PictureCrypt

1.3.5

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Contents

Chapter 1

PictureCrypt

Project made using QT Creator in C++

1.1 The idea of the project

The idea came to me, when I read an article about steganoraphy. I realised, that you can store data in an image in pixels near the border, so noone can see and even if they did, it is practically impossible to decipher the contents.

1.2 Realisation

To create the encrypted image, you need to select any file for encryption, then using EncryptDialog you select the image to store the data. Then output image is generated.

Attention

> Output image format available is .PNG, because .jpg isn't lossless, so the pixels containing data would be seriously simplified and the data damaged. .BMP isn't used, because noone really uses it and .PNG is just compressed .BMP (more or less)

Note

> JPHS support is under development :D

1.3 How can someone use it?

Well... Anyone who wants to securely commuicate. For example your boss watches your inbox, so you do the work and don't chat with your friends about the bar, they've just visited. Using this app you can send them a photo of your desk, saying it's my new working space, but inside the image there is secret message saying "Wanna get another beer tonight? xD". Boss sees this image, but doesn't spot anyhing. Great example...

1.4 Structure of the project.

Project is done via MVC Pattern. View and Model layers are totally isolated and run on different threads.

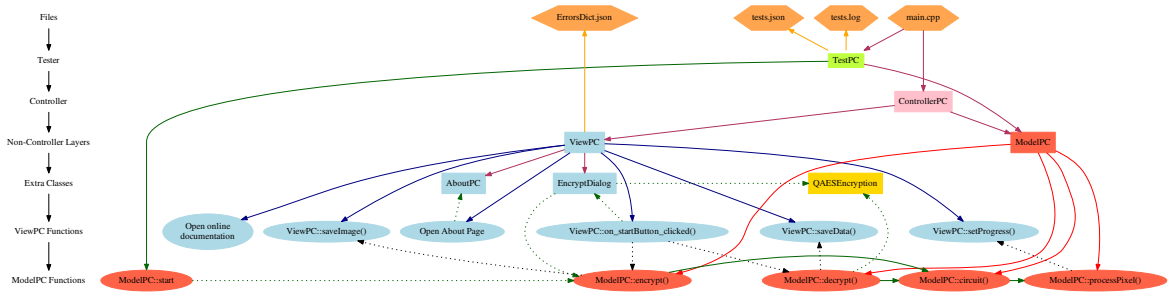
Code from controller.cpp

```
view = new ViewPC();
```

```
model = new ModelPC(version);
QThread * modelThread = new QThread();
model->moveToThread(modelThread);
modelThread->start();
```

So when Model is hard-working, View layer is just fine.

Layers also have a ton of functions, so here is a scheme, that I was doing for about 10 hours, which demonstrates the most important functions and classes in the project. And everything is clickable here, so try it out!



Well... I think you didn't quite understand what is happening here... So hop into my "User-friendly" Documentation!

See source on https://github.com/waleko/PictureCrypt

Note

QAESEncryption class done by Bricke

1.5 External use

ModelPC class can be used externally (without UI)

Note

TestPC class was introduced recently, its use is adviced.

```
#include <modelpc.h>
#include <testpc.h>
#include <QByteArray>
#include <QImage>

#include <QDebug> // Just for demonstration use

...

if(TestPC::Test())
    return;
ModelPC * model = new ModelPC();

// Embedding
QImage * resultImage = model->start(QByteArray data, // Data to be embedded
                                    QImage *image, // Image for embedding
                                    int mode = 0, // Mode of embedding
                                    QString key = "", // Key for extra-encryption (if empty, key will be
       generated automatically)
                                    int bitsUsed = 8, // Bits per Byte used (better explaination
       ModelPC::bitsUsed)
                                    QString *error = nullptr); // Error output, if everything is ok, error
       will be "ok"
if(*error != "ok")
    return;
// Note *error is just a code of error (like "muchdata", dictionary of error codes is also available on
       github.

// De-embedding
QByteArray output = model->decrypt(QImage * image, // Image with hidden data
                                   QString *_error = nullptr); // Error output
if(data == output)
   qDebug() << "Great success!";
else
   qDebug() << "Fiasco :(";
```

See Also

ModelPC, ModelPC::ModelPC, ModelPC::saveData, ModelPC::saveImage, ModelPC::alertView, ModelPC::setProgress

1.6 JPHS use

The newer versions of the app have jphs support, but they don't have jphs built in as it is provided under GNU General Public License v3.0, is "for test purposes only" and is illegal in some countries, so...

Attention

We support JPHS, but we don't use any responsibility for it, we never used or downloaded it, we just used .exe output in the web, and it somehow works by chance. All responsibility for using jphs is on you, that is why we use made only optionally. That means that to use jphs with our app you will have to download the jphs yourself and specify the jphs directory. However we provide link to the site where you can download the supported version of the jphs: http://linux01.gwdg.de/~alatham/stego.html As it's not our site publishing the dangerous zip file, we just put link to that site (Google does that too, so what? Sue Google?), This text is subject to United Nations' Universal Declaration of Human Rights, (see Article 19 http://www.un.org/en/universal-declaration-human-rights):

> Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.

And I typed this link randomly, and I'm scared...

1.7 License

This software is provided under the UNLICENSE

1.8 Contact us

Visit my site: https://www.alexkovrigin.me

Email me at a.kovrigin0@gmail.com

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Copyright

Chapter 2

Namespace Index

2.1 Namespace List

Here is a list of all namespaces with brief descriptions:

Chapter 3

Hierarchical Index

3.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Chapter 4

Class Index

4.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 5

File Index

5.1 File List

Here is a list of all files with brief descriptions:

Chapter 6

Namespace Documentation

6.1 ErrorsDictSetup Namespace Reference

Variables

- string filename = 'ErrorsDict.json'
- tuple raw = open(filename, 'r')
- tuple data = json.load(raw)
- tuple input_data = input()

6.1.1 Variable Documentation

6.1.1.1 tuple ErrorsDictSetup.data = json.load(raw)

Definition at line 6 of file ErrorsDictSetup.py.

6.1.1.2 string ErrorsDictSetup.filename = 'ErrorsDict.json'

Definition at line 2 of file ErrorsDictSetup.py.

6.1.1.3 tuple ErrorsDictSetup.input_data = input()

Definition at line 14 of file ErrorsDictSetup.py.

6.1.1.4 tuple ErrorsDictSetup.raw = open(filename, 'r')

Definition at line 4 of file ErrorsDictSetup.py.

6.2 tests-setup Namespace Reference

Variables

- string filename = 'tests.json'
- tuple raw = open(filename, 'r')
- tuple js = json.load(raw)
- tuple input_data = input()
- list arr = []

- dictionary obj = {'data':data, 'image':image,'expectation':expect,'mode':int(mode),'key':key,'bitsUsed':int(bitsUsed)}

6.2.1 Variable Documentation

6.2.1.1 list tests-setup.arr = [ ]

Definition at line 16 of file tests-setup.py.

6.2.1.2 string tests-setup.filename = 'tests.json'

Definition at line 2 of file tests-setup.py.

6.2.1.3 tuple tests-setup.input_data = input()

Definition at line 14 of file tests-setup.py.

6.2.1.4 tuple tests-setup.js = json.load(raw)

Definition at line 6 of file tests-setup.py.

6.2.1.5 dictionary tests-setup.obj = {'data':data, 'image':image,'expectation':expect,'mode':int(mode),'key':key,'bitsUsed':int(bitsUsed)}

Definition at line 20 of file tests-setup.py.

6.2.1.6 tuple tests-setup.raw = open(filename, 'r')

Definition at line 4 of file tests-setup.py.

6.3 Ui Namespace Reference

Chapter 7

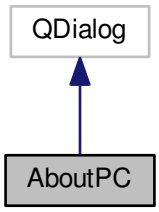
Class Documentation

7.1 AboutPC Class Reference

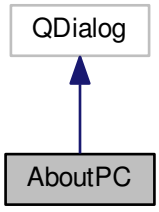
The AboutPC class The About Page dialog.

`#include <aboutpc.h>`

Inheritance diagram for AboutPC:



Collaboration diagram for AboutPC:



Public Member Functions

- AboutPC (QWidget *parent=0)
- ~AboutPC ()
- void setVersion (QString version)

  AboutPC::setVersion Function to set the version display.

7.1.1 Detailed Description

The AboutPC class The About Page dialog.

Definition at line 12 of file aboutpc.h.

7.1.2 Constructor & Destructor Documentation

7.1.2.1 AboutPC::AboutPC (QWidget * *parent* = 0) [explicit]

Definition at line 4 of file aboutpc.cpp.

7.1.2.2 AboutPC::~AboutPC ( )

Definition at line 11 of file aboutpc.cpp.

7.1.3 Member Function Documentation

7.1.3.1 void AboutPC::setVersion (QString *version*)

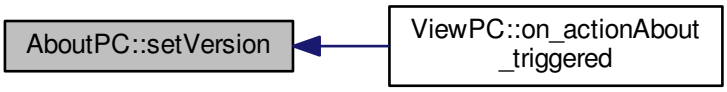
AboutPC::setVersion Function to set the version display.

Parameters

version	Version as QString

Definition at line 19 of file aboutpc.cpp.

Here is the caller graph for this function:



The documentation for this class was generated from the following files:

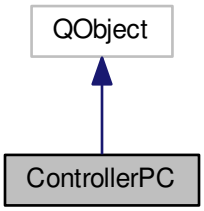
- aboutpc.h
- aboutpc.cpp

7.2 ControllerPC Class Reference

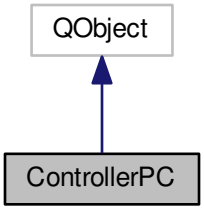
The ControllerPC class Controller class, which controls View and Model layers.

`#include <controllerpc.h>`

Inheritance diagram for ControllerPC:



Collaboration diagram for ControllerPC:



Public Slots

- void abortCircuit ()

  ControllerPC::abortCircuit Slot to be called when ProgressDialog in ViewPC is closed. It flags ModelPC to stop.
- void runTests ()

  ControllerPC::runTests Runs tests.
- void setJPHSDir (QString dir)

  ControllerPC::setJPHSDir Sets JPHS default dir.

Public Member Functions

- ControllerPC ()

  ControllerPC::ControllerPC Constructor of controller Constructor runs auto-test for ModelPC, creates Model Class (ModelPC) and View Class (ViewPC). All signals and slots are connected here.

Public Attributes

- long int version

  version Version of the app

- QString versionString

  versionString Version of the app as QString.

7.2.1 Detailed Description

The ControllerPC class Controller class, which controls View and Model layers.

See Also

ViewPC, ModelPC

Definition at line 21 of file controllerpc.h.

7.2.2 Constructor & Destructor Documentation

7.2.2.1 ControllerPC::ControllerPC ( )

ControllerPC::ControllerPC Constructor of controller Constructor runs auto-test for ModelPC, creates Model Class (ModelPC) and View Class (ViewPC). All signals and slots are connected here.

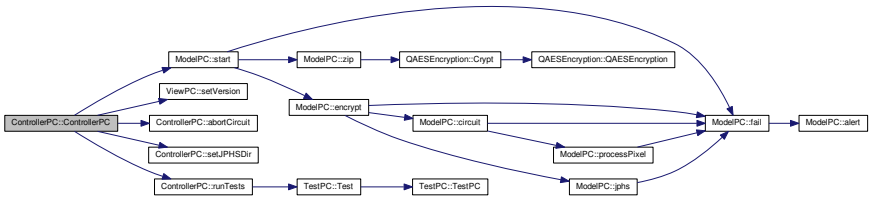
Controller class

Note

Version of the app is specified here.

Definition at line 9 of file controllerpc.cpp.

Here is the call graph for this function:



7.2.3 Member Function Documentation

7.2.3.1 void ControllerPC::abortCircuit ( ) [slot]

ControllerPC::abortCircuit Slot to be called when ProgressDialog in ViewPC is closed. It flags ModelPC to stop.

Definition at line 36 of file controllerpc.cpp.

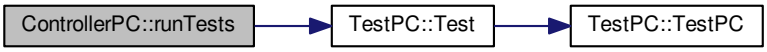
Here is the caller graph for this function:

7.2.3.2 void ControllerPC::runTests ( ) [slot]

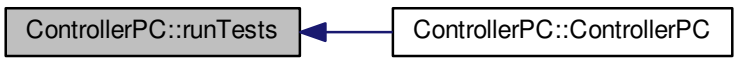
ControllerPC::runTests Runs tests.

Definition at line 43 of file controllerpc.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



7.2.3.3 void ControllerPC::setJPHSDir (QString *dir*) [slot]

ControllerPC::setJPHSDir Sets JPHS default dir.

Parameters

dir	Directory

Definition at line 54 of file controllerpc.cpp.

Here is the caller graph for this function:

7.2.4 Member Data Documentation

7.2.4.1 long int ControllerPC::version

version Version of the app

Definition at line 29 of file controllerpc.h.

7.2.4.2 QString ControllerPC::versionString

versionString Version of the app as QString.

Definition at line 33 of file controllerpc.h.

The documentation for this class was generated from the following files:

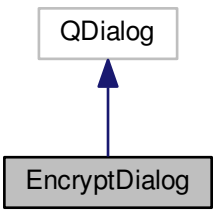
- controllerpc.h
- controllerpc.cpp

7.3 EncryptDialog Class Reference

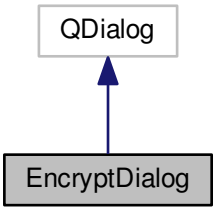
The EncryptDialog class Class to get the image and key to store secret info.

`#include <encryptdialog.h>`

Inheritance diagram for EncryptDialog:



Collaboration diagram for EncryptDialog:



Public Slots

- void on_fileButton_clicked ()

  EncryptDialog::on_fileButton_clicked Slot to select the image.
- void on_buttonBox_accepted ()

  EncryptDialog::on_buttonBox_accepted Slot to start the encryption. Successful closing of the app.
- void on_buttonBox_rejected ()

  EncryptDialog::on_buttonBox_rejected Slot to reject the encryption.
- void on_bitsSlider_valueChanged (int value)

  EncryptDialog::on_bitsSlider_valueChanged Slot if value of the bits slider is changed.

Public Member Functions

- EncryptDialog (QByteArray _data, QWidget ∗parent=0)

  EncryptDialog::EncryptDialog Constructor of the class. Input data is saved here and some variables are set here.
- ∼EncryptDialog ()
- QByteArray zip ()

  EncryptDialog::zip Zipping algorithm It copresses the data and then compresses it using qCompress()

Public Attributes

- QByteArray data

  data Input data
- bool success

  success Flag, if image was successfully selected and data was encrypted.
- QByteArray compr_data

  compr_data Compressed data, aka Output data.
- QString inputFileName

  inputFileName Filename of the image.
- long long int size

  size Size of the image in square pixels
- QString key

  key Key to be used for encryption in EncrytDialog::zip
- bool goodPercentage

  goodPercentage Flag if area of the used data via encryption is less than 70% of the area of the image.

- int val

  val Value of the slider
- int bitsUsed

  bitsUsed Bits used per byte of pixel.
- QImage image

  image Inputted image

7.3.1 Detailed Description

The EncryptDialog class Class to get the image and key to store secret info.

Note

Not the most important and well written class.

See Also

ViewPC

Definition at line 21 of file encryptdialog.h.

7.3.2 Constructor & Destructor Documentation

7.3.2.1 EncryptDialog::EncryptDialog (QByteArray *_data*, QWidget * *parent* = 0) [explicit]

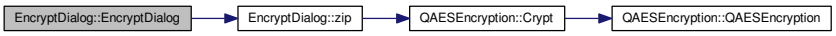
EncryptDialog::EncryptDialog Constructor of the class. Input data is saved here and some variables are set here.

Parameters

_data	Input data.
parent	Parent (not in use)

Definition at line 9 of file encryptdialog.cpp.

Here is the call graph for this function:



7.3.2.2 EncryptDialog::~EncryptDialog ( )

Definition at line 26 of file encryptdialog.cpp.

7.3.3 Member Function Documentation

7.3.3.1 void EncryptDialog::on_bitsSlider_valueChanged (int *value*) [slot]

EncryptDialog::on_bitsSlider_valueChanged Slot if value of the bits slider is changed.

Parameters

value	Well, value

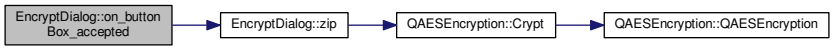
Definition at line 107 of file encryptdialog.cpp.

7.3.3.2 void EncryptDialog::on_buttonBox_accepted ( ) [slot]

EncryptDialog::on_buttonBox_accepted Slot to start the encryption. Successful closing of the app.

Definition at line 82 of file encryptdialog.cpp.

Here is the call graph for this function:



7.3.3.3 void EncryptDialog::on_buttonBox_rejected ( ) [slot]

EncryptDialog::on_buttonBox_rejected Slot to reject the encryption.

Definition at line 98 of file encryptdialog.cpp.

7.3.3.4 void EncryptDialog::on_fileButton_clicked ( ) [slot]

EncryptDialog::on_fileButton_clicked Slot to select the image.

Definition at line 57 of file encryptdialog.cpp.

7.3.3.5 QByteArray EncryptDialog::zip ( )

EncryptDialog::zip Zipping algorithm It copresses the data and then compresses it using qCompress()

Returns

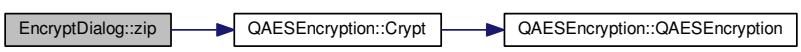
Returns Compressed data.

See Also

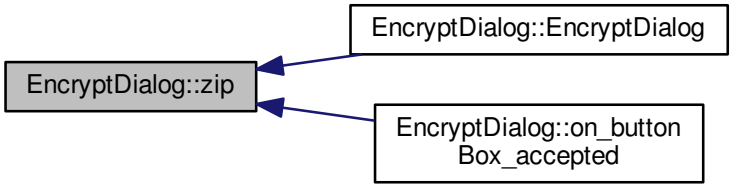
ModelPC::unzip

Definition at line 46 of file encryptdialog.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



7.3.4 Member Data Documentation

7.3.4.1 int EncryptDialog::bitsUsed

bitsUsed Bits used per byte of pixel.

See Also

ModelPC::circuit

Definition at line 75 of file encryptdialog.h.

7.3.4.2 QByteArray EncryptDialog::compr_data

compr_data Compressed data, aka Output data.

Definition at line 50 of file encryptdialog.h.

7.3.4.3 QByteArray EncryptDialog::data

data Input data

Definition at line 42 of file encryptdialog.h.

7.3.4.4 bool EncryptDialog::goodPercentage

goodPercentage Flag if area of the used data via encryption is less than 70% of the area of the image.

Definition at line 66 of file encryptdialog.h.

7.3.4.5 QImage EncryptDialog::image

image Inputted image

Definition at line 79 of file encryptdialog.h.

7.3.4.6 QString EncryptDialog::inputFileName

inputFileName Filename of the image.

Definition at line 54 of file encryptdialog.h.

7.3.4.7 QString EncryptDialog::key

key Key to be used for encryption in EncrytDialog::zip

Definition at line 62 of file encryptdialog.h.

7.3.4.8 long long int EncryptDialog::size

size Size of the image in square pixels

Definition at line 58 of file encryptdialog.h.

7.3.4.9 bool EncryptDialog::success

success Flag, if image was successfully selected and data was encrypted.

Definition at line 46 of file encryptdialog.h.

7.3.4.10 int EncryptDialog::val

val Value of the slider

Definition at line 70 of file encryptdialog.h.

The documentation for this class was generated from the following files:

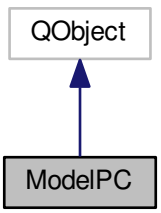
- encryptdialog.h
- encryptdialog.cpp

7.4 ModelPC Class Reference

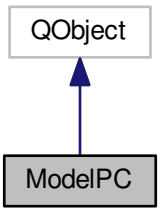
The ModelPC class Model Layer of the app. Main class that does the work of PictureCrypt logic Controled by ControllerPC.

`#include <modelpc.h>`

Inheritance diagram for ModelPC:



Collaboration diagram for ModelPC:



Public Slots

- QImage ∗ start (QByteArray data, QImage ∗image, int mode=0, QString key="", int _bitsUsed=8, QString ∗_error=nullptr)

  ModelPC::start Slot to zip and encrypt data and provide it with some extra stuff After completion start standard ModelPC::encrypt Isn't used in PictureCrypt, but used can be used in other - custom projects.
- QImage ∗ encrypt (QByteArray encr_data, QImage ∗image, int mode=0, int _bitsUsed=8, QString ∗_error=nullptr)

  ModelPC::encrypt Slot to be called when encrypt mode in ViewPC is selected and started.
- QByteArray decrypt (QImage ∗image, QString key, QString ∗_error=nullptr)

  ModelPC::decrypt Slot to be called when decrypt mode in ViewPC is selected and started.
- void fail (QString message)

  ModelPC::fail Slot to stop execution of cryption.

Signals

- void alertView (QString messageCode, bool isWarning)

  alertView Signal to be called to create MessageBox.
- void saveData (QByteArray data)

  saveData Signal to be called to save data from ModelPC::decrypt.
- void saveImage (QImage ∗image)

  saveImage Signal to be called to save image from ModelPC::encrypt.
- void setProgress (int val)

  setProgress Signal to be called to set progress of ProgressDialog.

Public Member Functions

- ModelPC ()

  ModelPC::ModelPC Constructor Unit tests are run here.
- QByteArray unzip (QByteArray data, QByteArray key)

  ModelPC::unzip Unzip data from ModelPC::decrypt. Just mirrored EncryptDialog::zip.
- void alert (QString message, bool isWarning=false)

  ModelPC::alert Function emits signal ModelPC::alertView and calls ViewPC::alert.

Static Public Member Functions

- static QImage * Start (QByteArray data, QImage *image, int mode=0, QString key="", int _bitsUsed=8, QString *_error=nullptr)
- static QImage * Encrypt (QByteArray encr_data, QImage *image, int mode=0, int _bitsUsed=8, QString *_error=nullptr)
- static QByteArray Decrypt (QImage *image, QString key, QString *_error=nullptr)

Public Attributes

- bool success

  success Flag that true by default, but in case of error or cancelling of ProgressDialog it turns to false, which stops execution of ModelPC::circuit
- long version

  version Version of the class
- QString versionString

  versionString Version as string
- int curMode

  curMode Mode of en- or decryption
- int bitsUsed

  bitsUsed Bits per byte used in pixel
- QString defaultJPHSDir

  defaultJPHSDir Default JPHS directory
- QString * error

  error Current error

Protected Member Functions

- void circuit (QImage *image, QByteArray *data, long long int countBytes)

  ModelPC::circuit The brain of the app. Via special circuit stores data in image.
- void jphs (QImage *image, QByteArray *data)

  ModelPC::jphs JPHS function to use jphide and jpseek (currently under development)
- void processPixel (QPoint pos, QVector< QPoint > *were, bool isEncrypt)

  ModelPC::processPixel Processes every pixel. Reads its contains or writes data.
- QByteArray zip (QByteArray data, QByteArray key)

  ModelPC::zip Zip function, copy of EncryptDialog::zip Used for ModelPC in custom projects, other than PictureCrypt.
- void modernCircuit (QImage *image, QByteArray *data, long long int countBytes)

7.4.1 Detailed Description

The ModelPC class Model Layer of the app. Main class that does the work of PictureCrypt logic Controled by ControllerPC.

See Also

ViewPC, ControllerPC

Author

Alex Kovrigin (waleko)

Definition at line 30 of file modelpc.h.

7.4.2 Constructor & Destructor Documentation

7.4.2.1 ModelPC::ModelPC ( )

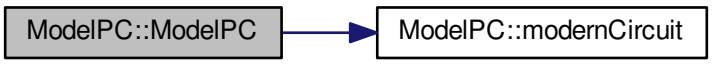
ModelPC::ModelPC Constructor Unit tests are run here.

See Also

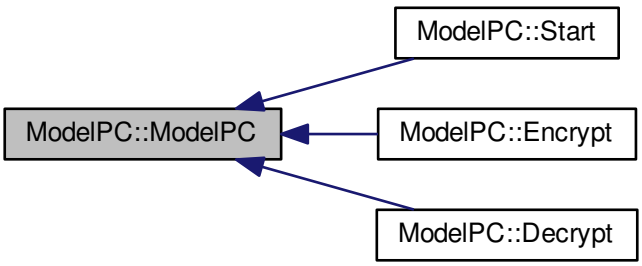
ControllerPC, ViewPC

Definition at line 9 of file modelpc.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



7.4.3 Member Function Documentation

7.4.3.1 void ModelPC::alert (QString *message*, bool *isWarning* = `false`)

ModelPC::alert Function emits signal ModelPC::alertView and calls ViewPC::alert.

Parameters

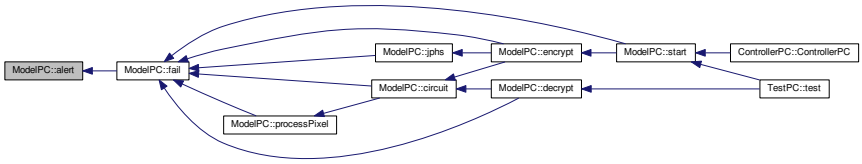
message	Message to be transmitted.
isWarning	Flag if message is critical.

See Also

ViewPC::alert

Definition at line 636 of file modelpc.cpp.

Here is the caller graph for this function:



7.4.3.2 void ModelPC::alertView (QString *messageCode,* bool *isWarning*) [signal]

alertView Signal to be called to create MessageBox.

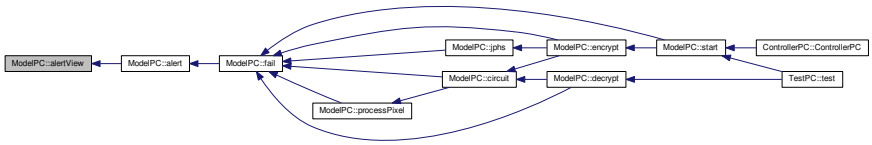
Parameters

messageCode	Message Code to be shown.
isWarning	Flag if message is critical.

See Also

ModelPC::alert, ViewPC::alert

Here is the caller graph for this function:



7.4.3.3 void ModelPC::circuit (QImage * *image,* QByteArray * *data,* long long int *countBytes*) [protected]

ModelPC::circuit The brain of the app. Via special circuit stores data in image.

The circuit itself can be found in documentation or in commentaries in source.

Parameters

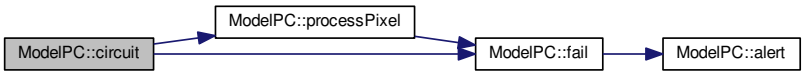
image	Image to be processed.
data	Data to be processed.
countBytes	Number of bytes to be read or written.

See Also

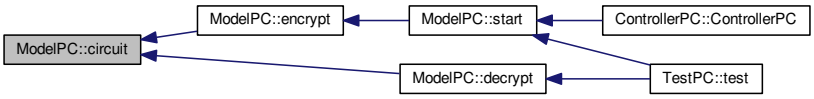
ModelPC::processPixel

Definition at line 324 of file modelpc.cpp.

Here is the call graph for this function:



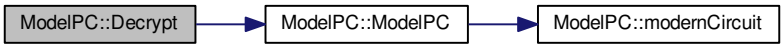
Here is the caller graph for this function:



7.4.3.4 QByteArray ModelPC::Decrypt (QImage * *image*, QString *key*, QString * *_error* = `nullptr`) [static]

Definition at line 36 of file modelpc.cpp.

Here is the call graph for this function:



7.4.3.5 QByteArray ModelPC::decrypt (QImage * *image*, QString *key*, QString * *_error* = `nullptr`) [slot]

ModelPC::decrypt Slot to be called when decrypt mode in ViewPC is selected and started.

Parameters

image	Image to be decrypted.
key	Keyphrase with which the data is encrypted
_error	Error output

Returns

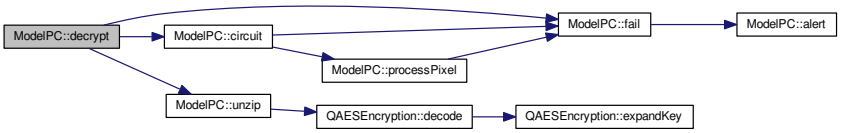
Returns decrypted data

See Also

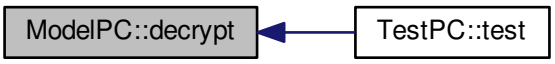
ViewPC::on_startButton_clicked, ModelPC::encrypt, ModelPC::circuit

Definition at line 169 of file modelpc.cpp.

Here is the call graph for this function:



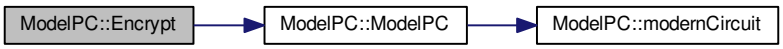
Here is the caller graph for this function:



7.4.3.6 QImage * ModelPC::Encrypt (QByteArray *encr_data*, QImage * *image*, int *mode* = 0, int *_bitsUsed* = 8, QString * *_error* = nullptr) [static]

Definition at line 31 of file modelpc.cpp.

Here is the call graph for this function:



7.4.3.7 QImage * ModelPC::encrypt (QByteArray *encr_data*, QImage * *image*, int *mode* = 0, int *_bitsUsed* = 8, QString * *_error* = nullptr) [slot]

ModelPC::encrypt Slot to be called when encrypt mode in ViewPC is selected and started.

Parameters

encr_data	Data to be inserted to an image.

image	Image to be inserted in.
mode	Mode of encryption
_bitsUsed	Bits per byte used
_error	Error output

Returns

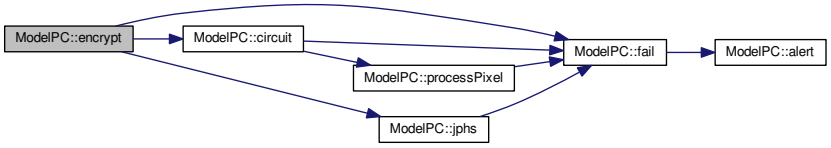
Returns image with embedded data.

See Also

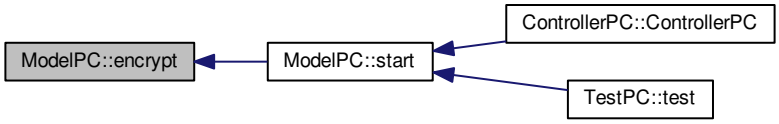
ViewPC::on_startButton_clicked, ModelPC::decrypt, ModelPC::circuit, ModelPC::start

Definition at line 110 of file modelpc.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



7.4.3.8 void ModelPC::fail (QString *message*) [slot]

ModelPC::fail Slot to stop execution of cryption.

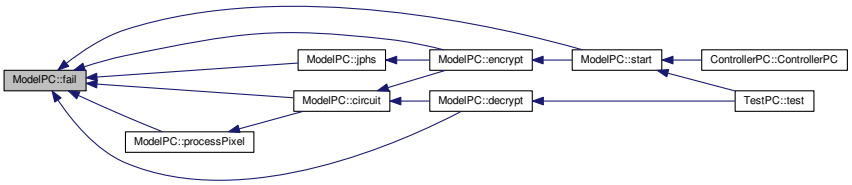
Parameters

message	Message for user

Definition at line 251 of file modelpc.cpp.

Here is the call graph for this function:

Here is the caller graph for this function:



7.4.3.9 void ModelPC::jphs (QImage * *image*, QByteArray * *data*) [protected]

ModelPC::jphs JPHS function to use jphide and jpseek (currently under development)

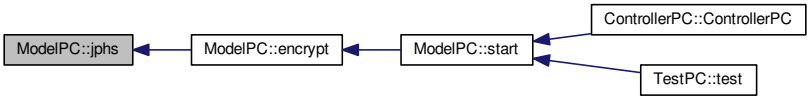
Parameters

image	Image for embedding
data	Data

Definition at line 263 of file modelpc.cpp.

Here is the call graph for this function:

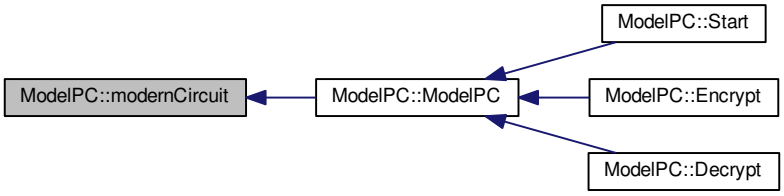
Here is the caller graph for this function:



7.4.3.10 void ModelPC::modernCircuit (QImage * *image,* QByteArray * *data,* long long int *countBytes*) [protected]

Definition at line 584 of file modelpc.cpp.

Here is the caller graph for this function:



7.4.3.11 void ModelPC::processPixel (QPoint *pos,* QVector< QPoint > * *were,* bool *isEncrypt*) [protected]

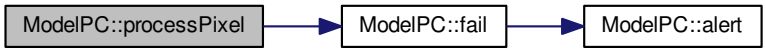
ModelPC::processPixel Processes every pixel. Reads its contains or writes data.

Parameters

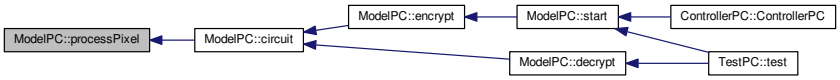
pos	Position of pixel
were	Vector array containing pixels, that were already processed.
isEncrypt	Mode of operation. If true encryption operations will continue, else the decryption ones.

Definition at line 465 of file modelpc.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



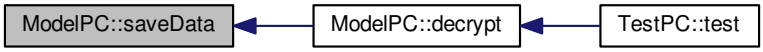
7.4.3.12 void ModelPC::saveData (QByteArray *data*) [signal]

saveData Signal to be called to save data from ModelPC::decrypt.

Parameters

data	Data to be saved.

Here is the caller graph for this function:



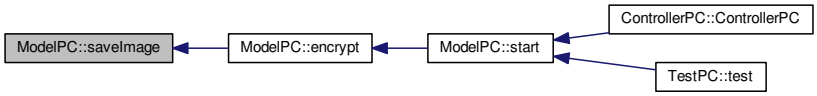
7.4.3.13 void ModelPC::saveImage (QImage * *image*) [signal]

saveImage Signal to be called to save image from ModelPC::encrypt.

Parameters

image	Image to be saved.

Here is the caller graph for this function:



7.4.3.14 void ModelPC::setProgress (int *val*) [signal]

setProgress Signal to be called to set progress of ProgressDialog.

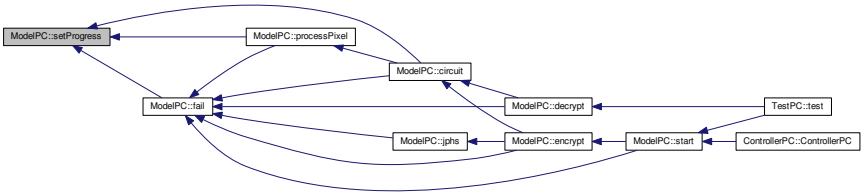
Parameters

val	Value to be set.

See Also

ViewPC::setProgress

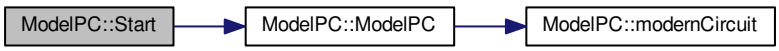
Here is the caller graph for this function:



7.4.3.15 QImage * ModelPC::Start (QByteArray *data*, QImage * *image*, int *mode* = 0, QString *key* = "", int *_bitsUsed* = 8, QString * *_error* = nullptr) [static]

Definition at line 26 of file modelpc.cpp.

Here is the call graph for this function:



7.4.3.16 QImage * ModelPC::start (QByteArray *data*, QImage * *image*, int *mode* = 0, QString *key* = "", int *_bitsUsed* = 8, QString * *_error* = nullptr) [slot]

ModelPC::start Slot to zip and encrypt data and provide it with some extra stuff After completion start standard ModelPC::encrypt Isn't used in PictureCrypt, but used can be used in other - custom projects.

Parameters

data	Data for embedding
image	Image for embedding
mode	Mode for embedding
key	Key for extra encryption
_bitsUsed	Bits per byte (see ModelPC::bitsUsed)
_error	Error output

Returns

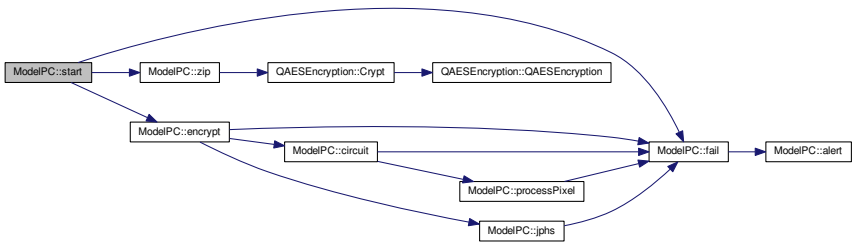
Returns image with embedded data

See Also

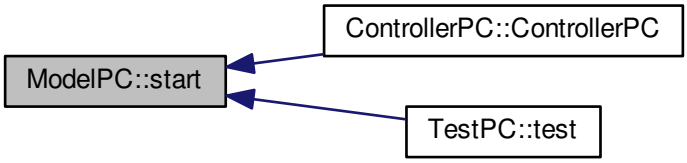
ModelPC::encrypt

Definition at line 53 of file modelpc.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



7.4.3.17 QByteArray ModelPC::unzip (QByteArray *data*, QByteArray *key*)

ModelPC::unzip Unzip data from ModelPC::decrypt. Just mirrored EncryptDialog::zip.

Parameters

data	Data to be decrypted.
key	Key to decrypt the data.

Returns

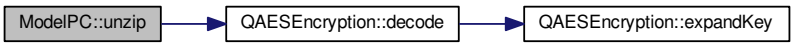
Returns data

See Also

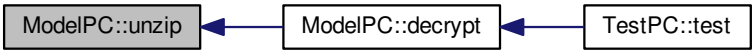
EncryptDialog::zip, ModelPC::decrypt, ModelPC::zip

Definition at line 558 of file modelpc.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



7.4.3.18 QByteArray ModelPC::zip (QByteArray *data,* QByteArray *key*) [protected]

ModelPC::zip Zip function, copy of EncryptDialog::zip Used for ModelPC in custom projects, other than PictureCrypt.

Parameters

data	Data to be encrypted
key	Key for encryption

Returns

Returns decrypted data

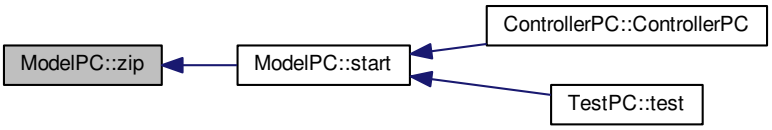
See Also

ModelPC::start, ModelPC::encrypt, ModelPC::unzip

Definition at line 575 of file modelpc.cpp.

Here is the call graph for this function:

Here is the caller graph for this function:



7.4.4 Member Data Documentation

7.4.4.1 int ModelPC::bitsUsed

bitsUsed Bits per byte used in pixel

Definition at line 91 of file modelpc.h.

7.4.4.2 int ModelPC::curMode

curMode Mode of en- or decryption

Definition at line 87 of file modelpc.h.

7.4.4.3 QString ModelPC::defaultJPHSDir

defaultJPHSDir Default JPHS directory

Definition at line 95 of file modelpc.h.

7.4.4.4 QString* ModelPC::error

error Current error

Definition at line 99 of file modelpc.h.

7.4.4.5 bool ModelPC::success

success Flag that true by default, but in case of error or cancelling of ProgressDialog it turns to false, which stops execution of ModelPC::circuit

Definition at line 75 of file modelpc.h.

7.4.4.6 long ModelPC::version

version Version of the class

Definition at line 79 of file modelpc.h.

7.4.4.7 QString ModelPC::versionString

versionString Version as string

Definition at line 83 of file modelpc.h.

The documentation for this class was generated from the following files:

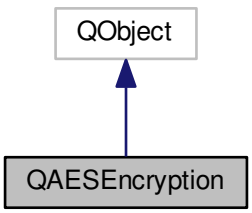
- modelpc.h
- modelpc.cpp

7.5 QAESEncryption Class Reference

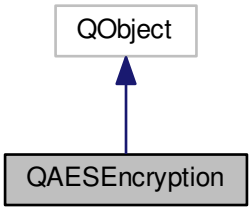
The QAESEncryption class Small and portable AES encryption class for Qt. Supports all key sizes - 128/192/256 bits - ECB, CBC, CFB and OFB modes. Class made entirely by bricke. Github: https://github.-com/bricke/Qt-AES.

```
#include <qaesencryption.h>
```

Inheritance diagram for QAESEncryption:



Collaboration diagram for QAESEncryption:



Public Types

- enum Aes { AES_128, AES_192, AES_256 }

  The Aes enum AES Level AES Levels The class supports all AES key lenghts.
- enum Mode { ECB, CBC, CFB, OFB }

  The Mode enum AES Mode The class supports the following operating modes ECB CBC CFB OFB.
- enum Padding { ZERO, PKCS7, ISO }

  The Padding enum Padding By default the padding method is ISO, however, the class supports:

Public Member Functions

- QAESEncryption (QAESEncryption::Aes level, QAESEncryption::Mode mode, QAESEncryption::Padding padding=QAESEncryption::ISO)
- QByteArray encode (const QByteArray &rawText, const QByteArray &key, const QByteArray &iv=NULL)

  encode Encodes data with AES
- QByteArray decode (const QByteArray &rawText, const QByteArray &key, const QByteArray &iv=NULL)

  decode Decodes data with AES
- QByteArray removePadding (const QByteArray &rawText)

  RemovePadding Removes padding.
- QByteArray expandKey (const QByteArray &key)

  ExpandKey Expands the key.

Static Public Member Functions

- static QByteArray Crypt (QAESEncryption::Aes level, QAESEncryption::Mode mode, const QByteArray &rawText, const QByteArray &key, const QByteArray &iv=NULL, QAESEncryption::Padding padding=QAESEncryption::ISO)

  Crypt Static encode function.
- static QByteArray Decrypt (QAESEncryption::Aes level, QAESEncryption::Mode mode, const QByteArray &rawText, const QByteArray &key, const QByteArray &iv=NULL, QAESEncryption::Padding padding=QAESEncryption::ISO)

  Decrypt Static decode function.
- static QByteArray ExpandKey (QAESEncryption::Aes level, QAESEncryption::Mode mode, const QByteArray &key)

  ExpandKey Expands the key.
- static QByteArray RemovePadding (const QByteArray &rawText, QAESEncryption::Padding padding)

  RemovePadding Removes padding.

7.5.1 Detailed Description

The QAESEncryption class Small and portable AES encryption class for Qt. Supports all key sizes - 128/192/256 bits - ECB, CBC, CFB and OFB modes. Class made entirely by bricke. Github: https://github.-com/bricke/Qt-AES.

Author

Bricke (Matteo B)

Definition at line 14 of file qaesencryption.h.

7.5.2 Member Enumeration Documentation

7.5.2.1 enum QAESEncryption::Aes

The Aes enum AES Level AES Levels The class supports all AES key lenghts.

AES_128 AES_192 AES_256

Enumerator

AES_128

AES_192

AES_256

Definition at line 27 of file qaesencryption.h.

7.5.2.2 enum QAESEncryption::Mode

The Mode enum AES Mode The class supports the following operating modes ECB CBC CFB OFB.

Enumerator

ECB

CBC

CFB

OFB

Definition at line 40 of file qaesencryption.h.

7.5.2.3 enum QAESEncryption::Padding

The Padding enum Padding By default the padding method is ISO, however, the class supports:

ZERO PKCS7 ISO

Enumerator

ZERO

PKCS7

ISO

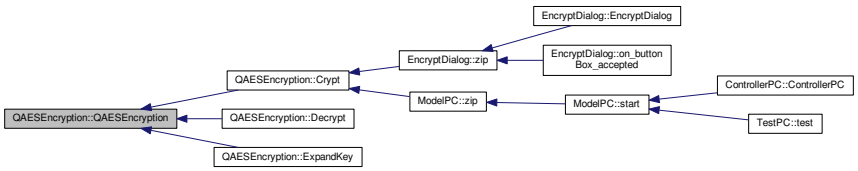
Definition at line 55 of file qaesencryption.h.

7.5.3 Constructor & Destructor Documentation

7.5.3.1 QAESEncryption::QAESEncryption (QAESEncryption::Aes *level*, QAESEncryption::Mode *mode*, QAESEncryption::Padding *padding* = QAESEncryption::ISO)

Definition at line 67 of file qaesencryption.cpp.

Here is the caller graph for this function:



7.5.4 Member Function Documentation

7.5.4.1 QByteArray QAESEncryption::Crypt (QAESEncryption::Aes *level*, QAESEncryption::Mode *mode*, const QByteArray & *rawText*, const QByteArray & *key*, const QByteArray & *iv* = NULL, QAESEncryption::Padding *padding* = QAESEncryption::ISO) [static]

Crypt Static encode function.

Parameters

level	AES level of encryption
mode	AES mode
rawText	Input data
key	Key for encrytion
iv	IV vector
padding	Padding

Returns

Returns encrypted data

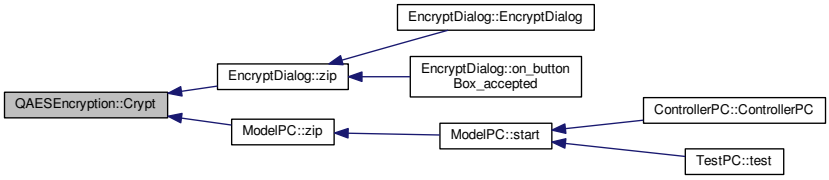
See Also

QAESEncryption::encode, QAESEncryption::Decrypt

Definition at line 6 of file qaesencryption.cpp.

Here is the call graph for this function:

Here is the caller graph for this function:



7.5.4.2 QByteArray QAESEncryption::decode (const QByteArray & *rawText,* const QByteArray & *key,* const QByteArray & *iv* = NULL)

decode Decodes data with AES

Note

Basically the non-static method of QAESEncryption::Decrypt

Parameters

rawText	Input data
key	Key
iv	IV vector

Returns

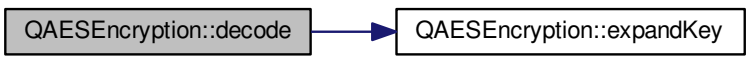
Returns decoded data

See Also

QAESEncryption::Decrypt, QAESEncryption::encode

Definition at line 441 of file qaesencryption.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:

7.5.4.3 QByteArray QAESEncryption::Decrypt (QAESEncryption::Aes *level*, QAESEncryption::Mode *mode*, const QByteArray & *rawText*, const QByteArray & *key*, const QByteArray & *iv* = NULL, QAESEncryption::Padding *padding* = QAESEncryption::ISO) [static]

Decrypt Static decode function.

Parameters

level	AES level of encryption
mode	AES mode
rawText	Encrypted data
key	Key for encrytion
iv	IV vector
padding	Padding

Returns

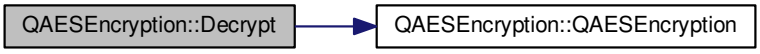
Returns Decrypted data

See Also

QAESEncryption::decode, QAESEncryption::Crypt

Definition at line 12 of file qaesencryption.cpp.

Here is the call graph for this function:



7.5.4.4 QByteArray QAESEncryption::encode (const QByteArray & *rawText,* const QByteArray & *key,* const QByteArray & *iv* = NULL)

encode Encodes data with AES

Note

Basically the non-static method of QAESEncryption::Crypt

Parameters

rawText	Input data
key	Key
iv	IV vector

Returns

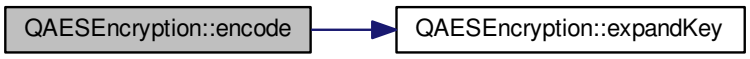
Returns encoded data

See Also

QAESEncryption::Crypt, QAESEncryption::decode

Definition at line 391 of file qaesencryption.cpp.

Here is the call graph for this function:



7.5.4.5 QByteArray QAESEncryption::ExpandKey (QAESEncryption::Aes *level*, QAESEncryption::Mode *mode*, const QByteArray & *key*) [static]

ExpandKey Expands the key.

Parameters

level	AES level
mode	AES Mode
key	key

Returns

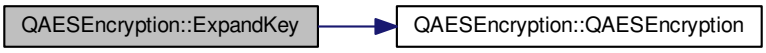
Returns expanded key (I guess)

See Also

QAESEncryption::expandKey

Definition at line 18 of file qaesencryption.cpp.

Here is the call graph for this function:



7.5.4.6 QByteArray QAESEncryption::expandKey (const QByteArray & *key*)

ExpandKey Expands the key.

Note

Basically the non-static method of QAESEncryption::ExpandKey

Parameters

key	key

Returns

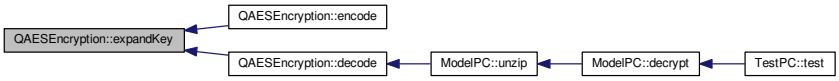
Returns expanded key (I guess)

See Also

QAESEncryption::ExpandKey

Definition at line 132 of file qaesencryption.cpp.

Here is the caller graph for this function:



7.5.4.7 QByteArray QAESEncryption::RemovePadding (const QByteArray & *rawText*, QAESEncryption::Padding *padding*) [static]

RemovePadding Removes padding.

Parameters

rawText	Input data
padding	Padding

Returns

Returns data with removed padding (I guess)

See Also

QAESEncryption::removePadding

Definition at line 23 of file qaesencryption.cpp.

7.5.4.8 QByteArray QAESEncryption::removePadding (const QByteArray & *rawText*)

RemovePadding Removes padding.

Note

Basically the non-static method of QAESEncryption::RemovePadding

Parameters

rawText	Input data

Returns

Returns data with removed padding (I guess)

See Also

QAESEncryption::RemovePadding

Definition at line 490 of file qaesencryption.cpp.

The documentation for this class was generated from the following files:

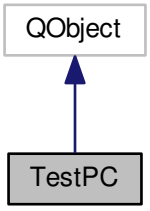
- qaesencryption.h
- qaesencryption.cpp

7.6 TestPC Class Reference

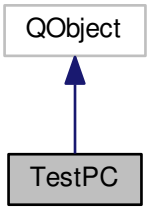
The TestPC class AutoTest for ModelPC Currently used in main.cpp.

`#include <testpc.h>`

Inheritance diagram for TestPC:



Collaboration diagram for TestPC:



Public Slots

- int startTest ()

  TestPC::startTest Starts the tests running.

Public Member Functions

- TestPC ()

  TestPC::TestPC Constructor.

Static Public Member Functions

- static int Test ()

  TestPC::Test Static function of testing.

Protected Slots

- bool test (QByteArray data, QImage rImage, QString expectedOutput="ok", int mode=0, QString key="", int bitsUsed=8)

  TestPC::test Function calling TestPC::model for tests.

7.6.1 Detailed Description

The TestPC class AutoTest for ModelPC Currently used in main.cpp.

Definition at line 22 of file testpc.h.

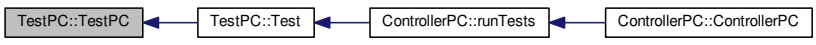
7.6.2 Constructor & Destructor Documentation

7.6.2.1 TestPC::TestPC ( )

TestPC::TestPC Constructor.

Definition at line 5 of file testpc.cpp.

Here is the caller graph for this function:



7.6.3 Member Function Documentation

7.6.3.1 int TestPC::startTest ( ) [slot]

TestPC::startTest Starts the tests running.

Note

Tests are configured in tests.json

Returns

Returns success of all tests

See Also

TestPC::autoTests

Definition at line 52 of file testpc.cpp.

7.6.3.2 int TestPC::Test ( ) [static]

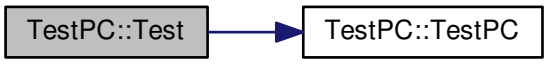
TestPC::Test Static function of testing.

Returns

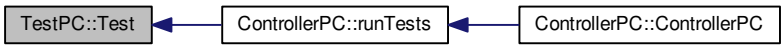
Returns result of the testing

Definition at line 13 of file testpc.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



7.6.3.3 bool TestPC::test (QByteArray *data*, QImage *rImage*, QString *expectedOutput* = "ok", int *mode* = 0, QString *key* = "", int *bitsUsed* = 8) [protected], [slot]

TestPC::test Function calling TestPC::model for tests.

Parameters

data	Data for test
rImage	Image for test
expectedOutput	Expected output for test ("ok" if everything is well... ok, else errorcode from ErrorsDict.json)

mode	Mode for embedding
key	Key for for test
bitsUsed	Bits Used

Returns

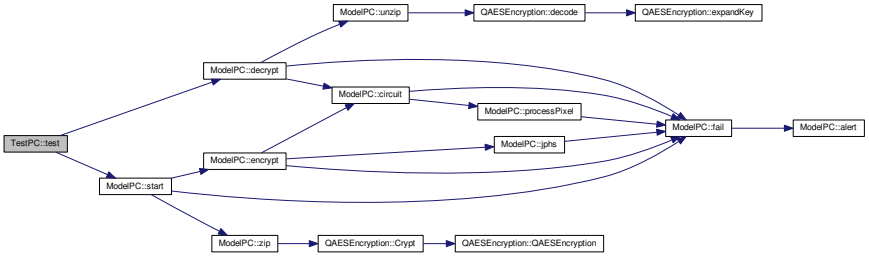
Returns if test is successful

See Also

TestPC::autoTest, ModelPC::start, ModelPC::decrypt

Definition at line 28 of file testpc.cpp.

Here is the call graph for this function:



The documentation for this class was generated from the following files:

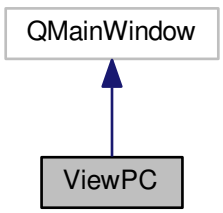
- testpc.h
- testpc.cpp

7.7 ViewPC Class Reference

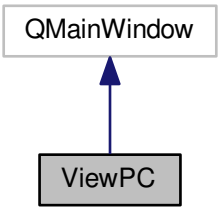
The ViewPC class View layer of the app. Controls EncryptDialog and ProgressDialog.

`#include <viewpc.h>`

Inheritance diagram for ViewPC:



Collaboration diagram for ViewPC:



Public Slots

- void alert (QString message, bool isWarning=false)

  ViewPC::alert Slot to create QMessageBox with message.
- void saveData (QByteArray Edata)

  ViewPC::saveData Slot to be called to save data using QFileDialog.
- void saveImage (QImage ∗image)

  ViewPC::saveImage Slot to be called to save image using QFileDialog.
- void setProgress (int val)

  ViewPC::setProgress Slot to set the value of the ProgressDialog (ViewPC::dialog).
- void abortCircuit ()

  ViewPC::abortCircuit Slot to close ProgressDialog (ViewPC::dialog)
- void setEncryptMode (bool encr)

  ViewPC::setEncryptMode Set the encrpt mode (ViewPC::isEncrypt)
- void setVersion (QString version)

  ViewPC::setVersion Set the version of the app from ControllerPC.

Signals

- void encrypt (QByteArray data, QImage ∗image, int mode, int bitsUsed)

  encrypt Signal calling ModelPC::encrypt
- void decrypt (QImage ∗_image, QString key)

  decrypt Signal calling ModelPC::decrypt
- void abortModel ()

  abortModel Signal calling to stop ModelPC::circuit
- void setJPHSDir (QString dir)

  setJPHSPath Sets the default JPHS directory
- void runTests ()

  runTests Runs tests in ControllerPC via TestPC

Public Member Functions

- ViewPC (QWidget ∗parent=nullptr)
- ∼ViewPC ()

  ViewPC::∼ViewPC Simple destructor for this layer.

Public Attributes

- QProgressDialog * dialog

  dialog ProgressDialog used.
- bool progressDialogClosed

  progressDialogClosed Flag, if dialog is closed.
- QJsonObject errorsDict

Protected Slots

- void on_fileButton_clicked ()

  ViewPC::on_fileButton_clicked Slot to be called, when according button is pressed.
- void on_startButton_clicked ()

  ViewPC::on_startButton_clicked Slot to be called, when Start Button is pressed.
- void on_actionAbout_triggered ()

  ViewPC::on_actionAbout_triggered Opens about page.
- void on_actionHelp_triggered ()

  ViewPC::on_actionHelp_triggered Opens online documentation.

Protected Member Functions

- QString requestKey ()

  ViewPC::requestKey Request keyphrase from user using InputDialog.

7.7.1 Detailed Description

The ViewPC class View layer of the app. Controls EncryptDialog and ProgressDialog.

See Also

ControllerPC, ModelPC, EncryptDialog

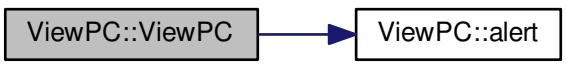
Definition at line 35 of file viewpc.h.

7.7.2 Constructor & Destructor Documentation

7.7.2.1 ViewPC::ViewPC (QWidget * *parent* = `nullptr`) [explicit]

Definition at line 4 of file viewpc.cpp.

Here is the call graph for this function:



7.7.2.2 ViewPC::~ViewPC ( )

ViewPC::~ViewPC Simple destructor for this layer.

Definition at line 28 of file viewpc.cpp.

7.7.3 Member Function Documentation

7.7.3.1 void ViewPC::abortCircuit ( ) [slot]

ViewPC::abortCircuit Slot to close ProgressDialog (ViewPC::dialog)

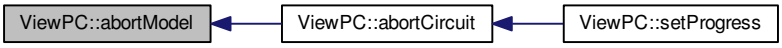
Definition at line 222 of file viewpc.cpp.

Here is the caller graph for this function:

7.7.3.2 void ViewPC::abortModel ( ) [signal]

abortModel Signal calling to stop ModelPC::circuit

Here is the caller graph for this function:



7.7.3.3 void ViewPC::alert (QString *message*, bool *isWarning* = false) [slot]

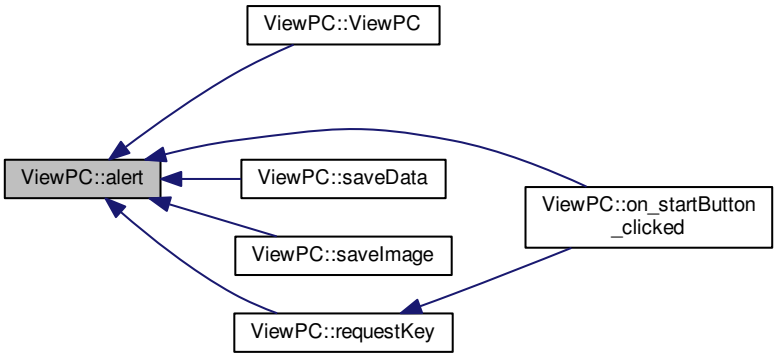
ViewPC::alert Slot to create QMessageBox with message.

Parameters

message	Message to be shown
isWarning	Flag, if message is critical.

Definition at line 136 of file viewpc.cpp.

Here is the caller graph for this function:



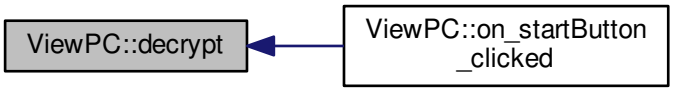
7.7.3.4 void ViewPC::decrypt (QImage * *_image,* QString *key*) [signal]

decrypt Signal calling ModelPC::decrypt

Parameters

_image	Image for decryption
key	encryption key

Here is the caller graph for this function:



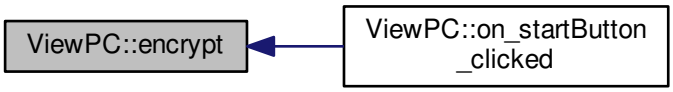
7.7.3.5 void ViewPC::encrypt (QByteArray *data,* QImage * *image,* int *mode,* int *bitsUsed*) [signal]

encrypt Signal calling ModelPC::encrypt

Parameters

data	Data to write
image	Image to be encrypted into.
mode	Mode of encryption
bitsUsed	Bits used per byte

Here is the caller graph for this function:

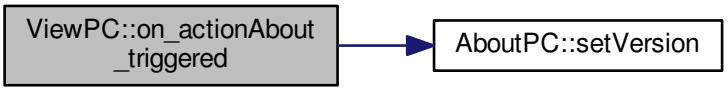


7.7.3.6 void ViewPC::on_actionAbout_triggered ( ) [protected], [slot]

ViewPC::on_actionAbout_triggered Opens about page.

Definition at line 277 of file viewpc.cpp.

Here is the call graph for this function:



7.7.3.7 void ViewPC::on_actionHelp_triggered ( ) [protected], [slot]

ViewPC::on_actionHelp_triggered Opens online documentation.

Definition at line 287 of file viewpc.cpp.

7.7.3.8 void ViewPC::on_fileButton_clicked ( ) [protected], [slot]

ViewPC::on_fileButton_clicked Slot to be called, when according button is pressed.

Definition at line 47 of file viewpc.cpp.

7.7.3.9 void ViewPC::on_startButton_clicked ( ) [protected], [slot]

ViewPC::on_startButton_clicked Slot to be called, when Start Button is pressed.

7.7.4 Encrypting

If Encrypting mode is active the data from text browser or from file from file selector will be opened and checked in size.

Note

File size limit is 16MB

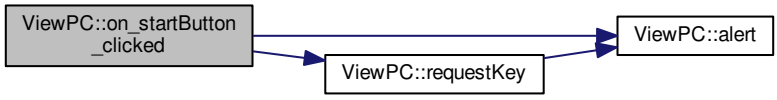
Then the EncryptDialog opens and image and key is selected. Then the ViewPC::encrypt signal is called to start ModelPC::encrypt

7.7.5 Decrypting

Else, the image from file selector is transmitted to ModelPC::decrypt

Definition at line 69 of file viewpc.cpp.

Here is the call graph for this function:



7.7.5.1 QString ViewPC::requestKey ( ) [protected]

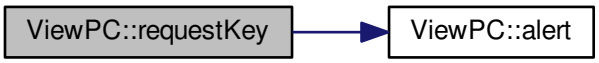
ViewPC::requestKey Request keyphrase from user using InputDialog.

Returns

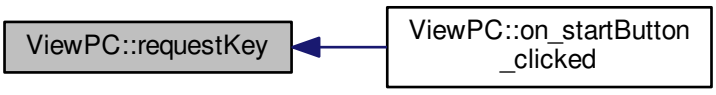
Returns keyphrase

Definition at line 257 of file viewpc.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



7.7.5.2 void ViewPC::runTests ( ) [signal]

runTests Runs tests in ControllerPC via TestPC

7.7.5.3 void ViewPC::saveData (QByteArray *Edata*) [slot]

ViewPC::saveData Slot to be called to save data using QFileDialog.

Parameters

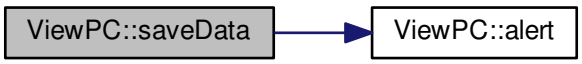
Edata	Encrypted data to be saved.

See Also

ModelPC::encrypt

Definition at line 157 of file viewpc.cpp.

Here is the call graph for this function:



7.7.5.4 void ViewPC::saveImage (QImage * *image*) [slot]

ViewPC::saveImage Slot to be called to save image using QFileDialog.

Parameters

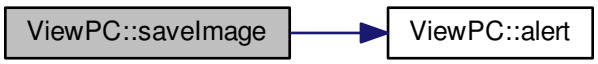
image	Image to be saved.

See Also

ModelPC::decrypt

Definition at line 178 of file viewpc.cpp.

Here is the call graph for this function:



7.7.5.5 void ViewPC::setEncryptMode (bool *encr*) [slot]

ViewPC::setEncryptMode Set the encrpt mode (ViewPC::isEncrypt)

Parameters

encr	

Definition at line 235 of file viewpc.cpp.

7.7.5.6 void ViewPC::setJPHSDir (QString *dir*) [signal]

setJPHSPath Sets the default JPHS directory

Parameters

dir	Directory

7.7.5.7 void ViewPC::setProgress (int *val*) [slot]

ViewPC::setProgress Slot to set the value of the ProgressDialog (ViewPC::dialog).

Parameters

val	New value of the dialog. If -1, creates ProgressDialog, if 101 closes the dialog.

See Also

ViewPC::abortCircuit(), ModelPC::setProgress()

Definition at line 196 of file viewpc.cpp.

Here is the call graph for this function:

7.7.5.8 void ViewPC::setVersion (QString *version*) [slot]

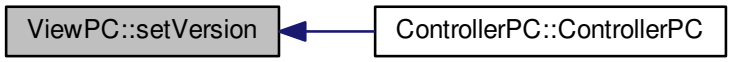
ViewPC::setVersion Set the version of the app from ControllerPC.

Parameters

version	Version as QString

Definition at line 248 of file viewpc.cpp.

Here is the caller graph for this function:



7.7.6 Member Data Documentation

7.7.6.1 QProgressDialog* ViewPC::dialog

dialog ProgressDialog used.

See Also

ViewPC::setProgress, ViewPC::cancel, ModelPC::setProgress

Definition at line 100 of file viewpc.h.

7.7.6.2 QJsonObject ViewPC::errorsDict

Definition at line 106 of file viewpc.h.

7.7.6.3 bool ViewPC::progressDialogClosed

progressDialogClosed Flag, if dialog is closed.

See Also

ViewPC::abortCircuit, ViewPC::setProgress

Definition at line 105 of file viewpc.h.

The documentation for this class was generated from the following files:

- viewpc.h
- viewpc.cpp

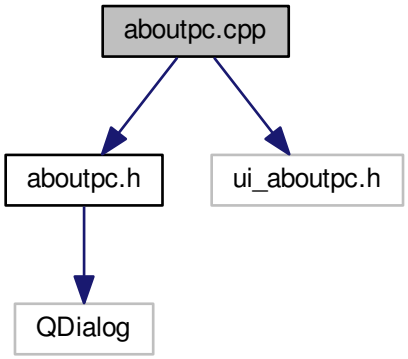
Chapter 8

File Documentation

8.1 aboutpc.cpp File Reference

```
#include "aboutpc.h"
#include "ui_aboutpc.h"
```

Include dependency graph for aboutpc.cpp:



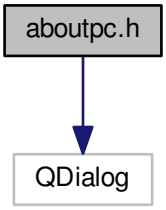
8.2 aboutpc.cpp

```
00001 #include "aboutpc.h"
00002 #include "ui_aboutpc.h"
00003
00004 AboutPC::AboutPC(QWidget *parent) :
00005     QDialog(parent),
00006     ui(new Ui::AboutPC)
00007 {
00008     ui->setupUi(this);
00009 }
00010
00011 AboutPC::~AboutPC()
00012 {
00013     delete ui;
00014 }
00019 void AboutPC::setVersion(QString version)
00020 {
00021     ui->versionLabel->setText("Version " + version);
00022 }
```

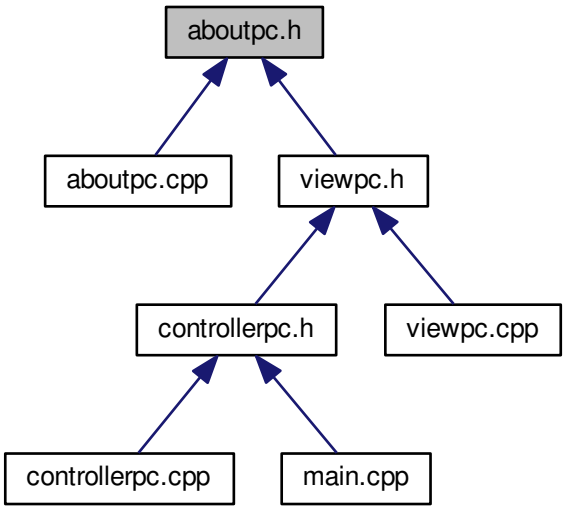
8.3 aboutpc.h File Reference

```
#include <QDialog>
```

Include dependency graph for aboutpc.h:



This graph shows which files directly or indirectly include this file:



Classes

- class AboutPC

  The AboutPC class The About Page dialog.

Namespaces

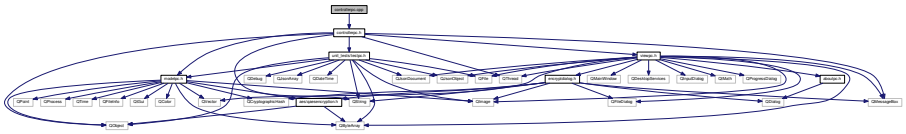
- Ui

8.4 aboutpc.h

```
00001 #ifndef ABOUTPC_H
00002 #define ABOUTPC_H
00003
00004 #include <QDialog>
00005
00006 namespace Ui {
00007 class AboutPC;
00008 }
00012 class AboutPC : public QDialog
00013 {
00014     Q_OBJECT
00015
00016 public:
00017     explicit AboutPC(QWidget *parent = 0);
00018     ~AboutPC();
00019     void setVersion(QString version);
00020
00021 private:
00022     Ui::AboutPC *ui;
00023 };
00024
00025 #endif // ABOUTPC_H
```

8.5 controllerpc.cpp File Reference

`#include "controllerpc.h"`
Include dependency graph for controllerpc.cpp:



8.6 controllerpc.cpp

```
00001 #include "controllerpc.h"
00002
00009 ControllerPC::ControllerPC()
00010 {
00011     // Layer creation
00012     view = new ViewPC();
00013     model = new ModelPC();
00014     QThread * modelThread = new QThread();
00015     model->moveToThread(modelThread);
00016     modelThread->start();
00017
00018     view->setVersion(model->versionString);
00019     view->show();
00020     // Layer Connection
00021     connect(view, SIGNAL(encrypt(QByteArray,QImage*,int, int)), model, SLOT(encrypt(QByteArray,QImage*,int,
      int)));
00022     connect(view, SIGNAL(decrypt(QImage*, QString)), model, SLOT(decrypt(QImage*, QString)));
00023     connect(view, SIGNAL(abortModel()), this, SLOT(abortCircuit()));
00024     connect(view, SIGNAL(setJPHSDir(QString)), this, SLOT(setJPHSDir(QString)));
00025     connect(view, SIGNAL(runTests()), this, SLOT(runTests()));
00026
00027     connect(model, SIGNAL(alertView(QString,bool)), view, SLOT(alert(QString,bool)));
00028     connect(model, SIGNAL(saveData(QByteArray)), view, SLOT(saveData(QByteArray)));
00029     connect(model, SIGNAL(saveImage(QImage*)), view, SLOT(saveImage(QImage*)));
00030     connect(model, SIGNAL(setProgress(int)), view, SLOT(setProgress(int)));
00031 }
00036 void ControllerPC::abortCircuit()
00037 {
00038     model->success = false;
00039 }
00043 void ControllerPC::runTests()
00044 {
00045     bool res = TestPC::Test();
00046     QMessageBox o;
00047     o.setText(!res ? "Testing complete! All tests passed." : "Testing failed.");
```

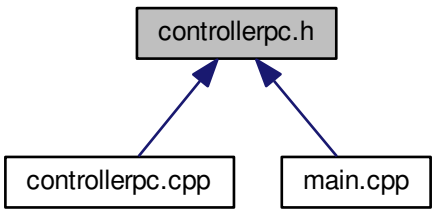
```
00048     o.exec();
00049 }
00054 void ControllerPC::setJPHSDir(QString dir)
00055 {
00056     model->defaultJPHSDir = dir;
00057 }
```

8.7 controllerpc.h File Reference

```
#include <QObject>
#include <QString>
#include <QThread>
#include <QMessageBox>
#include <modelpc.h>
#include <viewpc.h>
#include <unit_tests/testpc.h>
```

Include dependency graph for controllerpc.h:

This graph shows which files directly or indirectly include this file:



Classes

- class ControllerPC

  The ControllerPC class Controller class, which controls View and Model layers.

8.7.1 Detailed Description

Header of ControllerPC class

See Also

ControllerPC, ModelPC, ViewPC

Definition in file controllerpc.h.

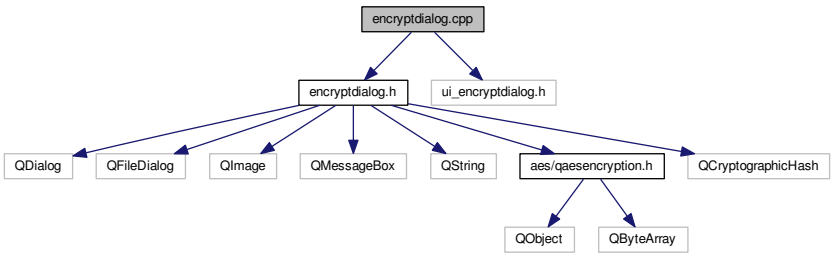
8.8 controllerpc.h

```
00001 #ifndef CONTROLLERPC_H
00002 #define CONTROLLERPC_H
00003
00004 #include <QObject>
00005 #include <QString>
00006 #include <QThread>
00007 #include <QMessageBox>
00008
00009 #include <modelpc.h>
00010 #include <viewpc.h>
00011 #include <unit_tests/testpc.h>
00021 class ControllerPC : public QObject
00022 {
00023     Q_OBJECT
00024 public:
00025     ControllerPC();
00029     long int version;
00033     QString versionString;
00034 public slots:
00035     void abortCircuit();
00036     void runTests();
00037     void setJPHSDir(QString dir);
00038 private:
00039     ViewPC * view;
00040     ModelPC * model;
00041 };
00042
00043 #endif // CONTROLLERPC_H
```

8.9 encryptdialog.cpp File Reference

```
#include "encryptdialog.h"
#include "ui_encryptdialog.h"
```

Include dependency graph for encryptdialog.cpp:



8.10 encryptdialog.cpp

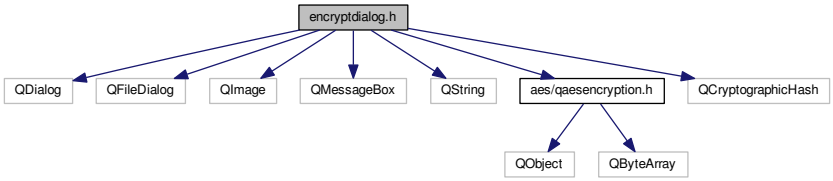
```
00001 #include "encryptdialog.h"
00002 #include "ui_encryptdialog.h"
00009 EncryptDialog::EncryptDialog(QByteArray _data, QWidget *parent) :
00010     QDialog(parent),
00011     ui(new Ui::EncryptDialog)
00012 {
00013     ui->setupUi(this);
00014     data = _data;
00015     success = false;
00016     // UI setup
00017     ui->totalBytes->setText(QString::number(data.size()));
00018     key = "";
00019     compr_data = zip();
00020     long long int compr_data_size = compr_data.size();
00021     ui->zippedBytes->setText(QString::number(compr_data_size));
00022     goodPercentage = false;
00023     bitsUsed = 8;
00024 }
```

```
00025
00026 EncryptDialog::~EncryptDialog()
00027 {
00028     delete ui;
00029 }
00030
00031 void EncryptDialog::alert(QString text)
00032 {
00033     QMessageBox t;
00034     t.setWindowTitle("Message");
00035     t.setIcon(QMessageBox::Warning);
00036     t.setWindowIcon(QIcon(":/mail.png"));
00037     t.setText(text);
00038     t.exec();
00039 }
00046 QByteArray EncryptDialog::zip()
00047 {
00048     // Zip
00049     QByteArray c_data = qCompress(data, 9);
00050     // Encryption
00051     QByteArray hashKey = QCryptographicHash::hash(key.toUtf8(), QCryptographicHash::Sha256);
00052     return QAESEncryption::Crypt(QAESEncryption::AES_256,
      QAESEncryption::ECB, c_data, hashKey);
00053 }
00057 void EncryptDialog::on_fileButton_clicked()
00058 {
00059     // Selet file
00060     inputFileName = QFileDialog::getOpenFileName(this, tr("Open File"), "/", tr("Images (*.png
       *.xpm *.jpg *.jpeg)"));
00061     ui->fileLabel->setText(inputFileName);
00062     // Open image
00063     QImage img(inputFileName);
00064     image = img;
00065     // Get size
00066     size = img.width() * img.height();
00067     // UI setup
00068     long long int compr_data_size = compr_data.size();
00069     ui->zippedBytes->setText(QString::number(compr_data_size));
00070     if(inputFileName.isEmpty()) {
00071         ui->percentage->setText("");
00072         return;
00073     }
00074     double perc = (compr_data_size + 14) * 100 / (size * 3) * bitsUsed / 8;
00075     ui->percentage->setText(QString::number(perc) + "%");
00076     goodPercentage = perc < 70;
00077 }
00082 void EncryptDialog::on_buttonBox_accepted()
00083 {
00084     if(!goodPercentage) {
00085         alert("Your encoding percentage is over 70% which is a bit ambiguous :(");
00086         success = false;
00087         return;
00088     }
00089     // Final zip
00090     key = ui->keyLine->text();
00091     compr_data = zip();
00092     success = true;
00093     close();
00094 }
00098 void EncryptDialog::on_buttonBox_rejected()
00099 {
00100     success = false;
00101     close();
00102 }
00107 void EncryptDialog::on_bitsSlider_valueChanged(int value)
00108 {
00109     bitsUsed = value;
00110     ui->bitsUsedLbl->setText(QString::number(value));
00111     if(ui->percentage->text().isEmpty())
00112         return;
00113     double perc = (compr_data.size() + 14) * 100 / (size * 3) * 8 /
      bitsUsed;
00114     ui->percentage->setText(QString::number(perc) + "%");
00115 }
```

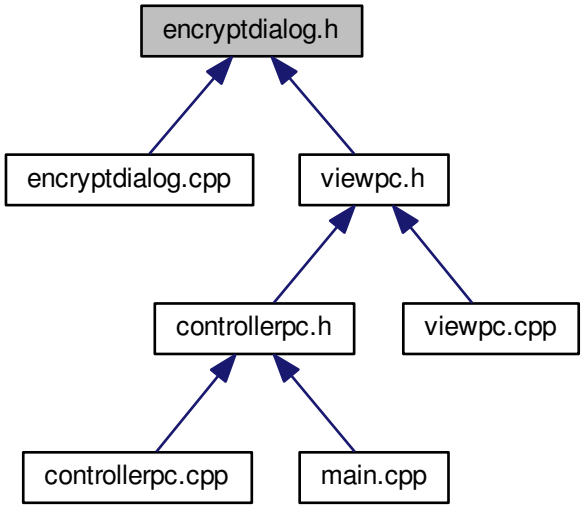
8.11 encryptdialog.h File Reference

```
#include <QDialog>
#include <QFileDialog>
#include <QImage>
#include <QMessageBox>
#include <QString>
#include <aes/qaesencryption.h>
#include <QCryptographicHash>
```

Include dependency graph for encryptdialog.h:



This graph shows which files directly or indirectly include this file:



Classes

- class EncryptDialog

  The EncryptDialog class Class to get the image and key to store secret info.

Namespaces

- Ui

8.12 encryptdialog.h

```
00001 #ifndef ENCRYPTDIALOG_H
00002 #define ENCRYPTDIALOG_H
00003
00004 #include <QDialog>
00005 #include <QFileDialog>
00006 #include <QImage>
00007 #include <QMessageBox>
00008 #include <QString>
00009
00010 #include <aes/qaesencryption.h>
00011 #include <QCryptographicHash>
00012
00013 namespace Ui {
00014 class EncryptDialog;
00015 }
00021 class EncryptDialog : public QDialog
00022 {
00023     Q_OBJECT
00024
00025 public:
00026     explicit EncryptDialog(QByteArray _data, QWidget *parent = 0);
00027     ~EncryptDialog();
00028
00029 public slots:
00030     void on_fileButton_clicked();
00031
00032     void on_buttonBox_accepted();
00033
00034     void on_buttonBox_rejected();
00035
00036     void on_bitsSlider_valueChanged(int value);
00037
00038 public:
00042     QByteArray data;
00046     bool success;
00050     QByteArray compr_data;
00054     QString inputFileName;
00058     long long int size;
00062     QString key;
00066     bool goodPercentage;
00070     int val;
00075     int bitsUsed;
00079     QImage image;
00080     QByteArray zip();
00081 private:
00082     Ui::EncryptDialog *ui;
00083     void alert(QString text);
00084 };
00085
00086 #endif // ENCRYPTDIALOG_H
```

8.13 ErrorsDict.json File Reference

8.14 ErrorsDict.json

```
00001 {
00002     "nodata": "No data given!",
00003     "nullimage": "Image not valid!",
00004     "bigkey": "Key is too big, max is 255 bytes!",
00005     "muchdata": "Too much data for this image",
00006     "wrongmode": "Incorrect mode selected",
00007     "wrongimage": "Image wasn't encrypted by this app or is damaged!",
00008     "noreaddata": "Read data is empty!",
00009     "savefilefail": "Cannot save the file!",
00010     "bitsBufferFail": "Something went very wrong! Error code: bitsBuffer",
00011     "nojphs": "JPHS not installed, installation required!\nSee Menu -> Configure -> JPHS directory",
00012     "fail_hash": "Invalid keyphrase"
00013 }
```

8.15 ErrorsDictSetup.py File Reference

Namespaces

- ErrorsDictSetup

Variables

- string ErrorsDictSetup.filename = 'ErrorsDict.json'
- tuple ErrorsDictSetup.raw = open(filename, 'r')
- tuple ErrorsDictSetup.data = json.load(raw)
- tuple ErrorsDictSetup.input_data = input()

8.16 ErrorsDictSetup.py

```
00001 import json
00002 filename = 'ErrorsDict.json'
00003
00004 raw = open(filename, 'r')
00005
00006 data = json.load(raw)
00007 print('Existing data:')
00008 for key, value in data.items():
00009     print(key, value)
00010
00011 print('------------')
00012 print('Type new data')
00013
00014 input_data = input()
00015
00016 while len(input_data):
00017     key, value = map(str, input_data.split('-'))
00018     data[key] = value
00019     input_data = input()
00020
00021 with open(filename, 'w') as f:
00022     json.dump(data, f, indent=4)
```

8.17 main.cpp File Reference

```
#include "controllerpc.h"
#include <QApplication>
```

Include dependency graph for main.cpp:

Functions

- int main (int argc, char *argv[])

8.17.1 Function Documentation

8.17.1.1 int main (int *argc*, char * *argv[]*)

Definition at line 113 of file main.cpp.

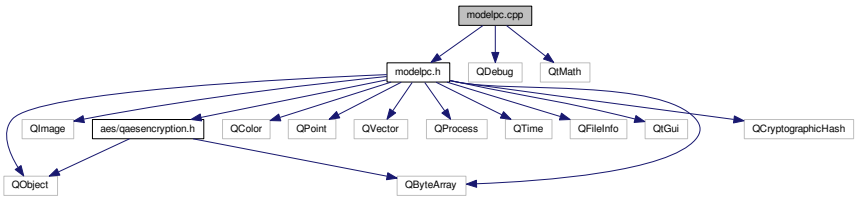
8.18 main.cpp

```
00001 #include "controllerpc.h"
00002 #include <QApplication>
00113 int main(int argc, char *argv[])
00114 {
00115     QApplication a(argc, argv);
00116     ControllerPC w;
00117
00118     return a.exec();
00119 }
```

8.19 modelpc.cpp File Reference

```
#include "modelpc.h"
#include <QDebug>
#include <QtMath>
```

Include dependency graph for modelpc.cpp:



8.20 modelpc.cpp

```
00001 #include "modelpc.h"
00002 #include <QDebug>
00003 #include <QtMath>
00009 ModelPC::ModelPC()
00010 {
00011     // Version control
00012     versionString = "1.3.4";
00013
00014     auto ver = versionString.split(".");
00015     version = ver[0].toInt() * qPow(2, 16) + ver[1].toInt() * qPow(2, 8) + ver[2].toInt();
00016
00017     ver_byte = bytes(ver[0].toInt()) +
00018             bytes(ver[1].toInt()) +
00019             bytes(ver[2].toInt());
00020     // Random seed
00021     qsrand(randSeed());
00022     mykey = "password";
00023     modernCircuit(new QImage(), new QByteArray(), 1);
00024 }
00025
00026 QImage *ModelPC::Start(QByteArray data, QImage *image, int mode, QString key, int
      _bitsUsed, QString *_error)
00027 {
00028     return ModelPC().start(data, image, mode, key, _bitsUsed, _error);
00029 }
00030
00031 QImage *ModelPC::Encrypt(QByteArray encr_data, QImage *image, int mode, int _bitsUsed,
      QString *_error)
00032 {
00033     return ModelPC().encrypt(encr_data, image, mode, _bitsUsed, _error);
00034 }
00035
00036 QByteArray ModelPC::Decrypt(QImage *image, QString key, QString *_error)
00037 {
00038     return ModelPC().decrypt(image, key, _error);
00039 }
00053 QImage * ModelPC::start(QByteArray data, QImage * image, int mode, QString key, int
      _bitsUsed, QString *_error)
00054 {
```

```
00055     // Error management
00056     if(_error == nullptr)
00057         _error = new QString();
00058     *_error = "ok";
00059     error = _error;
00060
00061     if(data.isEmpty()) {
00062         fail("nodata");
00063         return nullptr;
00064     }
00065     if(image == nullptr || image->isNull()) {
00066         fail("nullimage");
00067         return nullptr;
00068     }
00069     if(_bitsUsed < 1 || _bitsUsed > 8) {
00070         fail("bitsWrong");
00071         return nullptr;
00072     }
00073     if(key.isEmpty()) {
00074         fail("no_key");
00075         return nullptr;
00076     }
00077     else if(key.size() > 255) {
00078         fail("bigkey");
00079         return nullptr;
00080     }
00081     long long usedBytes = data.size() + 14 + key.size();
00082     long long size = image->width() * image->height();
00083     if(usedBytes * 100 / (size * 3) * 8 / _bitsUsed > 70) {
00084         fail("muchdata");
00085         return nullptr;
00086     }
00087
00088     curMode = mode;
00089
00090     QByteArray zipped_data = zip(data, key.toUtf8());
00091     QByteArray hash = QCryptographicHash::hash(data, QCryptographicHash::Sha256);
00092     QByteArray encr_data = hash + zipped_data;
00093
00094     if(*error == "ok")
00095         return encrypt(encr_data, image, curMode, _bitsUsed, error);
00096     else
00097         return nullptr;
00098 }
00099
00110 QImage * ModelPC::encrypt(QByteArray encr_data, QImage * image, int mode, int _bitsUsed,
      QString *_error)
00111 {
00112     // Error management
00113     if(_error == nullptr)
00114         _error = new QString();
00115     *_error = "ok";
00116     error = _error;
00117
00118     // TODO Remove debug mode = 0
00119     mode = 0;
00120
00121     bitsUsed = _bitsUsed;
00122
00123     if(encr_data.isEmpty()) {
00124         fail("nodata");
00125         return nullptr;
00126     }
00127     if(image == nullptr || image->isNull()) {
00128         fail("nullimage");
00129         return nullptr;
00130     }
00131     if(_bitsUsed < 1 || _bitsUsed > 8) {
00132         fail("bitsWrong");
00133         return nullptr;
00134     }
00135
00136     encr_data = ver_byte + encr_data;
00137     long long int countBytes = encr_data.size();
00138     curMode = mode;
00139     switch(curMode)
00140     {
00141     case 0:
00142         circuit(image, &encr_data, countBytes);
00143         break;
00144     case 1:
00145         jphs(image, &encr_data);
00146         break;
00147     default:
00148         fail("wrongmode");
00149         return nullptr;
00150     }
```

```
00151
00152
00153     // Saving
00154     if(success) {
00155         emit saveImage(image);
00156         return image;
00157     }
00158     else
00159         return nullptr;
00160 }
00169 QByteArray ModelPC::decrypt(QImage * image, QString key, QString *_error)
00170 {
00171     // Error management
00172     if(_error == nullptr)
00173         _error = new QString();
00174     *_error = "ok";
00175     error = _error;
00176     if(image == nullptr || image->isNull()) {
00177         fail("nullimage");
00178         return nullptr;
00179     }
00180     // Image opening
00181     int w = image->width();
00182     int h = image->height();
00183
00184     // Getting corner pixels
00185     QColor colUL = image->pixelColor(0, 0).toRgb();
00186     QColor colUR = image->pixelColor(w - 1, 0).toRgb();
00187     QColor colDR = image->pixelColor(w - 1, h - 1).toRgb();
00188
00189     // Getting verification code
00190     int verifCode = (((colUR.green() % 2) << 5) + colUR.blue() % 32) << 2;
00191     verifCode += colDR.blue() % 4;
00192     if(verifCode != 166){
00193         fail("veriffail");
00194         return nullptr;
00195     }
00196     // Getting number of bytes
00197     long long int countBytes = (colUL.blue() % 32 + ((colUL.green() % 32) << 5) + ((colUL.red() % 32) << 10
      )) << 9;
00198     countBytes += ((colUR.red() % 32) << 4) + (colUR.green() >> 1) % 16;
00199
00200     bitsUsed = (colDR.blue() >> 2) % 8 + 1;
00201     curMode = colDR.green() % 32;
00202
00203     // Start of the circuit
00204     QByteArray data;
00205     circuit(image, &data, countBytes);
00206
00207     // Check if circuit was successful
00208     if(!success)
00209         return nullptr;
00210     if(data.isEmpty())
00211     {
00212         fail("noreaddata");
00213         return nullptr;
00214
00215     }
00216     // Version check
00217     long long int _ver = mod(data.at(0)) * qPow(2, 16);
00218     _ver += mod(data.at(1)) * qPow(2, 8);
00219     _ver += mod(data.at(2));
00220     data.remove(0, 3);
00221     if(_ver > version) {
00222         fail("Picture's app version is newer than yours. Image version is "
00223               + generateVersionString(_ver) + ", yours is "
00224               + generateVersionString(version) + ".");
00225         return nullptr;
00226     }
00227     else if(_ver < version) {
00228         fail("Picture's app version is older than yours. Image version is "
00229               + generateVersionString(_ver) + ", yours is "
00230               + generateVersionString(version) + ".");
00231         return nullptr;
00232     }
00233     // Get the hash
00234     QByteArray hash = data.left(32);
00235     data.remove(0, 32);
00236
00237     // Unzip
00238     QByteArray unzipped_data = unzip(data, key.toUtf8());
00239     QByteArray our_hash = QCryptographicHash::hash(unzipped_data, QCryptographicHash::Sha256);
00240     if(our_hash != hash) {
00241         fail("fail_hash");
00242         return QByteArray("");
00243     }
00244     emit saveData(unzipped_data);
```

```
00245     return unzipped_data;
00246 }
00251 void ModelPC::fail(QString message)
00252 {
00253     *error = message;
00254     alert(message, true);
00255     success = false;
00256     emit setProgress(101);
00257 }
00263 void ModelPC::jphs(QImage *image, QByteArray *data)
00264 {
00265     // Under Development
00266     return;
00267
00268     // Dead code
00269
00270     success = true;
00271     bool isEncrypt = !data->isEmpty();
00272     QString targetEXE = defaultJPHSDir + (isEncrypt ? "/jphide.exe" : "/jpseek.exe");
00273     if(!fileExists(targetEXE))
00274     {
00275         fail("nojphs");
00276         return;
00277     }
00278
00279     QString randomFileName = defaultJPHSDir + "/";
00280     qsrand(randSeed());
00281     for(int i = 0; i < 10; i++)
00282         randomFileName.append(97 + qrand() % 25);
00283     image->save(randomFileName + ".jpg");
00284     if(isEncrypt) {
00285         QFile file(randomFileName + ".pc");
00286         if(!file.open(QFile::WriteOnly)) {
00287             fail("savefilefail");
00288             return;
00289         }
00290         file.write(*data);
00291         file.close();
00292
00293         QStringList args;
00294         args << (randomFileName + ".jpg") << (randomFileName + "_out.jpg") << (randomFileName + ".pc");
00295         QProcess prog(this);
00296         prog.start(targetEXE, args);
00297         prog.waitForStarted();
00298         prog.write("test\n");
00299         prog.waitForBytesWritten();
00300         prog.write("test\n");
00301         prog.waitForBytesWritten();
00302         prog.waitForReadyRead();
00303         QByteArray bytes = prog.readAll();
00304         prog.waitForFinished();
00305         //QByteArray readData = prog.readAll();
00306         prog.close();
00307         // Cleaning - Deleting temp files
00308
00309     }
00310     else {
00311
00312     }
00313
00314 }
00315
00324 void ModelPC::circuit(QImage *image, QByteArray *data, long long countBytes)
00325 {
00326     // Some flags and creation of the ProgressDialog
00327     success = true;
00328     emit setProgress(-1);
00329     bool isEncrypt = !data->isEmpty();
00330
00331     // Image setup
00332     int w = image->width();
00333     int h = image->height();
00334
00335     // Visited pixels array
00336     QVector <QPoint> were;
00337     were.push_back(QPoint(0, 0));
00338     were.push_back(QPoint(0, h - 1));
00339     were.push_back(QPoint(w - 1, 0));
00340     were.push_back(QPoint(w - 1, h - 1));
00341
00342     long long int offset = 0;
00343
00344     // Pre-start Cleaning
00345     circuitData = data;
00346     circuitImage = image;
00347     circuitCountBytes = countBytes;
00348     cur = 0;
```

```
00349     bitsBuffer.clear();
00350
00351     // Writing Top-Left to Bottom-Left
00352     for(int i = 1; i < h - 1 && mustGoOn(isEncrypt); i++) {
00353         QPoint pos(0, i);
00354         processPixel(pos, &were, isEncrypt);
00355     }
00356     // Writing Bottom-Right to Top-Right
00357     if(mustGoOn(isEncrypt))
00358     {
00359         for(int i = h - 2; i >= 1 && mustGoOn(isEncrypt); i--){
00360             QPoint pos(w - 1, i);
00361             processPixel(pos, &were, isEncrypt);
00362         }
00363     }
00364     // Main cycle
00365     // Strong is considered as actual corner pixel and weak as pixel near it like (1, 0) or (0, 1)
00366     while(mustGoOn(isEncrypt))
00367     {
00368         // Strong Top-Right to Strong Bottom-Right
00369         for(int i = offset; i < h - offset && mustGoOn(isEncrypt); i++){
00370             QPoint pos(w - offset - 2, i);
00371             processPixel(pos, &were, isEncrypt);
00372         }
00373         // Strong Top-Left to Weak Top-Right
00374         for(int i = offset + 1; i < w - offset - 2 && mustGoOn(isEncrypt); i++){
00375             QPoint pos(i, offset);
00376             processPixel(pos, &were, isEncrypt);
00377         }
00378         // Weak Bottom-Right to Weak Bottom-Left
00379         for(int i = w - 3 - offset; i >= offset + 2 && mustGoOn(isEncrypt); i--){
00380             QPoint pos(i, h - offset - 1);
00381             processPixel(pos, &were, isEncrypt);
00382         }
00383         // Weak Top-Left to Strong Bottom-Left
00384         for(int i = offset + 1; i < h - offset && mustGoOn(isEncrypt); i++){
00385             QPoint pos(offset + 1, i);
00386             processPixel(pos, &were, isEncrypt);
00387         }
00388         offset++;
00389     }
00390     // Extra writing
00391     if(!success)
00392         return;
00393     if(isEncrypt)
00394     {
00395         // Getting past colors
00396         QColor colUL = image->pixelColor(0, 0).toRgb();
00397         QColor colUR = image->pixelColor(w - 1, 0).toRgb();
00398         QColor colDL = image->pixelColor(0, h - 1).toRgb();
00399         QColor colDR = image->pixelColor(w - 1, h - 1).toRgb();
00400         int red = 0;
00401         int green = 0;
00402         int blue = 0;
00403
00404         // Writing Upper Left
00405         red = (colUL.red() & 224) + (countBytes >> 19);
00406         green = (colUL.green() & 224) + (countBytes >> 14) % 32;
00407         blue = (colUL.blue() & 224) + (countBytes >> 9) % 32;
00408         image->setPixelColor(0, 0, QColor(red, green, blue));
00409
00410         // Writing Upper Right
00411         red = (colUR.red() & 224) + (countBytes >> 4) % 32;
00412         green = (colUR.green() & 224) + ((countBytes % 16) << 1) + 1;
00413         blue = (colUR.blue() & 224) + 9;
00414         image->setPixelColor(w - 1, 0, QColor(red, green, blue));
00415
00416         // Getting extra bytes if left
00417         while(cur < countBytes)
00418             push(mod(circuitData->at(cur++)), 8);
00419         if(bitsBuffer.size() > 20) {
00420             fail("bitsBufferFail");
00421             return;
00422         }
00423         // Getting extra data as long.
00424         long extraData = pop(-2);
00425
00426         // Writing Down Left
00427         red = (colDL.red() & 224) + (extraData >> 15);
00428         green = (colDL.green() & 224) + (extraData >> 10) % 32;
00429         blue = (colDL.blue() & 224) + (extraData >> 5) % 32;
00430         image->setPixelColor(0, h - 1, QColor(red, green, blue));
00431
00432         // Writing Down Right
00433         red = (colDR.red() & 224) + extraData % 32;
00434         green = (colDR.green() & 224);
00435         blue = (colDR.blue() & 224) + ((bitsUsed - 1) << 2) + 2;
```

```
00436         image->setPixelColor(w - 1, h - 1, QColor(red, green, blue));
00437     }
00438     else
00439     {
00440         // Read the past pixels
00441         QColor colDL = image->pixelColor(0, h - 1).toRgb();
00442         QColor colDR = image->pixelColor(w - 1, h - 1).toRgb();
00443 
00444         // Read extra data
00445         long extraData = ((colDL.red() % 32) << 15) + ((colDL.green() % 32) << 10);
00446         extraData += ((colDL.blue() % 32) << 5) + colDR.red() % 32;
00447 
00448         // Add extra data to the bitsBuffer
00449         push(extraData, (countBytes - cur) * 8 - bitsBuffer.size());
00450 
00451         // Move bits from bitsBuffer to the QByteArray
00452         while(!bitsBuffer.isEmpty())
00453             data->append(pop(8));
00454     }
00455     emit setProgress(101);
00456 }
00457 
00465 void ModelPC::processPixel(QPoint pos, QVector<QPoint> *were, bool isEncrypt)
00466 {
00467     if(!success)
00468         return;
00469     // Check if point was already visited
00470     if(were->contains(pos)){
00471         fail("Point (" + QString::number(pos.x()) + "," + QString::number(pos.y()) + ") was visited
      twice! Error code 2");
00472         return;
00473     }
00474     else
00475         were->push_back(pos);
00476     if(isEncrypt)
00477     {
00478         // Make sure that there are enough bits in bitsBuffer to write
00479         while(bitsBuffer.size() < 3 * bitsUsed)
00480             push(mod(circuitData->at(cur++)), 8);
00481         // Read past contains
00482         QColor pixelColor = circuitImage->pixelColor(pos);
00483         int red = pixelColor.red();
00484         int green = pixelColor.green();
00485         int blue = pixelColor.blue();
00486 
00487         // Write new data in last bitsUsed pixels
00488         red += pop() - red % (int) qPow(2, bitsUsed);
00489         green += pop() - green % (int) qPow(2, bitsUsed);
00490         blue += pop() - blue % (int) qPow(2, bitsUsed);
00491 
00492         circuitImage->setPixelColor(pos, QColor(red, green, blue));
00493     }
00494     else
00495     {
00496         QColor read_color = circuitImage->pixelColor(pos).toRgb();
00497         // Reading the pixel
00498         int red = read_color.red();
00499         int green = read_color.green();
00500         int blue = read_color.blue();
00501 
00502         // Reading the last bitsUsed pixels
00503         red %= (int) qPow(2, bitsUsed);
00504         green %= (int) qPow(2, bitsUsed);
00505         blue %= (int) qPow(2, bitsUsed);
00506 
00507         // Getting the data in the bitsBuffer.
00508         push(red);
00509         push(green);
00510         push(blue);
00511 
00512         // Getting data to QByteArray
00513         while(bitsBuffer.size() >= 8) {
00514             circuitData->append(pop(8));
00515             cur++;
00516         }
00517     }
00518     emit setProgress(100 * cur / circuitCountBytes);
00519 }
00520 
00521 long ModelPC::pop(int bits)
00522 {
00523     // Hard to say
00524     long res = 0;
00525     int poppedBits = bits == -1 ? bitsUsed : bits;
00526     if(bits == -2)
00527         poppedBits = bitsBuffer.size();
00528     for(int i = 0; i < poppedBits; i++)
```

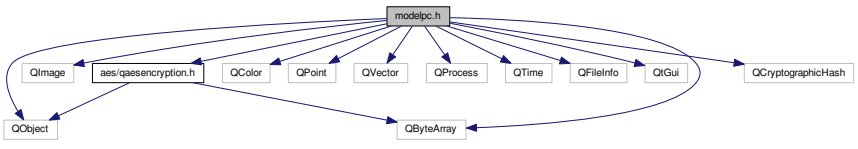
```
00529         res += bitsBuffer[i] * qPow(2, poppedBits - i - 1);
00530     bitsBuffer.remove(0, poppedBits);
00531     return res;
00532 }
00533
00534 void ModelPC::push(int data, int bits)
00535 {
00536     // That's easier, but also hard
00537     int buf_size = bitsBuffer.size();
00538     int extraSize = bits == -1 ? bitsUsed : bits;
00539     bitsBuffer.resize(buf_size + extraSize);
00540     for(int i = bitsBuffer.size() - 1; i >= buf_size; i--, data >>= 1)
00541         bitsBuffer[i] = data % 2;
00542 }
00543
00544 bool ModelPC::mustGoOn(bool isEncrypt)
00545 {
00546     return success && (isEncrypt ? (circuitCountBytes - cur) * 8 + bitsBuffer.size() >=
      bitsUsed * 3 :
00547                                    circuitData->size() * 8 + bitsBuffer.size() <
00548                                    circuitCountBytes * 8 - (circuitCountBytes * 8)% (
      bitsUsed * 3));
00549 }
00558 QByteArray ModelPC::unzip(QByteArray data, QByteArray key)
00559 {
00560     // Decryption
00561     QByteArray hashKey = QCryptographicHash::hash(key, QCryptographicHash::Sha256);
00562     QAESEncryption encryption(QAESEncryption::AES_256,
      QAESEncryption::ECB);
00563     QByteArray new_data = encryption.decode(data, hashKey);
00564     // Decompressing
00565     return qUncompress(new_data);
00566 }
00575 QByteArray ModelPC::zip(QByteArray data, QByteArray key)
00576 {
00577     // Zip
00578     QByteArray c_data = qCompress(data, 9);
00579     // Encryption
00580     QByteArray hashKey = QCryptographicHash::hash(key, QCryptographicHash::Sha256);
00581     return QAESEncryption::Crypt(QAESEncryption::AES_256,
      QAESEncryption::ECB, c_data, hashKey);
00582 }
00583
00584 void ModelPC::modernCircuit(QImage *image, QByteArray *data, long long countBytes)
00585 {
00586     // Currently in development
00587     return;
00588     // Dead code
00589
00590     QByteArray hash = QCryptographicHash::hash(mykey.toUtf8(), QCryptographicHash::Sha256);
00591     QByteArray hex = hash.toHex().toUpper().left(16);
00592     auto random_seed = hex.toULongLong(nullptr, 16);
00593     qsrand(random_seed);
00594
00595     for(int i = 0; i < 20; i++)
00596         qDebug() << qrand() << endl;
00597
00598     qsrand(randSeed());
00599 }
00600
00601 bool ModelPC::fileExists(QString path)
00602 {
00603     QFileInfo check_file(path);
00604     return check_file.exists() && check_file.isFile();
00605 }
00606
00613 QByteArray ModelPC::bytes(long long n)
00614 {
00615     return QByteArray::fromHex(QByteArray::number(n, 16));
00616 }
00623 unsigned int ModelPC::mod(int input)
00624 {
00625     if(input < 0)
00626         return (unsigned int) (256 + input);
00627     else
00628         return (unsigned int) input;
00629 }
00636 void ModelPC::alert(QString message, bool isWarning)
00637 {
00638     emit alertView(message, isWarning);
00639 }
00645 QColor ModelPC::RGBbytes(long long byte)
00646 {
00647     int blue = byte % 256;
00648     int green = (byte / 256) % 256;
00649     int red = byte / qPow(2, 16);
00650     return QColor(red, green, blue);
```

```
00651 }
00652
00653 QString ModelPC::generateVersionString(long ver)
00654 {
00655     return QString::number((int)( ver / qPow(2, 16))) + "." + QString::number(((int) (ver / 256)) % 256) +
      "." + QString::number(ver % 256);
00656 }
00657
00658 uint ModelPC::randSeed()
00659 {
00660     QTime time = QTime::currentTime();
00661     uint randSeed = time.msecsSinceStartOfDay() % 65536 + time.minute() * 21 + time.second() * 2;
00662     return randSeed;
00663 }
00664
```

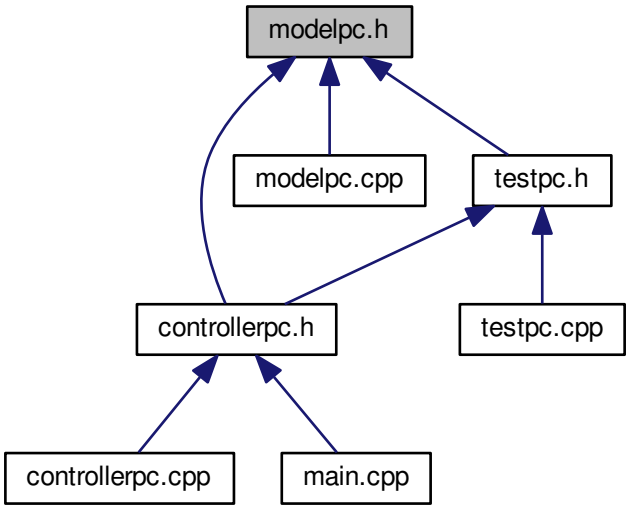
8.21 modelpc.h File Reference

```
#include <QObject>
#include <QImage>
#include <QByteArray>
#include <QColor>
#include <QPoint>
#include <QVector>
#include <QProcess>
#include <QTime>
#include <QFileInfo>
#include <QtGui>
#include <aes/qaesencryption.h>
#include <QCryptographicHash>
```

Include dependency graph for modelpc.h:



This graph shows which files directly or indirectly include this file:



Classes

- class ModelPC

  The ModelPC class Model Layer of the app. Main class that does the work of PictureCrypt logic Controled by ControllerPC.

8.21.1 Detailed Description

Header of ModelPC class

See Also

ControllerPC, ModelPC, ViewPC

Definition in file modelpc.h.

8.22 modelpc.h

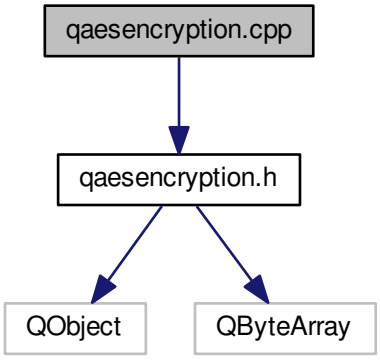
```
00001 #ifndef MODELPC_H
00002 #define MODELPC_H
00003
00004 #include <QObject>
00005 #include <QImage>
00006 #include <QByteArray>
00007 #include <QColor>
00008 #include <QPoint>
00009 #include <QVector>
00010 #include <QProcess>
00011 #include <QTime>
00012 #include <QFileInfo>
00013 #include <QtGui>
00014
00015 #include <aes/qaesencryption.h>
00016 #include <QCryptographicHash>
```

```
00017
00030 class ModelPC : public QObject
00031 {
00032     Q_OBJECT
00033 public:
00034     ModelPC();
00035     static QImage *Start(QByteArray data, QImage *image, int mode = 0, QString key = "", int
      _bitsUsed = 8, QString *_error = nullptr);
00036     static QImage *Encrypt(QByteArray encr_data, QImage * image, int mode = 0, int _bitsUsed = 8,
      QString *_error = nullptr);
00037     static QByteArray Decrypt(QImage * image, QString key, QString *_error = nullptr);
00038
00039 signals:
00046     void alertView(QString messageCode, bool isWarning);
00051     void saveData(QByteArray data);
00056     void saveImage(QImage *image);
00062     void setProgress(int val);
00063
00064 public slots:
00065     QImage *start(QByteArray data, QImage *image, int mode = 0, QString key = "", int _bitsUsed = 8,
      QString *_error = nullptr);
00066     QImage *encrypt(QByteArray encr_data, QImage * image, int mode = 0, int _bitsUsed = 8, QString *
      _error = nullptr);
00067     QByteArray decrypt(QImage * image, QString key, QString *_error = nullptr);
00068     void fail(QString message);
00069
00070 public:
00075     bool success;
00079     long version;
00083     QString versionString;
00087     int curMode;
00091     int bitsUsed;
00095     QString defaultJPHSDir;
00099     QString * error;
00100     QByteArray unzip(QByteArray data, QByteArray key);
00101     void alert(QString message, bool isWarning = false);
00102     // TODO add static functions: start, encrypt, decrypt.
00103 protected:
00104     void circuit(QImage * image, QByteArray * data, long long int countBytes);
00105     void jphs(QImage * image, QByteArray * data);
00106     void processPixel(QPoint pos, QVector<QPoint> *were, bool isEncrypt);
00107     QByteArray zip(QByteArray data, QByteArray key);
00108     void modernCircuit(QImage * image, QByteArray * data, long long int countBytes);
00109 private:
00110     bool fileExists(QString path);
00111     QByteArray bytes(long long n);
00112     unsigned int mod(int input);
00113     QByteArray ver_byte;
00114     QColor RGBbytes(long long byte);
00115     QString generateVersionString(long ver);
00116     uint randSeed();
00117
00118     QByteArray * circuitData;
00119     QImage * circuitImage;
00120     long long circuitCountBytes;
00121     long cur;
00122     QString mykey;
00123     bool mustGoOn(bool isEncrypt);
00124
00125     QVector <bool> bitsBuffer;
00126     long pop(int bits = -1);
00127     void push(int data, int bits = -1);
00128
00129     void setError(QString word);
00130 };
00131
00132 #endif // MODELPC_H
```

8.23 qaesencryption.cpp File Reference

```
#include "qaesencryption.h"
```

Include dependency graph for qaesencryption.cpp:



Functions

- quint8 xTime (quint8 x)
- quint8 multiply (quint8 x, quint8 y)

8.23.1 Function Documentation

8.23.1.1 quint8 multiply (quint8 *x*, quint8 *y*) [inline]

Definition at line 57 of file qaesencryption.cpp.

Here is the call graph for this function:

8.23.1.2 quint8 xTime (quint8 *x*) [inline]

Definition at line 53 of file qaesencryption.cpp.

Here is the caller graph for this function:

8.24 qaesencryption.cpp

```
00001 #include "qaesencryption.h"
00002
00003 /*
00004  * Static Functions
00005  * */
00006 QByteArray QAESEncryption::Crypt(QAESEncryption::Aes level,
      QAESEncryption::Mode mode, const QByteArray &rawText,
00007                                   const QByteArray &key, const QByteArray &iv,
      QAESEncryption::Padding padding)
00008 {
00009     return QAESEncryption(level, mode, padding).encode(rawText, key, iv);
00010 }
00011
00012 QByteArray QAESEncryption::Decrypt(QAESEncryption::Aes level,
      QAESEncryption::Mode mode, const QByteArray &rawText,
00013                                     const QByteArray &key, const QByteArray &iv,
      QAESEncryption::Padding padding)
00014 {
00015      return QAESEncryption(level, mode, padding).decode(rawText, key, iv);
00016 }
00017
00018 QByteArray QAESEncryption::ExpandKey(
      QAESEncryption::Aes level, QAESEncryption::Mode mode, const
      QByteArray &key)
00019 {
00020      return QAESEncryption(level, mode).expandKey(key);
00021 }
00022
00023 QByteArray QAESEncryption::RemovePadding(const QByteArray &rawText,
      QAESEncryption::Padding padding)
00024 {
00025     QByteArray ret(rawText);
00026     switch (padding)
00027     {
00028     case Padding::ZERO:
00029         //Works only if the last byte of the decoded array is not zero
00030         while (ret.at(ret.length()-1) == 0x00)
00031             ret.remove(ret.length()-1, 1);
00032         break;
00033     case Padding::PKCS7:
00034         ret.remove(ret.length() - ret.at(ret.length()-1), ret.at(ret.length()-1));
00035         break;
00036     case Padding::ISO:
00037         ret.truncate(ret.lastIndexOf(0x80));
00038         break;
00039     default:
00040         //do nothing
00041         break;
00042     }
00043     return ret;
00044 }
00045 /*
00046  * End Static function declarations
00047  * */
00048
00049 /*
00050  * Inline Functions
00051  * */
00052
00053 inline quint8 xTime(quint8 x){
00054   return ((x<<1) ^ (((x>>7) & 1) * 0x1b));
00055 }
00056
00057 inline quint8 multiply(quint8 x, quint8 y){
```

```
00058   return (((y & 1) * x) ^ ((y>>1 & 1) * xTime(x)) ^ ((y>>2 & 1) * xTime(
      xTime(x))) ^ ((y>>3 & 1)
00059               * xTime(xTime(xTime(x)))) ^ ((y>>4 & 1) * xTime(
      xTime(xTime(xTime(x))))));
00060 }
00061
00062 /*
00063  * End Inline functions
00064  * */
00065
00066
00067 QAESEncryption::QAESEncryption(Aes level, Mode mode,
00068                                Padding padding)
00069     : m_nb(4), m_blocklen(16), m_level(level), m_mode(mode), m_padding(padding)
00070 {
00071     m_state = NULL;
00072
00073     switch (level)
00074     {
00075     case AES_128: {
00076         AES128 aes;
00077         m_nk = aes.nk;
00078         m_keyLen = aes.keylen;
00079         m_nr = aes.nr;
00080         m_expandedKey = aes.expandedKey;
00081         }
00082         break;
00083     case AES_192: {
00084         AES192 aes;
00085         m_nk = aes.nk;
00086         m_keyLen = aes.keylen;
00087         m_nr = aes.nr;
00088         m_expandedKey = aes.expandedKey;
00089         }
00090         break;
00091     case AES_256: {
00092         AES256 aes;
00093         m_nk = aes.nk;
00094         m_keyLen = aes.keylen;
00095         m_nr = aes.nr;
00096         m_expandedKey = aes.expandedKey;
00097         }
00098         break;
00099     default: {
00100         AES128 aes;
00101         m_nk = aes.nk;
00102         m_keyLen = aes.keylen;
00103         m_nr = aes.nr;
00104         m_expandedKey = aes.expandedKey;
00105         }
00106         break;
00107     }
00108
00109 }
00110 QByteArray QAESEncryption::getPadding(int currSize, int alignment)
00111 {
00112     int size = (alignment - currSize % alignment) % alignment;
00113     if (size == 0) return QByteArray();
00114     switch(m_padding)
00115     {
00116     case Padding::ZERO:
00117         return QByteArray(size, 0x00);
00118         break;
00119     case Padding::PKCS7:
00120         return QByteArray(size,size);
00121         break;
00122     case Padding::ISO:
00123         return QByteArray (size-1, 0x00).prepend(0x80);
00124         break;
00125     default:
00126         return QByteArray(size, 0x00);
00127         break;
00128     }
00129     return QByteArray(size, 0x00);
00130 }
00131
00132 QByteArray QAESEncryption::expandKey(const QByteArray &key)
00133 {
00134   int i, k;
00135   quint8 tempa[4]; // Used for the column/row operations
00136   QByteArray roundKey(key);
00137
00138   // The first round key is the key itself.
00139   // ...
00140
00141   // All other round keys are found from the previous round keys.
00142   //i == Nk
```

```
00143   for(i = m_nk; i < m_nb * (m_nr + 1); i++)
00144   {
00145     tempa[0] = (quint8) roundKey.at((i-1) * 4 + 0);
00146     tempa[1] = (quint8) roundKey.at((i-1) * 4 + 1);
00147     tempa[2] = (quint8) roundKey.at((i-1) * 4 + 2);
00148     tempa[3] = (quint8) roundKey.at((i-1) * 4 + 3);
00149
00150     if (i % m_nk == 0)
00151     {
00152         // This function shifts the 4 bytes in a word to the left once.
00153         // [a0,a1,a2,a3] becomes [a1,a2,a3,a0]
00154
00155         // Function RotWord()
00156         k = tempa[0];
00157         tempa[0] = tempa[1];
00158         tempa[1] = tempa[2];
00159         tempa[2] = tempa[3];
00160         tempa[3] = k;
00161
00162         // Function Subword()
00163         tempa[0] = getSBoxValue(tempa[0]);
00164         tempa[1] = getSBoxValue(tempa[1]);
00165         tempa[2] = getSBoxValue(tempa[2]);
00166         tempa[3] = getSBoxValue(tempa[3]);
00167
00168         tempa[0] =  tempa[0] ^ Rcon[i/m_nk];
00169     }
00170     if (m_level == AES_256 && i % m_nk == 4)
00171     {
00172         // Function Subword()
00173         tempa[0] = getSBoxValue(tempa[0]);
00174         tempa[1] = getSBoxValue(tempa[1]);
00175         tempa[2] = getSBoxValue(tempa[2]);
00176         tempa[3] = getSBoxValue(tempa[3]);
00177     }
00178     roundKey.insert(i * 4 + 0, (quint8) roundKey.at((i - m_nk) * 4 + 0) ^ tempa[0]);
00179     roundKey.insert(i * 4 + 1, (quint8) roundKey.at((i - m_nk) * 4 + 1) ^ tempa[1]);
00180     roundKey.insert(i * 4 + 2, (quint8) roundKey.at((i - m_nk) * 4 + 2) ^ tempa[2]);
00181     roundKey.insert(i * 4 + 3, (quint8) roundKey.at((i - m_nk) * 4 + 3) ^ tempa[3]);
00182   }
00183   return roundKey;
00184 }
00185
00186 // This function adds the round key to state.
00187 // The round key is added to the state by an XOR function.
00188 void QAESEncryption::addRoundKey(const quint8 round, const QByteArray expKey)
00189 {
00190   QByteArray::iterator it = m_state->begin();
00191   for(int i=0; i < 16; ++i)
00192       it[i] = (quint8) it[i] ^ (quint8) expKey.at(round * m_nb * 4 + (i/4) * m_nb + (i%4));
00193 }
00194
00195 // The SubBytes Function Substitutes the values in the
00196 // state matrix with values in an S-box.
00197 void QAESEncryption::subBytes()
00198 {
00199   QByteArray::iterator it = m_state->begin();
00200   for(int i = 0; i < 16; i++)
00201     it[i] = getSBoxValue((quint8) it[i]);
00202 }
00203
00204 // The ShiftRows() function shifts the rows in the state to the left.
00205 // Each row is shifted with different offset.
00206 // Offset = Row number. So the first row is not shifted.
00207 void QAESEncryption::shiftRows()
00208 {
00209     QByteArray::iterator it = m_state->begin();
00210     quint8 temp;
00211     //Keep in mind that QByteArray is column-driven!!
00212
00213      //Shift 1 to left
00214     temp   = (quint8)it[1];
00215     it[1]  = (quint8)it[5];
00216     it[5]  = (quint8)it[9];
00217     it[9]  = (quint8)it[13];
00218     it[13] = (quint8)temp;
00219
00220     //Shift 2 to left
00221     temp   = (quint8)it[2];
00222     it[2]  = (quint8)it[10];
00223     it[10] = (quint8)temp;
00224     temp   = (quint8)it[6];
00225     it[6]  = (quint8)it[14];
00226     it[14] = (quint8)temp;
00227
00228     //Shift 3 to left
00229     temp   = (quint8)it[3];
```

```
00230     it[3]  = (quint8)it[15];
00231     it[15] = (quint8)it[11];
00232     it[11] = (quint8)it[7];
00233     it[7]  = (quint8)temp;
00234 }
00235
00236 // MixColumns function mixes the columns of the state matrix
00237 //optimized!!
00238 void QAESEncryption::mixColumns()
00239 {
00240   QByteArray::iterator it = m_state->begin();
00241   quint8 tmp, tm, t;
00242
00243   for(int i = 0; i < 16; i += 4){
00244     t       = (quint8)it[i];
00245     tmp     =  (quint8)it[i] ^ (quint8)it[i+1] ^ (quint8)it[i+2] ^ (quint8)it[i+3] ;
00246
00247     tm      = xTime( (quint8)it[i] ^ (quint8)it[i+1] );
00248     it[i]   = (quint8)it[i] ^ (quint8)tm ^ (quint8)tmp;
00249
00250     tm      = xTime( (quint8)it[i+1] ^ (quint8)it[i+2]);
00251     it[i+1] = (quint8)it[i+1] ^ (quint8)tm ^ (quint8)tmp;
00252
00253     tm      = xTime( (quint8)it[i+2] ^ (quint8)it[i+3]);
00254     it[i+2] =(quint8)it[i+2] ^ (quint8)tm ^ (quint8)tmp;
00255
00256     tm      = xTime((quint8)it[i+3] ^ (quint8)t);
00257     it[i+3] =(quint8)it[i+3] ^ (quint8)tm ^ (quint8)tmp;
00258   }
00259 }
00260
00261 // MixColumns function mixes the columns of the state matrix.
00262 // The method used to multiply may be difficult to understand for the inexperienced.
00263 // Please use the references to gain more information.
00264 void QAESEncryption::invMixColumns()
00265 {
00266   QByteArray::iterator it = m_state->begin();
00267   quint8 a,b,c,d;
00268   for(int i = 0; i < 16; i+=4){
00269     a = (quint8) it[i];
00270     b = (quint8) it[i+1];
00271     c = (quint8) it[i+2];
00272     d = (quint8) it[i+3];
00273
00274     it[i]   = (quint8) (multiply(a, 0x0e) ^ multiply(b, 0x0b) ^
      multiply(c, 0x0d) ^ multiply(d, 0x09));
00275     it[i+1] = (quint8) (multiply(a, 0x09) ^ multiply(b, 0x0e) ^
      multiply(c, 0x0b) ^ multiply(d, 0x0d));
00276     it[i+2] = (quint8) (multiply(a, 0x0d) ^ multiply(b, 0x09) ^
      multiply(c, 0x0e) ^ multiply(d, 0x0b));
00277     it[i+3] = (quint8) (multiply(a, 0x0b) ^ multiply(b, 0x0d) ^
      multiply(c, 0x09) ^ multiply(d, 0x0e));
00278   }
00279 }
00280
00281 // The SubBytes Function Substitutes the values in the
00282 // state matrix with values in an S-box.
00283 void QAESEncryption::invSubBytes()
00284 {
00285     QByteArray::iterator it = m_state->begin();
00286     for(int i = 0; i < 16; ++i)
00287         it[i] = getSBoxInvert((quint8) it[i]);
00288 }
00289
00290 void QAESEncryption::invShiftRows()
00291 {
00292     QByteArray::iterator it = m_state->begin();
00293     uint8_t temp;
00294
00295     //Keep in mind that QByteArray is column-driven!!
00296
00297     //Shift 1 to right
00298     temp   = (quint8)it[13];
00299     it[13] = (quint8)it[9];
00300     it[9]  = (quint8)it[5];
00301     it[5]  = (quint8)it[1];
00302     it[1]  = (quint8)temp;
00303
00304     //Shift 2
00305     temp   = (quint8)it[10];
00306     it[10] = (quint8)it[2];
00307     it[2]  = (quint8)temp;
00308     temp   = (quint8)it[14];
00309     it[14] = (quint8)it[6];
00310     it[6]  = (quint8)temp;
00311
00312     //Shift 3
```

```
00313     temp   = (quint8)it[15];
00314     it[15] = (quint8)it[3];
00315     it[3]  = (quint8)it[7];
00316     it[7]  = (quint8)it[11];
00317     it[11] = (quint8)temp;
00318 }
00319
00320 QByteArray QAESEncryption::byteXor(const QByteArray &a, const QByteArray &b)
00321 {
00322   QByteArray::const_iterator it_a = a.begin();
00323   QByteArray::const_iterator it_b = b.begin();
00324   QByteArray ret;
00325
00326   //for(int i = 0; i < m_blocklen; i++)
00327   for(int i = 0; i < std::min(a.size(), b.size()); i++)
00328       ret.insert(i,it_a[i] ^ it_b[i]);
00329
00330   return ret;
00331 }
00332
00333 // Cipher is the main function that encrypts the PlainText.
00334 QByteArray QAESEncryption::cipher(const QByteArray &expKey, const QByteArray &in)
00335 {
00336
00337   //m_state is the input buffer...
00338   QByteArray output(in);
00339   m_state = &output;
00340
00341   // Add the First round key to the state before starting the rounds.
00342   addRoundKey(0, expKey);
00343
00344   // There will be Nr rounds.
00345   // The first Nr-1 rounds are identical.
00346   // These Nr-1 rounds are executed in the loop below.
00347   for(quint8 round = 1; round < m_nr; ++round){
00348     subBytes();
00349     shiftRows();
00350     mixColumns();
00351     addRoundKey(round, expKey);
00352   }
00353
00354   // The last round is given below.
00355   // The MixColumns function is not here in the last round.
00356   subBytes();
00357   shiftRows();
00358   addRoundKey(m_nr, expKey);
00359
00360   return output;
00361 }
00362
00363 QByteArray QAESEncryption::invCipher(const QByteArray &expKey, const QByteArray &in)
00364 {
00365     //m_state is the input buffer.... handle it!
00366     QByteArray output(in);
00367     m_state = &output;
00368
00369     // Add the First round key to the state before starting the rounds.
00370     addRoundKey(m_nr, expKey);
00371
00372     // There will be Nr rounds.
00373     // The first Nr-1 rounds are identical.
00374     // These Nr-1 rounds are executed in the loop below.
00375     for(quint8 round=m_nr-1; round>0 ; round--){
00376         invShiftRows();
00377         invSubBytes();
00378         addRoundKey(round, expKey);
00379         invMixColumns();
00380     }
00381
00382     // The last round is given below.
00383     // The MixColumns function is not here in the last round.
00384     invShiftRows();
00385     invSubBytes();
00386     addRoundKey(0, expKey);
00387
00388     return output;
00389 }
00390
00391 QByteArray QAESEncryption::encode(const QByteArray &rawText, const QByteArray &key,
    const QByteArray &iv)
00392 {
00393     if (m_mode >= CBC && (iv.isNull() || iv.size() != m_blocklen))
00394        return QByteArray();
00395
00396     QByteArray ret;
00397     QByteArray expandedKey = expandKey(key);
00398     QByteArray alignedText(rawText);
```

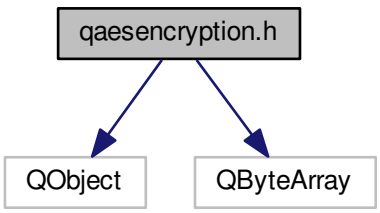
```
00399
00400     //Fill array with padding
00401     alignedText.append(getPadding(rawText.size(), m_blocklen));
00402
00403     switch(m_mode)
00404     {
00405     case ECB:
00406         for(int i=0; i < alignedText.size(); i+= m_blocklen)
00407             ret.append(cipher(expandedKey, alignedText.mid(i, m_blocklen)));
00408         break;
00409     case CBC: {
00410             QByteArray ivTemp(iv);
00411             for(int i=0; i < alignedText.size(); i+= m_blocklen) {
00412                 alignedText.replace(i, m_blocklen, byteXor(alignedText.mid(i, m_blocklen),ivTemp));
00413                 ret.append(cipher(expandedKey, alignedText.mid(i, m_blocklen)));
00414                 ivTemp = ret.mid(i, m_blocklen);
00415             }
00416         }
00417         break;
00418     case CFB: {
00419             ret.append(byteXor(alignedText.left(m_blocklen), cipher(expandedKey, iv)));
00420             for(int i=0; i < alignedText.size(); i+= m_blocklen) {
00421                 if (i+m_blocklen < alignedText.size())
00422                     ret.append(byteXor(alignedText.mid(i+m_blocklen, m_blocklen),
00423                                        cipher(expandedKey, ret.mid(i, m_blocklen))));
00424             }
00425         }
00426         break;
00427     case OFB: {
00428             QByteArray ofbTemp;
00429             ofbTemp.append(cipher(expandedKey, iv));
00430             for (int i=m_blocklen; i < alignedText.size(); i += m_blocklen){
00431                 ofbTemp.append(cipher(expandedKey, ofbTemp.right(m_blocklen)));
00432             }
00433             ret.append(byteXor(alignedText, ofbTemp));
00434         }
00435         break;
00436     default: break;
00437     }
00438     return ret;
00439 }
00440
00441 QByteArray QAESEncryption::decode(const QByteArray &rawText, const QByteArray &key,
      const QByteArray &iv)
00442 {
00443     if (m_mode >= CBC && (iv.isNull() || iv.size() != m_blocklen))
00444        return QByteArray();
00445
00446     QByteArray ret;
00447     QByteArray expandedKey = expandKey(key);
00448
00449     switch(m_mode)
00450     {
00451     case ECB:
00452         for(int i=0; i < rawText.size(); i+= m_blocklen)
00453             ret.append(invCipher(expandedKey, rawText.mid(i, m_blocklen)));
00454         break;
00455     case CBC: {
00456             QByteArray ivTemp(iv);
00457             for(int i=0; i < rawText.size(); i+= m_blocklen){
00458                 ret.append(invCipher(expandedKey, rawText.mid(i, m_blocklen)));
00459                 ret.replace(i, m_blocklen, byteXor(ret.mid(i, m_blocklen),ivTemp));
00460                 ivTemp = rawText.mid(i, m_blocklen);
00461             }
00462         }
00463         break;
00464     case CFB: {
00465             ret.append(byteXor(rawText.mid(0, m_blocklen), cipher(expandedKey, iv)));
00466             for(int i=0; i < rawText.size(); i+= m_blocklen){
00467                 if (i+m_blocklen < rawText.size()) {
00468                     ret.append(byteXor(rawText.mid(i+m_blocklen, m_blocklen),
00469                                        cipher(expandedKey, rawText.mid(i, m_blocklen))));
00470                 }
00471             }
00472         }
00473         break;
00474     case OFB: {
00475         QByteArray ofbTemp;
00476         ofbTemp.append(cipher(expandedKey, iv));
00477         for (int i=m_blocklen; i < rawText.size(); i += m_blocklen){
00478             ofbTemp.append(cipher(expandedKey, ofbTemp.right(m_blocklen)));
00479         }
00480         ret.append(byteXor(rawText, ofbTemp));
00481     }
00482         break;
00483     default:
00484         //do nothing
```

```
00485         break;
00486     }
00487     return ret;
00488 }
00489
00490 QByteArray QAESEncryption::removePadding(const QByteArray &rawText)
00491 {
00492     QByteArray ret(rawText);
00493     switch (m_padding)
00494     {
00495     case Padding::ZERO:
00496         //Works only if the last byte of the decoded array is not zero
00497         while (ret.at(ret.length()-1) == 0x00)
00498             ret.remove(ret.length()-1, 1);
00499         break;
00500     case Padding::PKCS7:
00501         ret.remove(ret.length() - ret.at(ret.length()-1), ret.at(ret.length()-1));
00502         break;
00503     case Padding::ISO:
00504         ret.truncate(ret.lastIndexOf(0x80));
00505         break;
00506     default:
00507         //do nothing
00508         break;
00509     }
00510     return ret;
00511 }
```

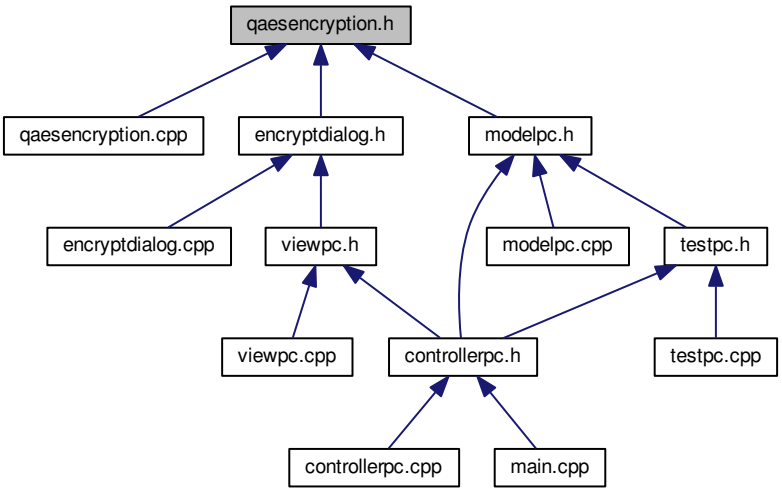
8.25 qaesencryption.h File Reference

```
#include <QObject>
#include <QByteArray>
```

Include dependency graph for qaesencryption.h:



This graph shows which files directly or indirectly include this file:



Classes

- class QAESEncryption

  The QAESEncryption class Small and portable AES encryption class for Qt. Supports all key sizes - 128/192/256 bits - ECB, CBC, CFB and OFB modes. Class made entirely by bricke. Github: https://github.com/bricke/Qt-AES.

8.26 qaesencryption.h

```
00001 #ifndef QAESENCRYPTION_H
00002 #define QAESENCRYPTION_H
00003
00004 #include <QObject>
00005 #include <QByteArray>
00006
00014 class QAESEncryption : public QObject
00015 {
00016     Q_OBJECT
00017 public:
00027     enum Aes {
00028         AES_128,
00029         AES_192,
00030         AES_256
00031     };
00040     enum Mode {
00041         ECB,
00042         CBC,
00043         CFB,
00044         OFB
00045     };
00046
00055     enum Padding {
00056       ZERO,
00057       PKCS7,
00058       ISO
00059     };
00071     static QByteArray Crypt(QAESEncryption::Aes level,
      QAESEncryption::Mode mode, const QByteArray &rawText, const QByteArray &key,
00072                             const QByteArray &iv = NULL, QAESEncryption::Padding
      padding = QAESEncryption::ISO);
00084     static QByteArray Decrypt(QAESEncryption::Aes level,
      QAESEncryption::Mode mode, const QByteArray &rawText, const QByteArray &key,
00085                               const QByteArray &iv = NULL,
```

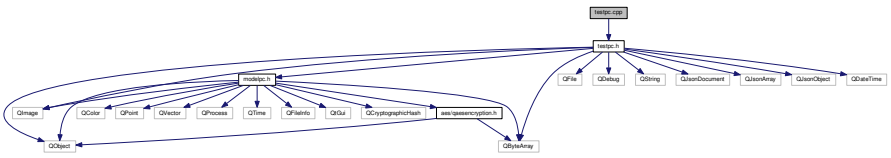
```
      QAESEncryption::Padding padding = QAESEncryption::ISO);
00094     static QByteArray ExpandKey(QAESEncryption::Aes level,
      QAESEncryption::Mode mode, const QByteArray &key);
00102     static QByteArray RemovePadding(const QByteArray &rawText,
      QAESEncryption::Padding padding);
00103
00104     QAESEncryption(QAESEncryption::Aes level,
      QAESEncryption::Mode mode,
00105                    QAESEncryption::Padding padding =
      QAESEncryption::ISO);
00116     QByteArray encode(const QByteArray &rawText, const QByteArray &key, const QByteArray &iv = NULL);
00127     QByteArray decode(const QByteArray &rawText, const QByteArray &key, const QByteArray &iv = NULL);
00136     QByteArray removePadding(const QByteArray &rawText);
00145     QByteArray expandKey(const QByteArray &key);
00146
00147 signals:
00148
00149 public slots:
00150
00151 private:
00152     int m_nb;
00153     int m_blocklen;
00154     int m_level;
00155     int m_mode;
00156     int m_nk;
00157     int m_keyLen;
00158     int m_nr;
00159     int m_expandedKey;
00160     int m_padding;
00161     QByteArray* m_state;
00162
00163     struct AES256{
00164         int nk = 8;
00165         int keylen = 32;
00166         int nr = 14;
00167         int expandedKey = 240;
00168     };
00169
00170     struct AES192{
00171         int nk = 6;
00172         int keylen = 24;
00173         int nr = 12;
00174         int expandedKey = 209;
00175     };
00176
00177     struct AES128{
00178         int nk = 4;
00179         int keylen = 16;
00180         int nr = 10;
00181         int expandedKey = 176;
00182     };
00183
00184     quint8 getSBoxValue(quint8 num){return sbox[num];}
00185     quint8 getSBoxInvert(quint8 num){return rsbox[num];}
00186
00187     void addRoundKey(const quint8 round, const QByteArray expKey);
00188     void subBytes();
00189     void shiftRows();
00190     void mixColumns();
00191     void invMixColumns();
00192     void invSubBytes();
00193     void invShiftRows();
00194     QByteArray getPadding(int currSize, int alignment);
00195     QByteArray cipher(const QByteArray &expKey, const QByteArray &plainText);
00196     QByteArray invCipher(const QByteArray &expKey, const QByteArray &plainText);
00197     QByteArray byteXor(const QByteArray &in, const QByteArray &iv);
00198
00199     const quint8 sbox[256] =   {
00200       //0     1    2      3     4    5     6     7      8    9     A      B    C     D     E     F
00201       0x63, 0x7c, 0x77, 0x7b, 0xf2, 0x6b, 0x6f, 0xc5, 0x30, 0x01, 0x67, 0x2b, 0xfe, 0xd7, 0xab, 0x76,
00202       0xca, 0x82, 0xc9, 0x7d, 0xfa, 0x59, 0x47, 0xf0, 0xad, 0xd4, 0xa2, 0xaf, 0x9c, 0xa4, 0x72, 0xc0,
00203       0xb7, 0xfd, 0x93, 0x26, 0x36, 0x3f, 0xf7, 0xcc, 0x34, 0xa5, 0xe5, 0xf1, 0x71, 0xd8, 0x31, 0x15,
00204       0x04, 0xc7, 0x23, 0xc3, 0x18, 0x96, 0x05, 0x9a, 0x07, 0x12, 0x80, 0xe2, 0xeb, 0x27, 0xb2, 0x75,
00205       0x09, 0x83, 0x2c, 0x1a, 0x1b, 0x6e, 0x5a, 0xa0, 0x52, 0x3b, 0xd6, 0xb3, 0x29, 0xe3, 0x2f, 0x84,
00206       0x53, 0xd1, 0x00, 0xed, 0x20, 0xfc, 0xb1, 0x5b, 0x6a, 0xcb, 0xbe, 0x39, 0x4a, 0x4c, 0x58, 0xcf,
00207       0xd0, 0xef, 0xaa, 0xfb, 0x43, 0x4d, 0x33, 0x85, 0x45, 0xf9, 0x02, 0x7f, 0x50, 0x3c, 0x9f, 0xa8,
00208       0x51, 0xa3, 0x40, 0x8f, 0x92, 0x9d, 0x38, 0xf5, 0xbc, 0xb6, 0xda, 0x21, 0x10, 0xff, 0xf3, 0xd2,
00209       0xcd, 0x0c, 0x13, 0xec, 0x5f, 0x97, 0x44, 0x17, 0xc4, 0xa7, 0x7e, 0x3d, 0x64, 0x5d, 0x19, 0x73,
00210       0x60, 0x81, 0x4f, 0xdc, 0x22, 0x2a, 0x90, 0x88, 0x46, 0xee, 0xb8, 0x14, 0xde, 0x5e, 0x0b, 0xdb,
00211       0xe0, 0x32, 0x3a, 0x0a, 0x49, 0x06, 0x24, 0x5c, 0xc2, 0xd3, 0xac, 0x62, 0x91, 0x95, 0xe4, 0x79,
00212       0xe7, 0xc8, 0x37, 0x6d, 0x8d, 0xd5, 0x4e, 0xa9, 0x6c, 0x56, 0xf4, 0xea, 0x65, 0x7a, 0xae, 0x08,
00213       0xba, 0x78, 0x25, 0x2e, 0x1c, 0xa6, 0xb4, 0xc6, 0xe8, 0xdd, 0x74, 0x1f, 0x4b, 0xbd, 0x8b, 0x8a,
00214       0x70, 0x3e, 0xb5, 0x66, 0x48, 0x03, 0xf6, 0x0e, 0x61, 0x35, 0x57, 0xb9, 0x86, 0xc1, 0x1d, 0x9e,
00215       0xe1, 0xf8, 0x98, 0x11, 0x69, 0xd9, 0x8e, 0x94, 0x9b, 0x1e, 0x87, 0xe9, 0xce, 0x55, 0x28, 0xdf,
00216       0x8c, 0xa1, 0x89, 0x0d, 0xbf, 0xe6, 0x42, 0x68, 0x41, 0x99, 0x2d, 0x0f, 0xb0, 0x54, 0xbb, 0x16 };
00217
00218     const quint8 rsbox[256] =
```

```
00219     { 0x52, 0x09, 0x6a, 0xd5, 0x30, 0x36, 0xa5, 0x38, 0xbf, 0x40, 0xa3, 0x9e, 0x81, 0xf3, 0xd7, 0xfb,
00220       0x7c, 0xe3, 0x39, 0x82, 0x9b, 0x2f, 0xff, 0x87, 0x34, 0x8e, 0x43, 0x44, 0xc4, 0xde, 0xe9, 0xcb,
00221       0x54, 0x7b, 0x94, 0x32, 0xa6, 0xc2, 0x23, 0x3d, 0xee, 0x4c, 0x95, 0x0b, 0x42, 0xfa, 0xc3, 0x4e,
00222       0x08, 0x2e, 0xa1, 0x66, 0x28, 0xd9, 0x24, 0xb2, 0x76, 0x5b, 0xa2, 0x49, 0x6d, 0x8b, 0xd1, 0x25,
00223       0x72, 0xf8, 0xf6, 0x64, 0x86, 0x68, 0x98, 0x16, 0xd4, 0xa4, 0x5c, 0xcc, 0x5d, 0x65, 0xb6, 0x92,
00224       0x6c, 0x70, 0x48, 0x50, 0xfd, 0xed, 0xb9, 0xda, 0x5e, 0x15, 0x46, 0x57, 0xa7, 0x8d, 0x9d, 0x84,
00225       0x90, 0xd8, 0xab, 0x00, 0x8c, 0xbc, 0xd3, 0x0a, 0xf7, 0xe4, 0x58, 0x05, 0xb8, 0xb3, 0x45, 0x06,
00226       0xd0, 0x2c, 0x1e, 0x8f, 0xca, 0x3f, 0x0f, 0x02, 0xc1, 0xaf, 0xbd, 0x03, 0x01, 0x13, 0x8a, 0x6b,
00227       0x3a, 0x91, 0x11, 0x41, 0x4f, 0x67, 0xdc, 0xea, 0x97, 0xf2, 0xcf, 0xce, 0xf0, 0xb4, 0xe6, 0x73,
00228       0x96, 0xac, 0x74, 0x22, 0xe7, 0xad, 0x35, 0x85, 0xe2, 0xf9, 0x37, 0xe8, 0x1c, 0x75, 0xdf, 0x6e,
00229       0x47, 0xf1, 0x1a, 0x71, 0x1d, 0x29, 0xc5, 0x89, 0x6f, 0xb7, 0x62, 0x0e, 0xaa, 0x18, 0xbe, 0x1b,
00230       0xfc, 0x56, 0x3e, 0x4b, 0xc6, 0xd2, 0x79, 0x20, 0x9a, 0xdb, 0xc0, 0xfe, 0x78, 0xcd, 0x5a, 0xf4,
00231       0x1f, 0xdd, 0xa8, 0x33, 0x88, 0x07, 0xc7, 0x31, 0xb1, 0x12, 0x10, 0x59, 0x27, 0x80, 0xec, 0x5f,
00232       0x60, 0x51, 0x7f, 0xa9, 0x19, 0xb5, 0x4a, 0x0d, 0x2d, 0xe5, 0x7a, 0x9f, 0x93, 0xc9, 0x9c, 0xef,
00233       0xa0, 0xe0, 0x3b, 0x4d, 0xae, 0x2a, 0xf5, 0xb0, 0xc8, 0xeb, 0xbb, 0x3c, 0x83, 0x53, 0x99, 0x61,
00234       0x17, 0x2b, 0x04, 0x7e, 0xba, 0x77, 0xd6, 0x26, 0xe1, 0x69, 0x14, 0x63, 0x55, 0x21, 0x0c, 0x7d };
00235
00236     // The round constant word array, Rcon[i], contains the values given by
00237     // x to th e power (i-1) being powers of x (x is denoted as {02}) in the field GF(2^8)
00238     // Only the first 14 elements are needed
00239     const quint8 Rcon[256] = {
00240         0x8d, 0x01, 0x02, 0x04, 0x08, 0x10, 0x20, 0x40, 0x80, 0x1b, 0x36, 0x6c, 0xd8, 0xab/*, 0x4d, 0x9a,
00241         0x2f, 0x5e, 0xbc, 0x63, 0xc6, 0x97, 0x35, 0x6a, 0xd4, 0xb3, 0x7d, 0xfa, 0xef, 0xc5, 0x91, 0x39,
00242         0x72, 0xe4, 0xd3, 0xbd, 0x61, 0xc2, 0x9f, 0x25, 0x4a, 0x94, 0x33, 0x66, 0xcc, 0x83, 0x1d, 0x3a,
00243         0x74, 0xe8, 0xcb, 0x8d, 0x01, 0x02, 0x04, 0x08, 0x10, 0x20, 0x40, 0x80, 0x1b, 0x36, 0x6c, 0xd8,
00244         0xab, 0x4d, 0x9a, 0x2f, 0x5e, 0xbc, 0x63, 0xc6, 0x97, 0x35, 0x6a, 0xd4, 0xb3, 0x7d, 0xfa, 0xef,
00245         0xc5, 0x91, 0x39, 0x72, 0xe4, 0xd3, 0xbd, 0x61, 0xc2, 0x9f, 0x25, 0x4a, 0x94, 0x33, 0x66, 0xcc,
00246         0x83, 0x1d, 0x3a, 0x74, 0xe8, 0xcb, 0x8d, 0x01, 0x02, 0x04, 0x08, 0x10, 0x20, 0x40, 0x80, 0x1b,
00247         0x36, 0x6c, 0xd8, 0xab, 0x4d, 0x9a, 0x2f, 0x5e, 0xbc, 0x63, 0xc6, 0x97, 0x35, 0x6a, 0xd4, 0xb3,
00248         0x7d, 0xfa, 0xef, 0xc5, 0x91, 0x39, 0x72, 0xe4, 0xd3, 0xbd, 0x61, 0xc2, 0x9f, 0x25, 0x4a, 0x94,
00249         0x33, 0x66, 0xcc, 0x83, 0x1d, 0x3a, 0x74, 0xe8, 0xcb, 0x8d, 0x01, 0x02, 0x04, 0x08, 0x10, 0x20,
00250         0x40, 0x80, 0x1b, 0x36, 0x6c, 0xd8, 0xab, 0x4d, 0x9a, 0x2f, 0x5e, 0xbc, 0x63, 0xc6, 0x97, 0x35,
00251         0x6a, 0xd4, 0xb3, 0x7d, 0xfa, 0xef, 0xc5, 0x91, 0x39, 0x72, 0xe4, 0xd3, 0xbd, 0x61, 0xc2, 0x9f,
00252         0x25, 0x4a, 0x94, 0x33, 0x66, 0xcc, 0x83, 0x1d, 0x3a, 0x74, 0xe8, 0xcb, 0x8d, 0x01, 0x02, 0x04,
00253         0x08, 0x10, 0x20, 0x40, 0x80, 0x1b, 0x36, 0x6c, 0xd8, 0xab, 0x4d, 0x9a, 0x2f, 0x5e, 0xbc, 0x63,
00254         0xc6, 0x97, 0x35, 0x6a, 0xd4, 0xb3, 0x7d, 0xfa, 0xef, 0xc5, 0x91, 0x39, 0x72, 0xe4, 0xd3, 0xbd,
00255             0x61, 0xc2, 0x9f, 0x25, 0x4a, 0x94, 0x33, 0x66, 0xcc, 0x83, 0x1d, 0x3a, 0x74, 0xe8, 0xcb, 0x8d
      */};
00256 };
00257
00258 #endif // QAESENCRYPTION_H
```

8.27 testpc.cpp File Reference

`#include "testpc.h"`

Include dependency graph for testpc.cpp:



8.28 testpc.cpp

```
00001 #include "testpc.h"
00005 TestPC::TestPC()
00006 {
00007     model = new ModelPC();
00008 }
00013 int TestPC::Test()
00014 {
00015     return TestPC().startTest();
00016 }
00028 bool TestPC::test(QByteArray data, QImage rImage, QString expectedOutput, int mode, QString
       key, int bitsUsed)
00029 {
00030     // Error outputs
00031     QString error1, error2;
00032     // Embedding
00033     QImage * retImage = model->start(data, &rImage, mode, key, bitsUsed, &error1);
00034     // De-embedding
```

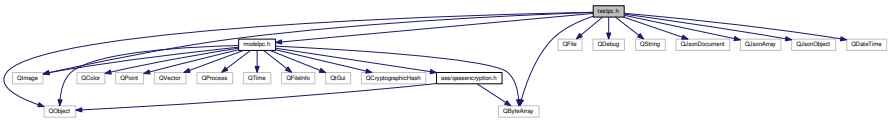
```
00035     QByteArray output = model->decrypt(retImage, key, &error2);
00036
00037     // Success of error outputs
00038     bool er1 = error1 == expectedOutput;
00039     bool er2 = error2 == expectedOutput;
00040     if(expectedOutput == "ok")
00041         return er1 && er2 && data == output;
00042     else
00043         return er1 || er2;
00044 }
00052 int TestPC::startTest()
00053 {
00054     qDebug() << "Testing started...\n";
00055     model = new ModelPC();
00056
00057     // Long text open
00058     QFile file(":/unit_tests/longtext.txt");
00059     if(!file.open(QFile::ReadOnly))
00060         return false;
00061     text = file.readAll();
00062     file.close();
00063
00064     // Big picture open
00065     image = QImage(":/unit_tests/bigpicture.jpg");
00066     if(image.isNull())
00067         return false;
00068
00069     // JSON tests list open
00070     QFile json_file(":/unit_tests/tests.json");
00071     QJsonDocument doc;
00072     if(!json_file.open(QFile::ReadOnly | QFile::Text))
00073         return false;
00074     QByteArray readData = json_file.readAll();
00075     json_file.close();
00076     doc = QJsonDocument::fromJson(readData);
00077     // Testing
00078     return autoTest(doc);
00079 }
00087 bool TestPC::autoTest(QJsonDocument doc)
00088 {
00089     // Opening the tests array
00090     QJsonObject o = doc.object();
00091     QJsonArray arr = o["tests"].toArray();
00092     int sum = 0;
00093
00094     // Info about tests
00095     QString extraText;
00096     for(int i = 0; i < arr.size(); i++) {
00097         // Reading the data
00098         QJsonObject obj = arr[i].toObject();
00099
00100         QString t = obj["data"].toString();
00101         if(t == "/text/")
00102             t = text;
00103         QByteArray data = t.toUtf8();
00104
00105         QString im = obj["image"].toString();
00106         QImage img(":/unit_tests/" + im);
00107
00108         QString expect = obj["expectation"].toString();
00109
00110         int mode = obj["mode"].toInt();
00111
00112         QString key = obj["key"].toString();
00113
00114         int bitsUsed = obj["bitsUsed"].toInt();
00115
00116         // Testing
00117         bool s = test(data, img, expect, mode, key, bitsUsed);
00118
00119         sum += s;
00120         extraText += "\n * Test #" + QString::number(i + 1) + " " + (s ? "completed." : "failed.");
00121     }
00122     // Writing log
00123     QFile file("tests.log");
00124     bool testsSuc = sum == arr.size();
00125     if(!file.open(QFile::WriteOnly | QFile::Text))
00126         return testsSuc;
00127     QDateTime curTime = QDateTime::currentDateTime();
00128     QString date = curTime.toString("dd.MM.yyyy HH:mm");
00129     QString logtext = "########################################\n"
00130                       "####Log file created at " + date + "####\n"
00131                       "########################################\n\n"
00132                       "Status: " + (testsSuc ? "All tests completed" : "Tests failed") + "\n\n"
00133                       "Tests list:\n";
00134     logtext += extraText;
00135     file.write(logtext.toUtf8());
```

```
00136     file.close();
00137     // Cleaning up
00138     qDebug() << "Testing completed\n";
00139     delete model;
00140     return !testsSuc;
00141 }
```

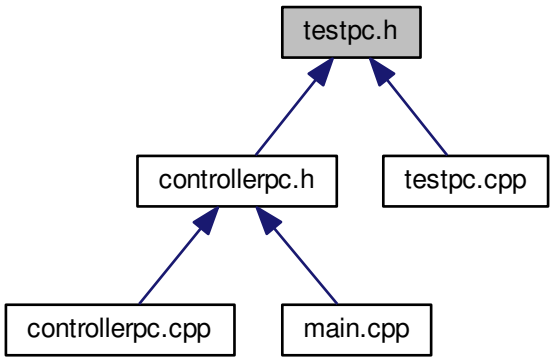
8.29 testpc.h File Reference

```
#include <QObject>
#include <modelpc.h>
#include <QFile>
#include <QDebug>
#include <QString>
#include <QImage>
#include <QByteArray>
#include <QJsonDocument>
#include <QJsonArray>
#include <QJsonObject>
#include <QDateTime>
```

Include dependency graph for testpc.h:



This graph shows which files directly or indirectly include this file:



Classes

- class TestPC

  The TestPC class AutoTest for ModelPC Currently used in main.cpp.

8.30 testpc.h

```
00001 #ifndef TESTPC_H
00002 #define TESTPC_H
00003
00004 #include <QObject>
00005 #include <modelpc.h>
00006
00007 #include <QFile>
00008 #include <QDebug>
00009 #include <QString>
00010 #include <QImage>
00011 #include <QByteArray>
00012
00013 #include <QJsonDocument>
00014 #include <QJsonArray>
00015 #include <QJsonObject>
00016
00017 #include <QDateTime>
00022 class TestPC : public QObject
00023 {
00024     Q_OBJECT
00025 public:
00026     TestPC();
00027     static int Test();
00028     // TODO add static Test();
00029 public slots:
00030     int startTest();
00031 protected slots:
00032     bool test(QByteArray data, QImage rImage,
00033               QString expectedOutput = "ok", int mode = 0,
00034               QString key = "", int bitsUsed = 8);
00035 private:
00039     ModelPC * model;
00043     QByteArray text;
00047     QImage image;
00048
00049     bool autoTest(QJsonDocument doc);
00050 };
00051
00052 #endif // TESTPC_H
```

8.31 tests-setup.py File Reference

Namespaces

- tests-setup

Variables

- string tests-setup.filename = 'tests.json'
- tuple tests-setup.raw = open(filename, 'r')
- tuple tests-setup.js = json.load(raw)
- tuple tests-setup.input_data = input()
- list tests-setup.arr = []
- dictionary tests-setup.obj = {'data':data, 'image':image,'expectation':expect,'mode':int(mode),'key':key,'bitsUsed':int(bitsUsed)}

8.32 tests-setup.py

```
00001 import json
00002 filename = 'tests.json'
00003
00004 raw = open(filename, 'r')
00005
00006 js = json.load(raw)
00007 print('Existing tests:')
00008 for obj in js['tests']:
00009     print(obj['data'], obj['image'], obj['expectation'], obj['mode'], obj['key'], obj['bitsUsed'], sep='-')
00010
```

```
00011 print('------------')
00012 print('Type new tests')
00013
00014 input_data = input()
00015
00016 arr = []
00017 while len(input_data):
00018     data, image, expect, mode, key, bitsUsed = map(str, input_data.split('-'))
00019
00020     obj = {'data':data, 'image':image,'expectation':expect,'mode':int(mode),'key':key,'bitsUsed':int(
      bitsUsed)}
00021     arr.append(obj)
00022     input_data = input()
00023
00024 js['tests'] += arr
00025 with open(filename, 'w') as f:
00026     json.dump(js, f, indent=4)
```

8.33 tests.json File Reference

8.34 tests.json

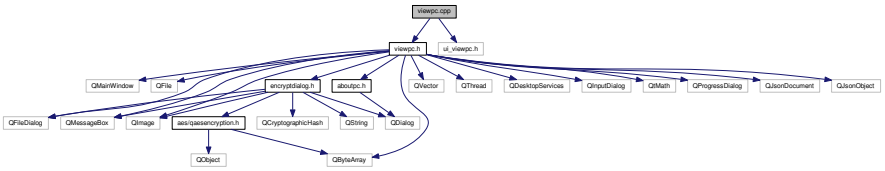
```
00001 {
00002     "tests": [
00003         {
00004             "data": "/text/",
00005             "image": "bigpicture.jpg",
00006             "expectation": "ok",
00007             "mode": 0,
00008             "key": "qwertykey",
00009             "bitsUsed": 8
00010         },
00011         {
00012             "data": "/text/",
00013             "image": "bigpicture.jpg",
00014             "expectation": "ok",
00015             "mode": 0,
00016             "key": "password",
00017             "bitsUsed": 5
00018         },
00019         {
00020             "data": "/text/",
00021             "image": "bigpicture.jpg",
00022             "expectation": "ok",
00023             "mode": 0,
00024             "key": "wowthatpassword",
00025             "bitsUsed": 1
00026         },
00027         {
00028             "data": "/text/",
00029             "image": "tinypicture.png",
00030             "expectation": "muchdata",
00031             "mode": 0,
00032             "key": "get123",
00033             "bitsUsed": 8
00034         },
00035         {
00036             "data": "",
00037             "image": "bigpicture.jpg",
00038             "expectation": "nodata",
00039             "mode": 0,
00040             "key": "42",
00041             "bitsUsed": 8
00042         },
00043         {
00044             "data": "/text/",
00045             "image": "invalid.jpg",
00046             "expectation": "nullimage",
00047             "mode": 0,
00048             "key": "blog it",
00049             "bitsUsed": 8
00050         },
00051         {
00052             "data": "/text/",
00053             "image": "bigpicture.jpg",
00054             "expectation": "bitsWrong",
00055             "mode": 0,
00056             "key": "turtles are great",
00057             "bitsUsed": 12
00058         },
00059         {
```

```
00060             "data": "/text/",
00061             "image": "bigpicture.jpg",
00062             "expectation": "no_key",
00063             "mode": 0,
00064             "key": "",
00065             "bitsUsed": 7
00066         }
00067     ]
00068 }
```

8.35 viewpc.cpp File Reference

```
#include "viewpc.h"
#include "ui_viewpc.h"
```

Include dependency graph for viewpc.cpp:



8.36 viewpc.cpp

```
00001 #include "viewpc.h"
00002 #include "ui_viewpc.h"
00003
00004 ViewPC::ViewPC(QWidget *parent) :
00005     QMainWindow(parent),
00006     ui(new Ui::ViewPC)
00007 {
00008     ui->setupUi(this);
00009
00010     progressDialogClosed = true;
00011
00012     // Alerts dictionary setup
00013     QFile file(":/config/ErrorsDict.json");
00014     if(!file.open(QFile::ReadOnly | QFile::Text)) {
00015         alert("Cannot open config file!");
00016         return;
00017     }
00018     QByteArray readData = file.readAll();
00019     file.close();
00020
00021     QJsonParseError error;
00022     QJsonDocument doc = QJsonDocument::fromJson(readData, &error);
00023     errorsDict = doc.object();
00024 }
00028 ViewPC::~ViewPC()
00029 {
00030     delete ui;
00031 }
00032
00033 void ViewPC::on_encryptMode_clicked()
00034 {
00035     // Encrypt radio button clicked
00036     setEncryptMode(true);
00037 }
00038
00039 void ViewPC::on_decryptMode_clicked()
00040 {
00041     // Decrypt radio button clicked
00042     setEncryptMode(false);
00043 }
00047 void ViewPC::on_fileButton_clicked()
00048 {
00049     // Opening QFileDialog depending on isEncrypt
00050     if(isEncrypt)
00051         inputFileName = QFileDialog::getOpenFileName(this, tr("Select file"), "/untitled.txt", tr("Text
      files (*.txt);;All Files (*)"));
```

```
00052     else
00053         inputFileName = QFileDialog::getOpenFileName(this, tr("Select file"), "/untitled.png", tr("PNG
      files (*.png);;All Files (*)"));
00054     // Display the file name
00055     ui->fileLabel->setText(inputFileName.isEmpty() ? "File not chosen" : inputFileName);
00056 }
00069 void ViewPC::on_startButton_clicked()
00070 {
00071     if(isEncrypt)
00072     {
00073         // Getting the data
00074         QString text = ui->text->toPlainText();
00075         QByteArray data;
00076         if(text.isEmpty()) {
00077             if(inputFileName.isEmpty()) {
00078                 alert("No input file or text was not given. Cannot continue!", true);
00079                 return;
00080             }
00081             // Opening the file
00082             QFile file(inputFileName);
00083             if (!file.open(QIODevice::ReadOnly))
00084             {
00085                 alert("Cannot open file. Cannot continue!", true);
00086                 return;
00087             }
00088             // Check the data size
00089             auto size = file.size();
00090             if(size > qPow(2, 24)) {
00091                 alert("Your file is too big, our systems can handle it, but it requires a lot of time.
      We decline.", true);
00092                 file.close();
00093                 return;
00094             }
00095             data = file.readAll();
00096             file.close();
00097         }
00098         else
00099             data = text.toUtf8();
00100         // Select image via EncryptDialog
00101         EncryptDialog * dialog = new EncryptDialog(data);
00102         dialog->exec();
00103         if(!dialog->success)
00104             return;
00105
00106         // Get the data
00107         QByteArray encr_data = dialog->compr_data;
00108
00109         // Save the hash
00110         QByteArray hash = QCryptographicHash::hash(data, QCryptographicHash::Sha256);
00111         encr_data = hash + encr_data;
00112         // TODO do the mode thing
00113         emit encrypt(encr_data, &dialog->image, 0, dialog->bitsUsed);
00114     }
00115     else
00116     {
00117         // Get the filename of the image
00118         if(!ui->text->toPlainText().isEmpty())
00119             alert("Obviously, the text browser isn't supported for decryption, use File Dialog
      instead.");
00120         if(inputFileName.isEmpty()) {
00121             alert("File not selected. Cannot continue!", true);
00122             return;
00123         }
00124         QByteArray key = requestKey().toUtf8();
00125         if(key.isEmpty())
00126             return;
00127         QImage * res_image = new QImage(inputFileName);
00128         emit decrypt(res_image, key);
00129     }
00130 }
00136 void ViewPC::alert(QString message, bool isWarning)
00137 {
00138     // Get message
00139     if(errorsDict.contains(message))
00140         message = errorsDict[message].toString();
00141     // Create message box
00142     QMessageBox box;
00143     if(isWarning)
00144         box.setIcon(QMessageBox::Warning);
00145     else
00146         box.setIcon(QMessageBox::Information);
00147     box.setText(message);
00148     box.setWindowIcon(QIcon(":/icons/mail.png"));
00149     box.setWindowTitle("Message");
00150     box.exec();
00151 }
00157 void ViewPC::saveData(QByteArray Edata)
```

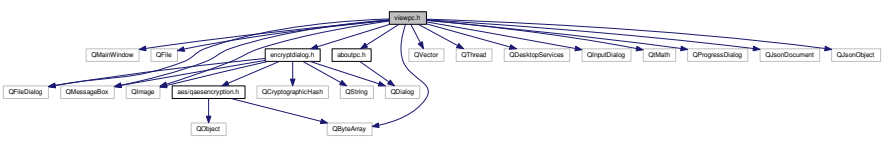
```
00158 {
00159     // Save data using QFileDialog
00160     QString outputFileName = QFileDialog::getSaveFileName(this, tr("Save File"),
00161                                "/untitled.txt",
00162                                tr("Text(*.txt);;All files (*)"));
00163     QFile writeFile(outputFileName);
00164     if (!writeFile.open(QIODevice::WriteOnly))
00165     {
00166         alert("Cannot access file path. Cannot continue!", true);
00167         return;
00168     }
00169     writeFile.write(Edata);
00170     writeFile.close();
00171     alert("Decryption completed!");
00172 }
00178 void ViewPC::saveImage(QImage * image)
00179 {
00180     // Save image using QFileDialog
00181     QString outputFileName = QFileDialog::getSaveFileName(this, tr("Save Image"),
00182                                "/untitled.png",
00183                                tr("Images(*.png)"));
00184     if(!image->save(outputFileName)) {
00185         alert("Cannot save file. Unable to continue!", true);
00186         return;
00187     }
00188     alert("Encryption completed!");
00189 }
00196 void ViewPC::setProgress(int val)
00197 {
00198     if(val < 0) {
00199         // Create dialog
00200         dialog = new QProgressDialog("Cryption in progress.", "Cancel", 0, 100);
00201         connect(dialog, SIGNAL(canceled()), this, SLOT(abortCircuit()));
00202         progressDialogClosed = false;
00203         dialog->setWindowTitle("Processing");
00204         dialog->setWindowIcon(QIcon(":/icons/loading.png"));
00205         dialog->show();
00206     }
00207     else if(val >= 100 && !progressDialogClosed) {
00208         // Close dialog
00209         dialog->setValue(100);
00210         QThread::msleep(25);
00211         dialog->close();
00212         dialog->reset();
00213         progressDialogClosed = true;
00214     }
00215     // Update the progress
00216     else if(!progressDialogClosed)
00217         dialog->setValue(val);
00218 }
00222 void ViewPC::abortCircuit()
00223 {
00224     // Set the flag
00225     progressDialogClosed = true;
00226     // Close the dialog
00227     dialog->close();
00228     dialog->reset();
00229     emit abortModel();
00230 }
00235 void ViewPC::setEncryptMode(bool encr)
00236 {
00237     ui->text->setEnabled(encr);
00238     isEncrypt = encr;
00239     ui->startButton->setText(encr ? "Continue configuration" : "Start decryption");
00240     ui->enLabel1->setText(encr ? "Type in the text for encryption:" : "Text input isn't supported in
       decryption mode");
00241     ui->enLabel1->setEnabled(encr);
00242     ui->enLabel2->setText(encr ? "Or use the file dialog to choose a file:" : "Choose a file for
      decryption:");
00243 }
00248 void ViewPC::setVersion(QString version)
00249 {
00250     // Version setup
00251     versionString = version;
00252 }
00257 QString ViewPC::requestKey()
00258 {
00259     bool ok;
00260     QString text = QInputDialog::getText(this, tr("QInputDialog::getText()"),
00261                                          tr("Enter the keyphrase:"), QLineEdit::Normal,
00262                                          QDir::home().dirName(), &ok);
00263     if(text.isEmpty() && ok) {
00264         alert("Key is empty!", true);
00265         return QString();
00266     }
00267     return ok ? text : QString();
00268 }
```

```
00269
00270 QByteArray ViewPC::bytes(long long n)
00271 {
00272     return QByteArray::fromHex(QByteArray::number(n, 16));
00273 }
00277 void ViewPC::on_actionAbout_triggered()
00278 {
00279     AboutPC about;
00280     about.setVersion(versionString);
00281     about.exec();
00282 }
00283
00287 void ViewPC::on_actionHelp_triggered()
00288 {
00289     QUrl docLink("https://alexkovrigin.me/PictureCrypt");
00290     QDesktopServices::openUrl(docLink);
00291 }
00292
00293 void ViewPC::on_actionJPHS_path_triggered()
00294 {
00295     QString dir = QFileDialog::getExistingDirectory(this, tr("Open JPHS folder"),
00296                                                     "/home",
00297                                                     QFileDialog::ShowDirsOnly
00298                                                     | QFileDialog::DontResolveSymlinks);
00299     emit setJPHSDir(dir);
00300 }
00301
00302 void ViewPC::on_actionRun_tests_triggered()
00303 {
00304     emit runTests();
00305 }
```

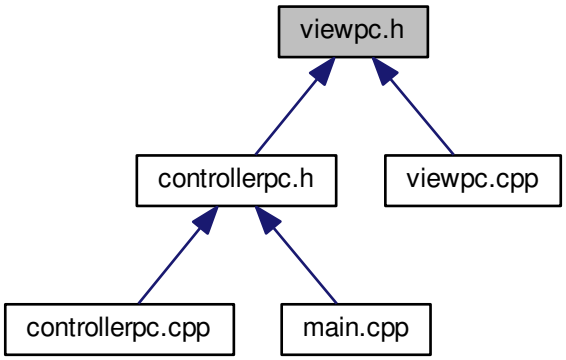
8.37 viewpc.h File Reference

```
#include <QMainWindow>
#include <QFile>
#include <QFileDialog>
#include <QMessageBox>
#include <QImage>
#include <QByteArray>
#include <QVector>
#include <QThread>
#include <QDesktopServices>
#include <QInputDialog>
#include <QtMath>
#include <encryptdialog.h>
#include <QProgressDialog>
#include <aboutpc.h>
#include <QJsonDocument>
#include <QJsonObject>
```

Include dependency graph for viewpc.h:



This graph shows which files directly or indirectly include this file:



Classes

- class ViewPC

  The ViewPC class View layer of the app. Controls EncryptDialog and ProgressDialog.

Namespaces

- Ui

8.37.1 Detailed Description

Header of ViewPC class

See Also

ControllerPC, ModelPC, ViewPC

Definition in file viewpc.h.

8.38 viewpc.h

```
00001 #ifndef VIEWPC_H
00002 #define VIEWPC_H
00003
00004 #include <QMainWindow>
00005 #include <QFile>
00006 #include <QFileDialog>
00007 #include <QMessageBox>
00008 #include <QImage>
00009 #include <QByteArray>
00010 #include <QVector>
00011 #include <QThread>
00012 #include <QDesktopServices>
00013 #include <QInputDialog>
00014 #include <QtMath>
00015
00016 #include <encryptdialog.h>
00017 #include <QProgressDialog>
```

```
00018 #include <aboutpc.h>
00019
00020 #include <QJsonDocument>
00021 #include <QJsonObject>
00022
00023 namespace Ui {
00024 class ViewPC;
00025 }
00035 class ViewPC : public QMainWindow
00036 {
00037     Q_OBJECT
00038
00039 public:
00040     explicit ViewPC(QWidget *parent = nullptr);
00041     ~ViewPC();
00042 private slots:
00043     void on_encryptMode_clicked();
00044
00045     void on_decryptMode_clicked();
00046
00047     void on_actionJPHS_path_triggered();
00048
00049     void on_actionRun_tests_triggered();
00050
00051 protected slots:
00052     void on_fileButton_clicked();
00053
00054     void on_startButton_clicked();
00055
00056     void on_actionAbout_triggered();
00057
00058     void on_actionHelp_triggered();
00059 public slots:
00060     void alert(QString message, bool isWarning = false);
00061     void saveData(QByteArray Edata);
00062     void saveImage(QImage *image);
00063     void setProgress(int val);
00064     void abortCircuit();
00065     void setEncryptMode(bool encr);
00066     void setVersion(QString version);
00067 signals:
00075     void encrypt(QByteArray data, QImage * image, int mode, int bitsUsed);
00081     void decrypt(QImage * _image, QString key);
00085     void abortModel();
00090     void setJPHSDir(QString dir);
00094     void runTests();
00095 public:
00100     QProgressDialog * dialog;
00105     bool progressDialogClosed;
00106     QJsonObject errorsDict;
00107 protected:
00108     QString requestKey();
00109 private:
00110     Ui::ViewPC *ui;
00111     bool isEncrypt;
00112     QString inputFileName;
00113     QByteArray bytes(long long n);
00114     QString versionString;
00115 };
00116
00117 #endif // VIEWPC_H
```

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