designer's UI form files

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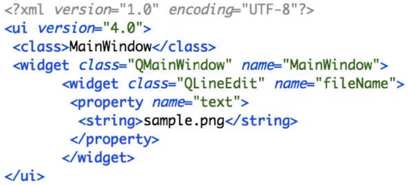

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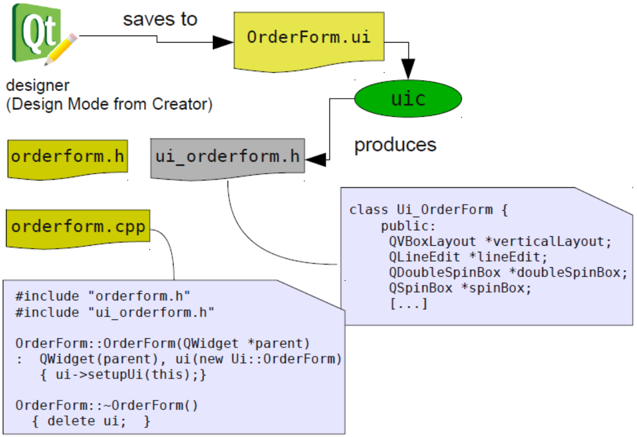
      <widget class="QLineEdit" name="fileName">
       <property name="text">
        <string>sample.png</string>
       </property>
      </widget>
</ui>
```

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

```

From .ui to C++



```
class Ui_OrderForm {
    public:
     QVBoxLayout *verticalLayout;
     QLineEdit *lineEdit;
     QDoubleSpinBox *doubleSpinBox;
     QSpinBox *spinBox;
     [...]
```

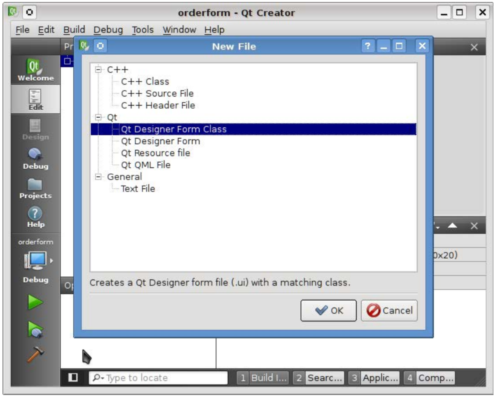
```
#include "orderform.h"
#include "ui_orderform.h"

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

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

Qt Creator - Form Wizards

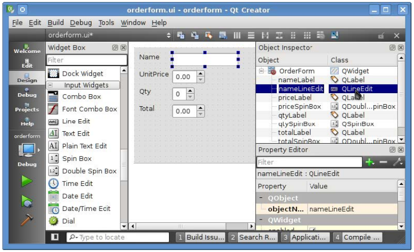
- Add New... "Designer Form"
- or "Designer Form Class" (for C++ integration)



Creates a Qt Designer form file (.ui) with a matching class.

Naming widgets

- Place widgets on form
- Edit `objectName` property



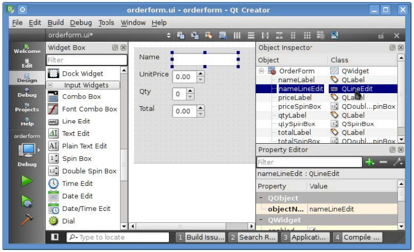
Object	Class
OrderForm	QWidget
nameLabel	QLabel
nameLineEdit	QLineEdit
priceLabel	QLabel
priceSpinBox	QDoubl...pinBox
qtyLabel	QLabel
qtySpinBox	QSpinBox
totalLabel	QLabel
totalSpinBox	QDoubl...pinBox

nameLineEdit : QLineEdit

Property	Value
QObject	
objectN...	nameLineEdit
QWidget	

Naming widgets

- Place widgets on form
- Edit `objectName` property



Object	Class
OrderForm	QWidget
nameLabel	QLabel
nameLineEdit	QLineEdit
priceLabel	QLabel
priceSpinBox	QDoubl...pinBox
qtyLabel	QLabel
qtySpinBox	QSpinBox
totalLabel	QLabel
totalSpinBox	QDoubl...pinBox

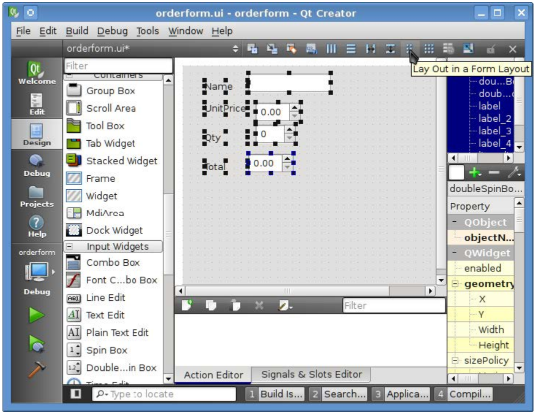
nameLineEdit : QLineEdit

Property	Value
QObject	
objectN...	nameLineEdit
QWidget	

- objectName defines member name in generated code

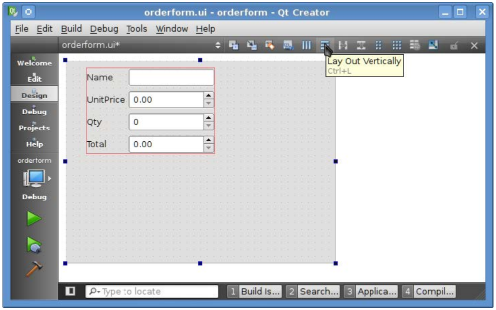
Form layout

QFormLayout: Suitable for most input forms



Top-level layout

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



Preview

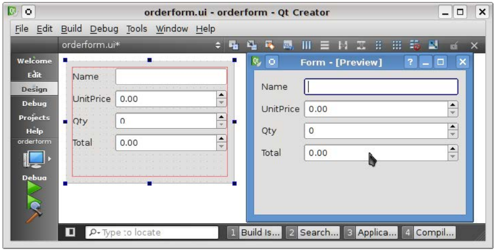
Check whether the widget is nicely resizable

Preview

Check whether the widget is nicely resizable
Tool→Form Editor→Preview

Preview

Check whether the widget is nicely resizable
Tool→Form Editor→Preview



Name
UnitPrice 0.00
Qty 0
Total 0.00

Header

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

```

Header

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

```

- “Your Widget” derives from appropriate base class

Header

```
// orderform.h
class Ui_OrderForm;
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private:
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```

- "Your Widget" derives from appropriate base class
- `*ui` member encapsulate UI class

Header

```cpp
// orderform.h
class Ui_OrderForm;
class OrderForm : public QDialog {
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```

- "Your Widget" derives from appropriate base class
- `*ui` member encapsulate UI class
- Question: what's the benefit of encapsulation?

Header

```
// 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
- Question: what’s the benefit of encapsulation?
- Makes header independent of designer generated code

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;
}

```

Signal and slots in Designer

There are two ways to implement

Signal and slots in Designer

There are two ways to implement

- Traditionally
- Visually

Signal and slots in Designer

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- Traditionally
  - Widgets created in UI could be accessed as public members
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Signal and slots in Designer

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Signal and slots in Designer

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  - Widgets created in UI could be accessed as public members
  - Then setup conventionally
  - `connect(ui->okButton, SIGNAL(clicked()), ...`
- Visually

Signal and slots in Designer

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- Traditionally
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  - `connect(ui->okButton, SIGNAL(clicked()), ...`
- Visually
  - Qt Creator: right-click on widget and "Go To Slot"

Signal and slots in Designer

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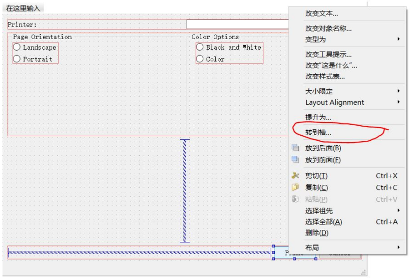
- Visually
  - Qt Creator: right-click on widget and "Go To Slot"


在这里输入
Printer:
Page Orientation
Landscape
Portrait
Color Options
Black and White
Color
改变文本...
改变对象名称...
变型为
改变工具提示...
改变"这是什么"...
改变样式表...
大小限定
Layout Alignment
提升为...
转到槽...
放到后面(B)
放到前面(F)
剪切(T) Ctrl+X
复制(C) Ctrl+C
粘贴(P) Ctrl+V
选择祖先
选择全部(A) Ctrl+A
删除(D)
布局