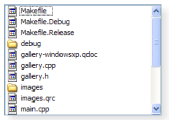
Qt Fundamentals: Widgets and Layouts

Common Widgets: Buttons

- All buttons inherit the QAbstractButton base class.
- Signals
  - **clicked**() - emitted when the button is clicked (button released)
  - **toggled**(bool) - emitted when the check state of the button is changed
- Properties
  - `checkable` - true if the button can be checked. Make a push button toggle
  - `checked` - true when the button is checked
  - text - the text of the button
  - icon - an icon on the button (can be displayed together with text)

Common Widgets: Item Widgets



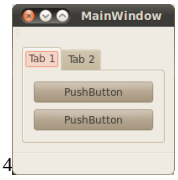
- **`QListWidget`** is used to show a list of items
- Adding items
  - `addItem(QString)` - appends an item to the end of the list
  - insertItem(int row, QString) - inserts an item at the specified row
- Selection
  - `selectedItems` - returns a list of `QListWidgetItem`'s, use `QListWidgetItem::text()` to get the text
- Signals
  - `itemSelectionChanged` - emitted when the selection is changed

- **`QComboBox`** is another way (more compact) to show a list of strings.

Common Widgets: Containers

Good to know:
- QGroupBox
- QTabWidget
- QStackedWidget

- Container widgets are used to give structure to the user interface
- They can be consider passive
- A plain QWidget can be used as a container
- **Designer:** Place widgets in the container and apply a layout to the container
- **Code:** Create a layout for the container and add the widgets to the layout

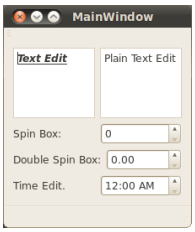



```
QGroupBox *box = new QGroupBox();
QVBoxLayout *layout = new QVBoxLayout(box);
layout->addWidget(...);
```


Common Widgets: Input Widgets

- There is a large choice of widgets for editing.
- Value input properties
  - value - current value
  - maximum - maximum value
  - minimum - minimum value

- Text widgets properties
  - readOnly
  - etc.



Common Widgets: Display Widgets

- The **QLabel** can be used to both display text or pictures
- Access through:
  - `setText()`
  - `setPixmap()`

- Input widgets made read-only also serve as display widgets

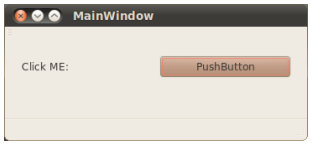

```
ui->forImage->setPixmap(QPixmap(":/qtlogo.jpg"));
ui->forImage->setScaledContents(true);
ui->forImage->setSizePolicy(QSizePolicy::Ignored, QSizePolicy::Ignored);
```

Size Policies

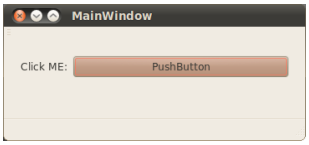
- Layouts manage size negotiation between the widget and the layout
- Layouts are used to bring structure
  - horizontal and vertical boxes (**`QHBoxLayout`**, **`QVBoxLayout`**)
  - grid (**`QGridLayout`**)
  - etc.
- Widgets supply
  - size policies for each direction
  - minimum and maximum sizes

Size Policies

Setting the horizontal size policy to expanding




```
ui->pushButton->setSizePolicy(QSizePolicy::Expanding, QSizePolicy::Fixed);
```



Size Policies

- Each widget has a size hint that is combined with a policy for each direction

- **`Fixed`** - the size hint specifies the size of the widget
- **`Minimum`** - the size hint specifies the **smallest size** of the widget
- **`Maximum`** - the size hint specifies the **largest size** of the widget
- **`Preferred`** - the size hint specified **is preferred**, but not required
- **`Expanding`** - as Preferred, but **wants to grow**
- **`MinimumExpanding`** - as Minimum, but **wants to grow**
- **`Ignored`** - the size hint is ignored, widget gets **as much space as possible**

Size Policies

- Each widget has a size hint that is combined with a policy for each direction

- `Fixed` – fixed to size hint
- `Minimum` – can grow
- `Maximum` – can shrink
- `Preferred` – can grow, can shrink
- `Expanding` – can grow, can shrink, wants to grow
- `MinimumExpanding` – can grow, wants to grow
- `Ignored` – the size hint is ignored, can grow, can shrink

More on sizes

- Widgets sizes can be further controlled using the minimum and maximum sizes

```
ui->pushButton->setMinimumSize(100,150);
ui->pushButton->setMaximumSize(150, 200);
```


Top-level Windows

- Widgets without a parent widget automatically become a window

- `QWidget` - a plain window, usually non-modal
- `QDialog` - a dialog, usually expecting a result such as Ok, Cancel, etc.
- `QMainWindow` - an application window with menus, toolbars, statusbar, etc.

- `QDialog` and `QMainWindow` inherit `QWidget`

Ready made dialogs

- **`QFileDialog`** - the `QFileDialog` class provides a dialog that allow users to select files or directories.
- **`QFontDialog`** - the QFontDialog class provides a dialog widget for selecting a font
- **`QColorDialog`** - the QColorDialog class provides a dialog widget for specifying colors.
- **`QInputDialog`** - the QInputDialog class provides a simple convenience dialog to get a single value from the user.
- **`QProgressDialog`** - the QProgressDialog class provides feedback on the progress of a slow operation
- and more

Message boxes

The `QMessageBox` class provides a modal dialog for informing the user or for asking the user a question and receiving an answer.

- Easy to use through the static functions:

Static functions are available for creating information(), question(), warning(), and critical() message boxes.

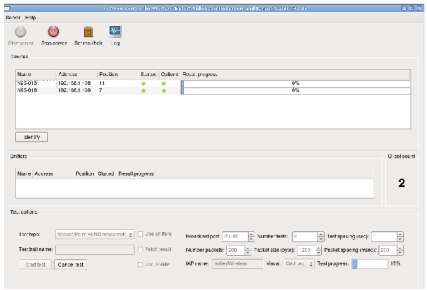
```
int ret = QMessageBox::warning(this, tr("My Application"),
                               tr("The document has been modified.\n"
                                  "Do you want to save your changes?"),
                               QMessageBox::Save | QMessageBox::Discard
                               | QMessageBox::Cancel,
                               QMessageBox::Save);
```

Note, one some platforms they all look the same :)

Using QMainWindow

A `QMainWindow` is the document windows of typical desktop applications

- Menus
- Toolbar
- Statusbar
- Docks
- Central widget



Introducing QAction

A QAction can be inserted into user interface components like toolbars and menus (but also used for keyboard shortcuts).

Lets see one in action:

```
openAct = new QAction(QIcon(":/images/open.png"), tr("&Open..."), this);
openAct->setShortcuts(QKeySequence::Open);
openAct->setStatusTip(tr("Open an existing file"));
connect(openAct, SIGNAL(triggered()), this, SLOT(open()));

fileMenu->addAction(openAct);
fileToolBar->addAction(openAct);
```

Inside QMainWindow it is even easier:

```
menuBar()->addAction("hello", this, SLOT(recv()));
```