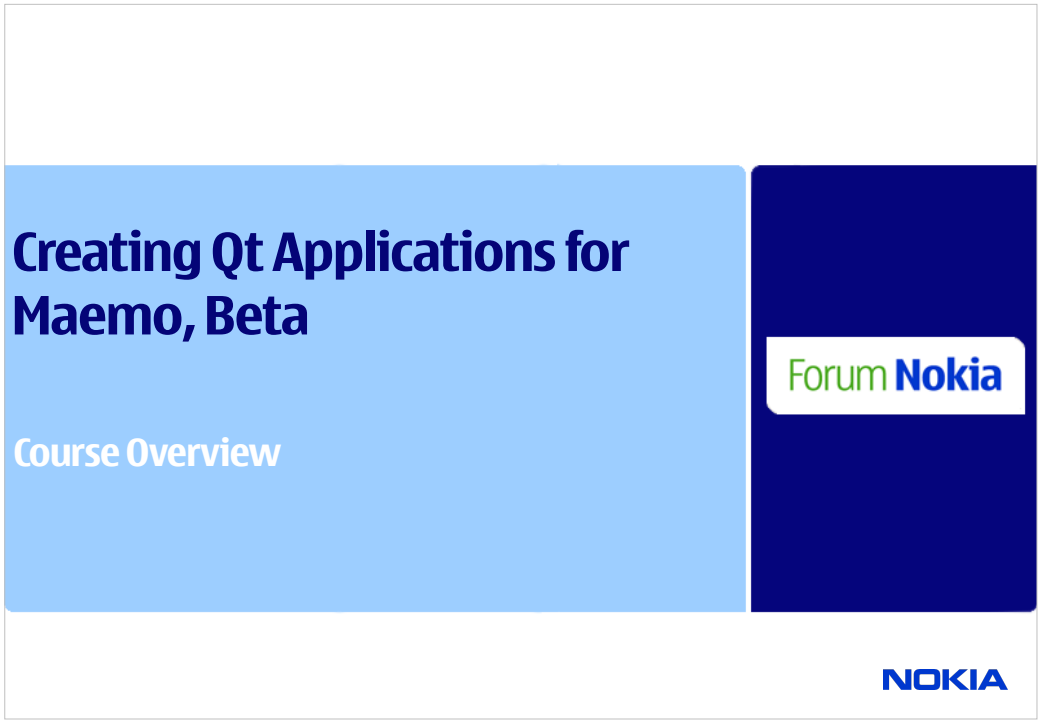

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Course Objectives and Prerequisites

Forum Nokia

- Objective is to study developing Qt applications for Maemo 5 platform
  - Get familiar with Maemo platform and the development tools
  - Learn porting Qt applications from other platforms to Maemo
  - Learn fine-tuning the UI for Maemo
  - Learn Qt features only available in Maemo
- It is assumed that the course attendant has
  - Basic knowledge of Qt
  - Some previous Linux or Maemo knowledge is a big advantage

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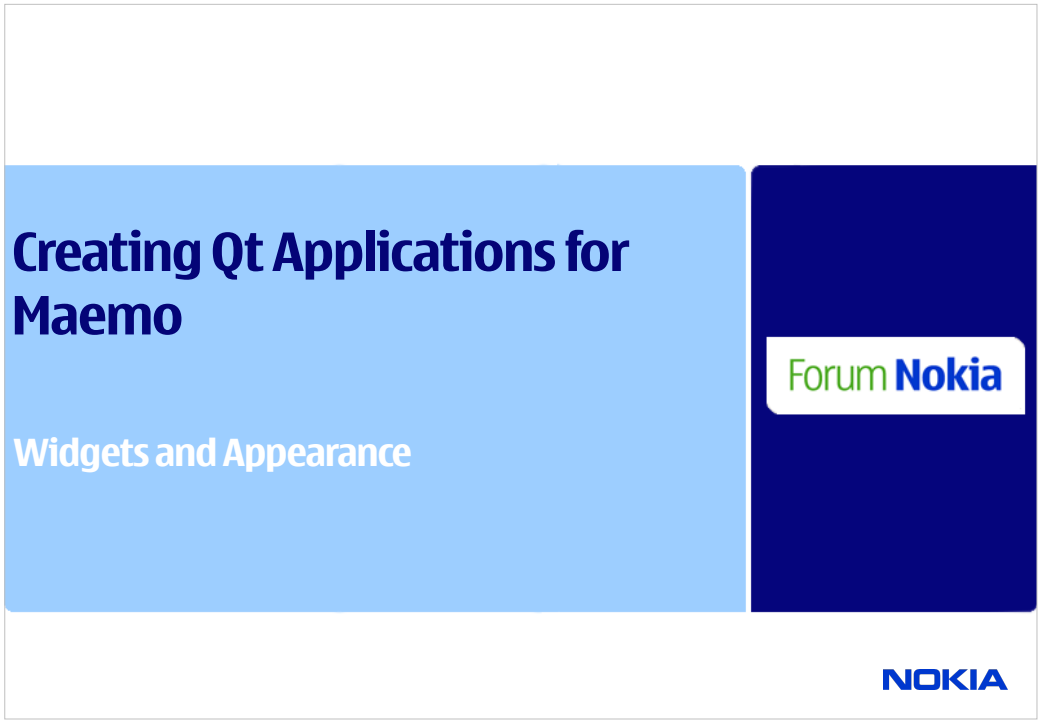

Take a look at the following Forum Nokia documents to learn about the visual aspects of Maemo applications. Especially the UI Style Guide is worth checking for any developers.

•http://www.forum.nokia.com/info/sw.nokia.com/id/eb8a68ba-6225-4d84-ba8f-a00e4a05ff6f/Hildon_2_2_UI_Style_Guide.html

•http://www.forum.nokia.com/info/sw.nokia.com/id/e778ba1f-2507-4672-be45-798359a3aea7/Fremantle_Master_Layout_Guide.html

•http://www.forum.nokia.com/info/sw.nokia.com/id/019c2b31-3777-49a0-9257-970d79580756/Hildon_2_2_Widget_UI_Specification.html

•http://www.forum.nokia.com/info/sw.nokia.com/id/97e9b8e0-904c-4141-bb8a-91d4f519735f/Maemo_5_Desktop_Widget_UI_Guidelines.html

•http://www.forum.nokia.com/info/sw.nokia.com/id/75994a4a-382b-4a60-aaf2-2446f9e8c4f3/Web_Design_Guidelines_for_the_Nokia_N900.html

"Hildonizing" Qt

Forum Nokia

- Qt for Maemo provides very Hildonized widgets already
  - Qt widgets behaving in Hildon way
  - There is no mapping between Qt and Maemo widgets
- Integration to Hildon input method server
  - Completely Maemo/Hildon-specific implementation
- Porting Qt software from other platforms is often rather straightforward
- Things to consider
  - Smallish screen, mainly used in landscape orientation
  - Finger usage and finger scrollable
  - Virtual keyboard may appear (does it fit on the screen?)
  - Consistent UI with other applications and utilizing Hildon-specific widgets
  - Avoid absolute layout

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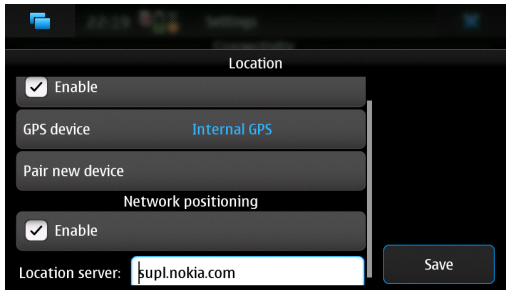
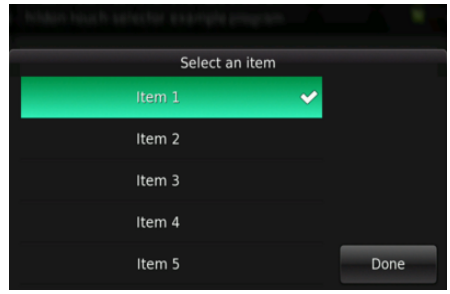
Recall Hildon from the Maemo Software Architecture diagram. In short Hildon is an application framework for Linux operating system mobile devices (PDAs, mobile phones, etc) that focuses on providing a finger friendly interface. It is developed by Nokia for Maemo and now a part of GNOME.

"Hildonizing" Qt

Forum Nokia

- Improved finger usability and screen real estate usage
- Lists and window panes scrollable with finger from window pane
- New dialog layout, no cancel button, cancel action by clicking outside of dialog





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Maemo Styles

Forum Nokia

- Default style is Maemo style
- QCleanlooks, Windows and Plastique styles also supported
- Styling made in Qt way
- Widgets painted using a selected style
- Style can be changed
  - During application launch
    - `./myqtapplication -style windows`
  - Dynamically when running the application in the code
    - For the application by using `QApplication::setStyle(QStyle* style)`
    - For certain widget by using `QWidget::setStyle(QStyle* style)`
- In some details Qt Maemo style may not be 100% similar to Hildon

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Look-and-Feel Customization

Forum Nokia

- There are three levels to customize widgets look-and-feel
  - By writing custom widgets with custom paintEvent() and other event handler functions
    - Lot of work to derive from all QWidget classes
  - By changing widget's style
    - Override QStyle or any of its sub-classes
    - QMaemoStyle – platform-level default style in Maemo
      - Provides Maemo look-and-feel
  - By using style sheets
    - Interpreted at run-time
    - Override QStyle definitions
    - May be slow, if large definitions

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How to Handle Maemo Specific Implementation?

Forum Nokia

- Maemo Qt 4.6 specific parts should be separated as follows:

```
#ifdef Q_WS_MAEMO_5
// maemo5-specific implementation added here
#endif
```

```
maemo5 {
# maemo5-specific configuration added here in .pro file
}
```

- Consider also using the private implementation programming idiom to separate platform specific implementations
- Remember to add `QT += dbus maemo5` (inside maemo5 scope) into your .pro file and add dependencies to libqt4-maemo5 to use maemo5 specific widgets introduced next

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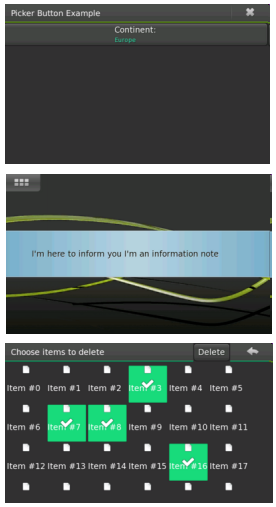
Maemo 5 Specific Widgets

Forum Nokia

- Some currently available Maemo 5 specific widgets in Qt 4.6:
  - QMaemo5ValueButton: Implements a picker button, basically a button with an extra value
  - QMaemo5AbstractPickSelector: An abstract interface to implement Maemo 5 “pickers”, plus a picker implementations for time picking (QMaemo5TimePickSelector) etc
  - QMaemo5InformationBox: Support for Maemo 5 banners and notes
  - QMaemo5EditBar: Support for Maemo 5 edit toolbar
- Note that these APIs are Maemo 5 specific only.
- Kinetic scrolling can be enabled with the help of QAbstractKineticScroller in Qt 4.6 for Maemo



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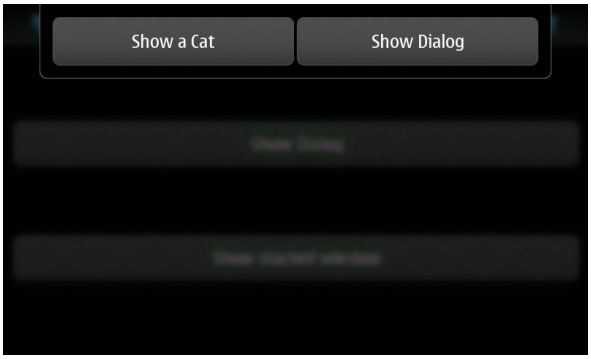
Code examples of these rather simple widgets are available in the ”widgets” example of the Qt for Maemo package, which is also bundled with this training material in examples\maemo5 folder.

See also the other examples in examples\maemo5 folder included in the Qt for Maemo package for more Maemo specific examples.

...More about Maemo 5 UI – Menus

Forum Nokia

- Maemo 5 does not use hierarchical menus that are difficult to use with fingers
- Just add QActions directly to QMenuBar
- Remember to keep the number of items small
- Menu bar is property of the window manager in Maemo



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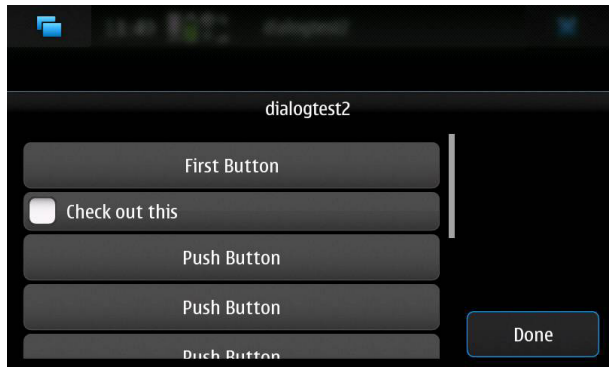
```
MyMainWindow::MyMainWindow()
 {
 QMenuBar *menuBar=new QMenuBar();
 QAction *showCat=new QAction("Show a Cat",this);
 menuBar->addAction(showCat);
 connect(showCat,SIGNAL(triggered()),this,SLOT(show_mainw2()));
 QAction *showDialog=new QAction("Show Dialog",this);
 menuBar->addAction(showDialog);
 connect(showDialog,SIGNAL(triggered()),this,SLOT(show_dialog()));
 setMenuBar(menuBar);
 …
 }
```

...More about Maemo 5 UI – Dialogs

Forum Nokia

- Make a normal dialog
- Put content in QScrollArea
- Activate finger scrollable
- QAbstractKineticScroller is enabled for QScrollArea by default in Qt 4.6 for Maemo
- Put content in QVerticalBoxLayout inside of scroll area
- Consider using Qt Designer (Qt Creator) for composing widgets



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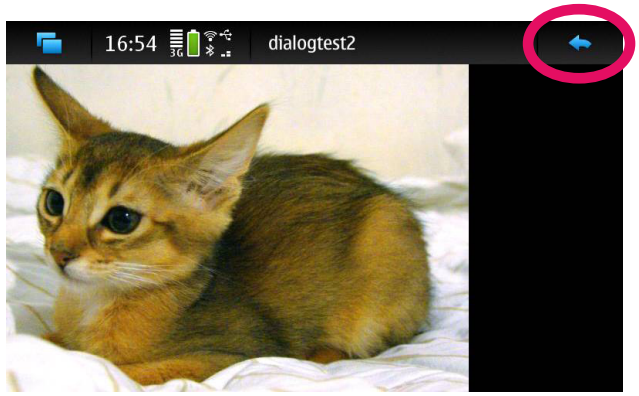
```
void MyMainWindow::SetupDialog()
 {
 // dialog content placed inside scroll area
 dialog = new QDialog(this);
 QScrollArea *scrollArea = new QScrollArea(dialog);
 scrollArea->setWidgetResizable(true);

 // activate scrolling
#ifdef Q_WS_MAEMO_5
 // Scrolling is activated for QAbstractItemView  and QScrollArea by default,
 // according to the qt 4.6.2 for maemo docs
#else
 // older maemo versions must set the property “FingerScrollable” to true.
   scrollArea->setProperty("FingerScrollable",true);
#endif

 // place content in vertical layout
 QWidget *scrollAreaWidgetContents = new QWidget();
 QVBoxLayout *verticalLayout = new QVBoxLayout(scrollAreaWidgetContents);
 verticalLayout->addWidget(new QPushButton("First Button",scrollAreaWidgetContents));
 verticalLayout->addWidget(new QCheckBox("Check out this",scrollAreaWidgetContents));
 for(int i=0;i<10;i++)
  verticalLayout->addWidget(new QPushButton("Push Button",scrollAreaWidgetContents));

 // OK button and overall horizontal layout
 QDialogButtonBox *buttonBox = new QDialogButtonBox(dialog);
 buttonBox->setOrientation(Qt::Vertical);
 buttonBox->setStandardButtons(QDialogButtonBox::Ok);
 buttonBox->setCenterButtons(false);
 scrollArea->setWidget(scrollAreaWidgetContents);
 QHBoxLayout *horizontalLayout = new QHBoxLayout(dialog);
 horizontalLayout->addWidget(scrollArea);
 horizontalLayout->addWidget(buttonBox);
 }
```

...More about Maemo 5 UI – Stacked Windows

Forum Nokia

- A stack sets the hierarchical relationships between windows. A child window is on top of its parent window. That allows navigation to previous window by removing the topmost window
- Users can only see and interact with the window on the top of stack until it is closed



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The child window needs to set the Maemo5StackedWindow attribute.

```
MyMainWindow::MyMainWindow()
 {
 #ifdef Q_WS_MAEMO_5
   setAttribute(Qt::WA_Maemo5StackedWindow);
 #endif
 b2=newQPushButton(”Show stacked window”);
 mainw2=new QMainWindow(this);
 #ifdef Q_WS_MAEMO_5
   mainw2->setAttribute(Qt::WA_Maemo5StackedWindow);
 #endif
 connect(b2,SIGNAL(clicked()),this,SLOT(show_mainw2()));
 …
 }

void MyMainWindow::show_mainw2()
 {
 mainw2->show();
 }
```

...More about Maemo 5 UI – Setting the orientation

Forum Nokia

- Qt applications are always shown in landscape mode by default.
- In order to set the application to portrait (vertical) orientation the Qt::WA_Maemo5PortraitOrientation attribute must be set on a top-level widget.

```
void Window::toggleLandscape(bool b)
{
    setAttribute(Qt::WA_Maemo5AutoOrientation, !b);
    setAttribute(Qt::WA_Maemo5LandscapeOrientation, b);
    relayout();
}
```

- Qt will handle rotation behind the scenes and re-layout all widgets accordingly.
  - In order to explicitly react on screen rotation, the QDesktopWidget::resized() signal can be used. This signal is emitted every time the device's screen rotates.

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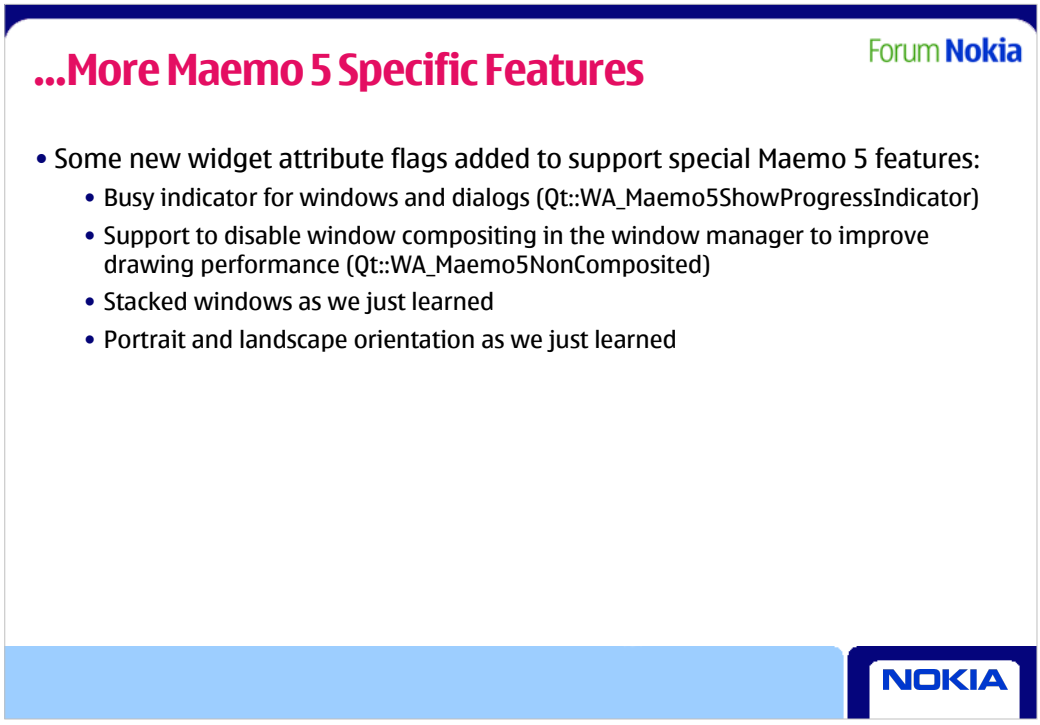
The Qt widget attribute constants related to the orientation are:

•Qt::WA_Maemo5LandscapeOrientation

•Qt::WA_Maemo5PortraitOrientation

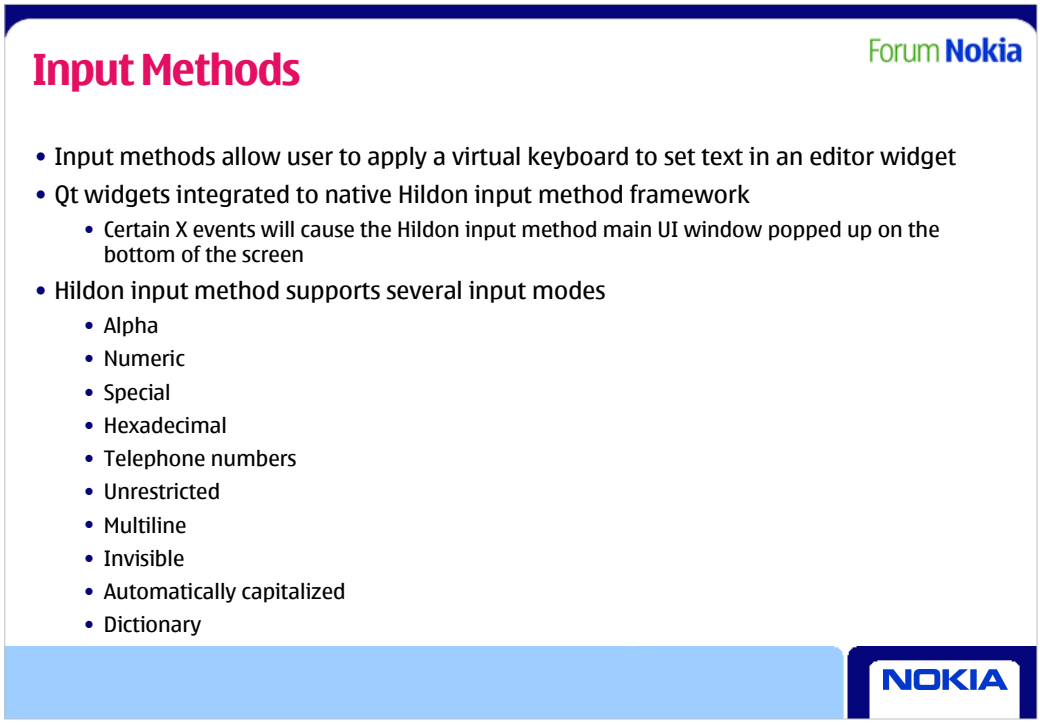
•Qt::WA_Maemo5AutoOrientation



Maemo-specific widget attributes in qnamespace.h:

- WA_Maemo5ShowProgressIndicator
- WA_Maemo5NonComposited
- WA_Maemo5StackedWindow
- WA_Maemo5PortraitOrientation
- WA_Maemo5LandscapeOrientation
- WA_Maemo5AutoOrientation

See also http://doc.qt.nokia.com/qt-maemo-4.6/qt.html



Input methods:

•HILDON_GTK_INPUT_MODE_ALPHA alphabetical characters and whitespace

•HILDON_GTK_INPUT_MODE_NUMERIC numbers 0-9 and the '-' character

•HILDON_GTK_INPUT_MODE_SPECIAL special characters

•HILDON_GTK_INPUT_MODE_HEXA hexadecimal characters; numbers 0-9, characters a-f, and A-F

•HILDON_GTK_INPUT_MODE_TELE telephone numbers; numbers 0-9, whitespace, and the characters "pwPW/().-+*#?,"

•HILDON_GTK_INPUT_MODE_FULL unrestricted entry mode, combination of the alpha, numeric and special modes.

•HILDON_GTK_INPUT_MODE_MULTILINE the client contains multiple lines of text or accepts linebreaks in the input.

•HILDON_GTK_INPUT_MODE_INVISIBLE do not echo or save the input in the IM when entering sensitive information such as passwords.
HILDON_GTK_INPUT_MODE_AUTOCAP automatically capitalize the first letter at the start of a sentence.

•HILDON_GTK_INPUT_MODE_DICTIONARY enable predictive dictionaries and learning based on the input.

See also http://wiki.maemo.org/Qt4_Hildon_Legacy#Diablo_2

How to Set the Input Mode?

Forum Nokia

- To force only digits to be accepted in QLineEdit:

```
QLineEdit *qLineEdit = new QLineEdit(...);
Qt::InputMethodHint hints = Qt::ImhDigitsOnly;
qLineEdit->setInputMethodHints(hints);
```

- Each kind of widget can set its input method hints. Qt widgets like QTextEdit, QLineEdit, etc., set the right input method mode automatically
- Notice some hardcoded keys in QMainWindow
  - F6 – Toggle full screen
  - F4 – Shows/hides the application menu
  - Zoom in – standard key sequence `QKeySequence::ZoomIn`
  - Zoom out – standard key sequence `QKeySequence::ZoomOut`

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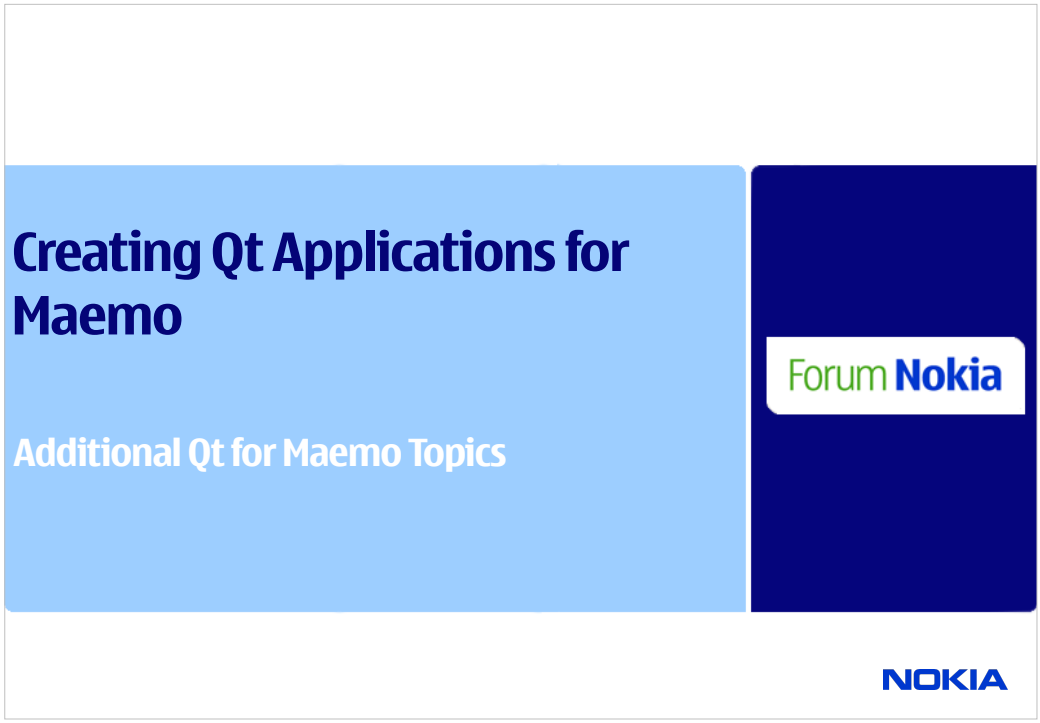
QHildonInputContext is a Maemo-specific input context, which takes the widget's input method hints and sets the corresponding Maemo-specific Hildon input mode in setFocusWidget method.

See also QLineEdit's setEchoMode method.



OpenGL-ES2.0 Support

Forum Nokia

- Hardware-accelerated OpenGL-ES2.0 in Omap3 based devices like N900 (but not N800 and N810 which are Omap2 based)
- By default QGraphicsView is not using OpenGL-ES2.0 for drawing
- You can switch it on from command line- gr aphi cssyst em opengl
- You can enable it in code just setting viewport to beQGLWidget

```
myView *view  = new myView();
view->setViewport(new
QGLWidget(QGLFormat(QGL::SampleBuffers)));
```

- QGLWidget make Qt a perfect OpenGL wrapper for application developer
- You can mix Qt widgets, Qt API and OpenGL API

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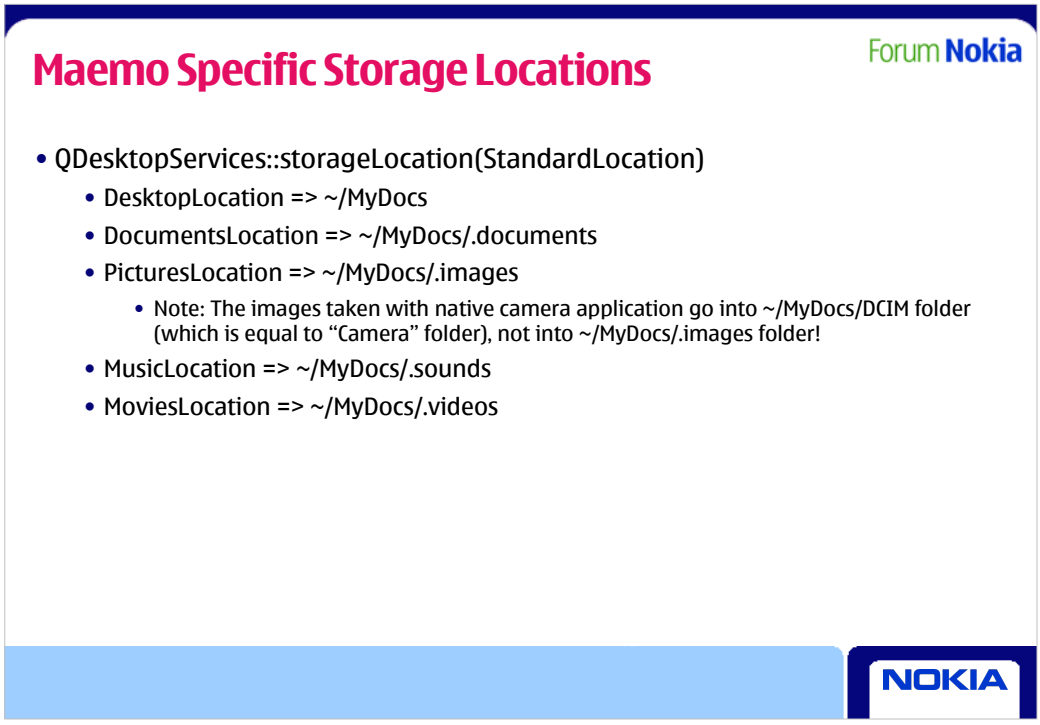
Imagination Technologies SDK x86 Linux OpenGL-ES2.0 emulation library .deb package can installed to under scratchbox (libgles2-dev_1-1_i386.deb)

• Imagination technologies SDK:
http://www.imgtec.com/powervr/insider/sdk/KhronosOpenGLES2xSGX.asp

Maemo OpenGL-ES wiki page

• http://wiki.maemo.org/OpenGL-ES



QString QDesktopServices::storageLocation(StandardLocation type) returns specific Maemo locations for these types:

-DesktopLocation: QDir::homePath() + QLatin1String("/MyDocs"), instead of QDir::homePath() + QLatin1String("/Desktop")

-DocumentsLocation: QDir::homePath() + QLatin1String("/MyDocs/.documents"), instead of QDir::homePath() + QLatin1String("/MyDocs/.documents")

-PicturesLocation: QDir::homePath() + QLatin1String("/MyDocs/.images"), instead of QDir::homePath() + QLatin1String("/Pictures")

-MusicLocation: QDir::homePath() + QLatin1String("/MyDocs/.sounds"), instead of QDir::homePath() + QLatin1String("/Music")

-MoviesLocation: QDir::homePath() + QLatin1String("/MyDocs/.videos"), instead of QDir::homePath() + QLatin1String("/MyDocs/.videos")

Using D-Bus

Forum Nokia

- D-Bus was mentioned when we talked about Maemo Software Architecture
- It is an Inter-Process Communication (IPC) and Remote Procedure Calling (RPC) for Linux (including Maemo), and available via QtDBus module
- See:
  - http://qt.nokia.com/doc/4.6/intro-to-dbus.html
  - http://qt.nokia.com/doc/4.6/qtdbus.html
- To use QtDbus add in your project file: `CONFIG += dbus`
  - Remember that QtDBus is not available on all platforms
- An example of using D-Bus to request notifications is given in the next slide

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Applications using the QtDBus module can provide services to other, remote applications by exporting objects, as well as use services exported by those applications by placing calls and accessing properties. The QtDBus module provides an interface that extends the Qt Signals and Slots mechanism, allowing one to connect to a signal emitted remotely as well as to connect a local signal to remote slot.

As another practical D-Bus example, see the qt-maemo-gravity-example which uses the accelerometer D-Bus interface in a Maemo 5 Qt application.

•The example is bundled with this training material

•The example is briefly documented here: http://wiki.maemo.org/Documentation/Maemo_5_Developer_Guide/Development_Environment/Maemo_Programming_Environments/Using_Maemo_5_specific_APIs_in_Qt_application

•The original example location is: https://garage.maemo.org/svn/maemoexamples/trunk/qt-maemo-gravity-example/

Using D-Bus to Detect Device Orientation

Forum Nokia

- Orientation changes can be noticed with DBUS connection

```
MyReceiverClass * receiver = new MyReceiverClass(this);
QDBusConnection systemBus = QDBusConnection::systemBus();
systemBus.connect("com.nokia.mce",
                  "/com/nokia/mce/signal",
                  "com.nokia.mce.signal",
                  "sig_device_orientation_ind",
                  receiver,
                  SLOT(orientationChanged(QString))); // "portrait" or "landscape"
```

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Another Hildon-specific mechanism for changing application's orientation that works even with the unofficial Qt 4.5 port:

Includes for portrait mode support:

```
# include <X11/Xlib.h>
# include <X11/Xatom.h>
# include <QtGui/QX11Info>
```

Code for the application's main widget constructor:

```
int value = 1;
Atom portraitSupport = XInternAtom(QX11Info::display(),
"_HILDON_PORTRAIT_MODE_SUPPORT", false);
Atom portraitRequest = XInternAtom(QX11Info::display(),
"_HILDON_PORTRAIT_MODE_REQUEST", false);
XChangeProperty(QX11Info::display(), winId(), portraitSupport, XA_CARDINAL, 32,
PropModeReplace, (uchar *)&value, 1);
XChangeProperty(QX11Info::display(), winId(), portraitRequest, XA_CARDINAL, 32,
PropModeReplace, (uchar *)&value, 1);
```