Code less.
Create more.
Deploy everywhere.

A Simple Floorplan Painter Using Qt-C++

Outline

- What is Qt?
- Downloading Qt
- Qt Installation
- New Qt Project
- Paint

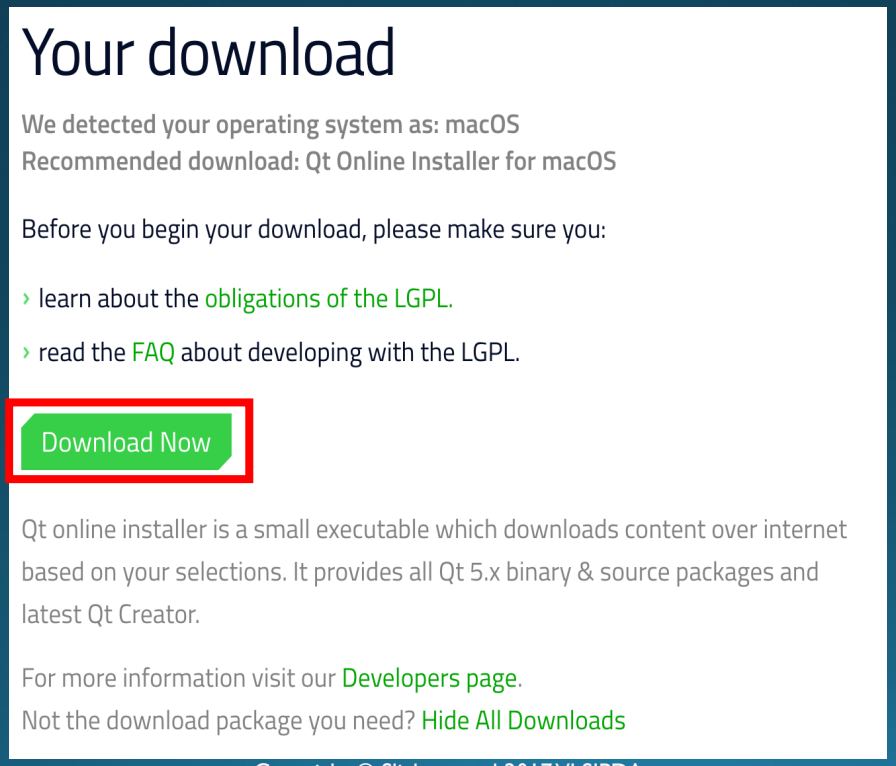
What is Qt?

- Qt (官方發音同cute)，是一個跨平台的 C++ 應用程式開發框架，廣泛用於開發 GUI 程式
- Qt 擁有完善的 C++ 圖形函式庫
- 支援多種平台。會自動依平台的不同，表現平台特有的圖形介面風格
- 目前最新版本為 5.8.0
- Windows/Linux/MacOS 皆可用

source: Wikipedia

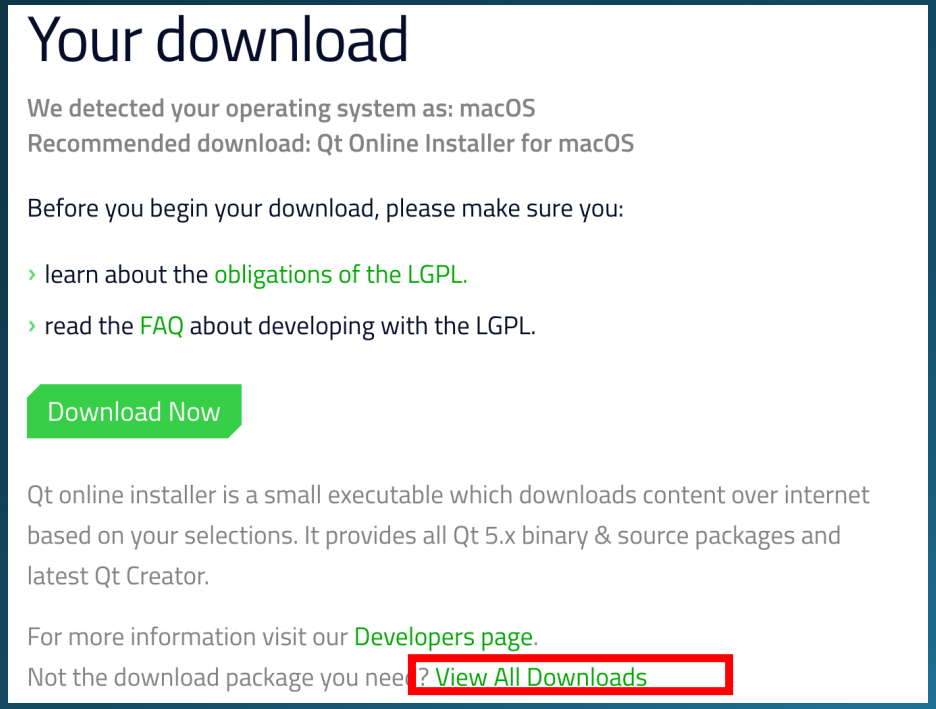
Downloading Qt (Option I)

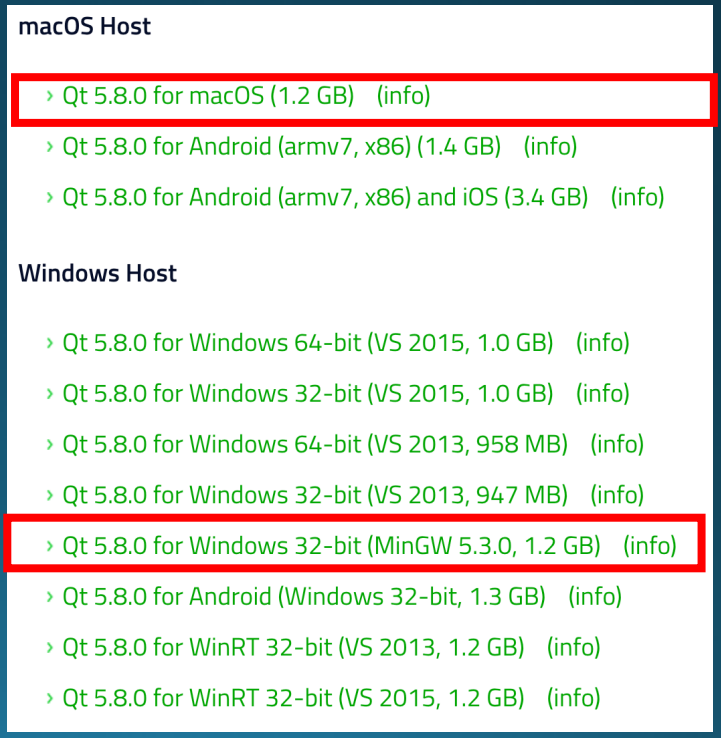
- URL: http://www.qt.io/download-open-source/
- Online installer (smaller size)



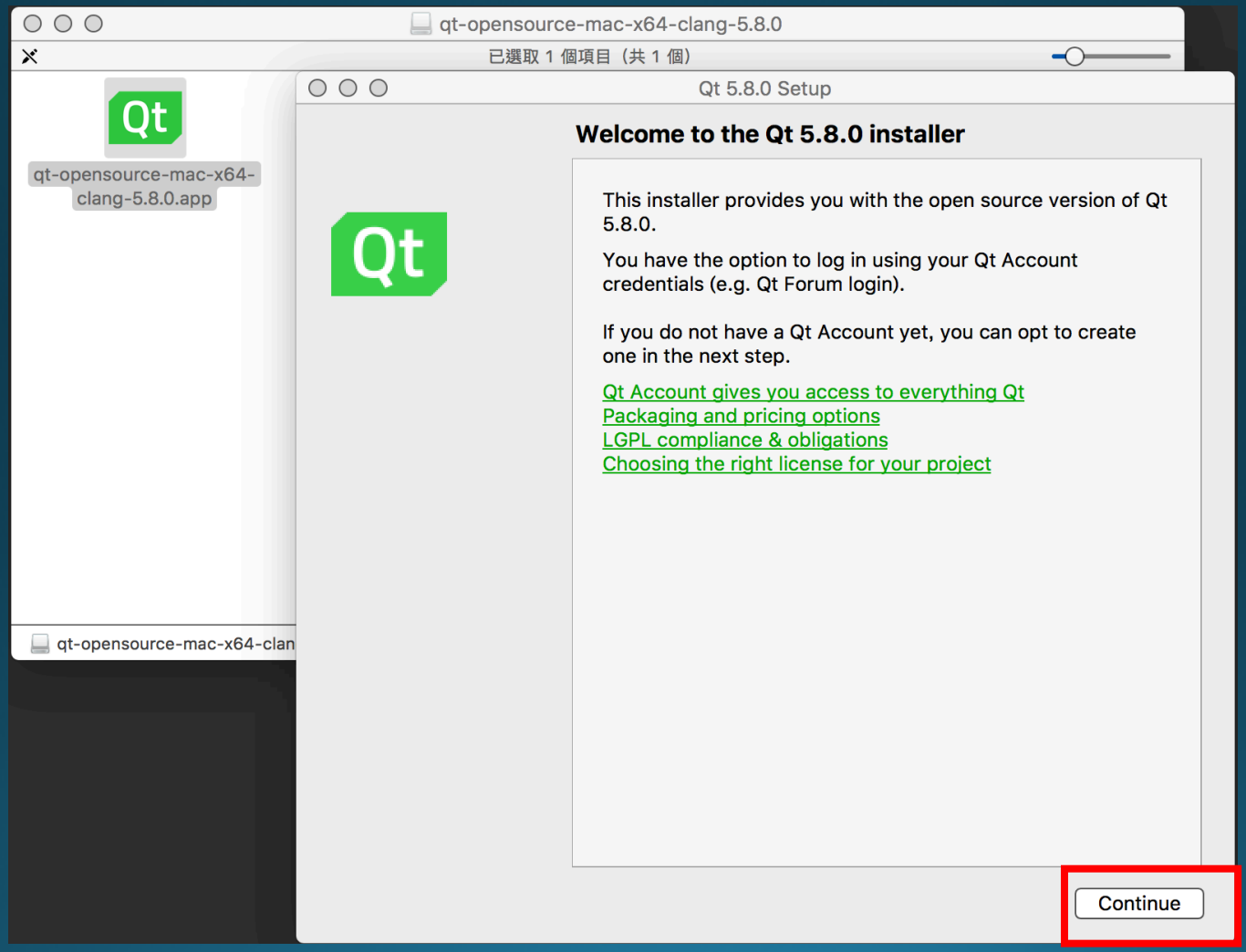
Downloading Qt (Option II)

- URL: http://www.qt.io/download-open-source/
- Full offline installer (larger size)
- Use this one to demo

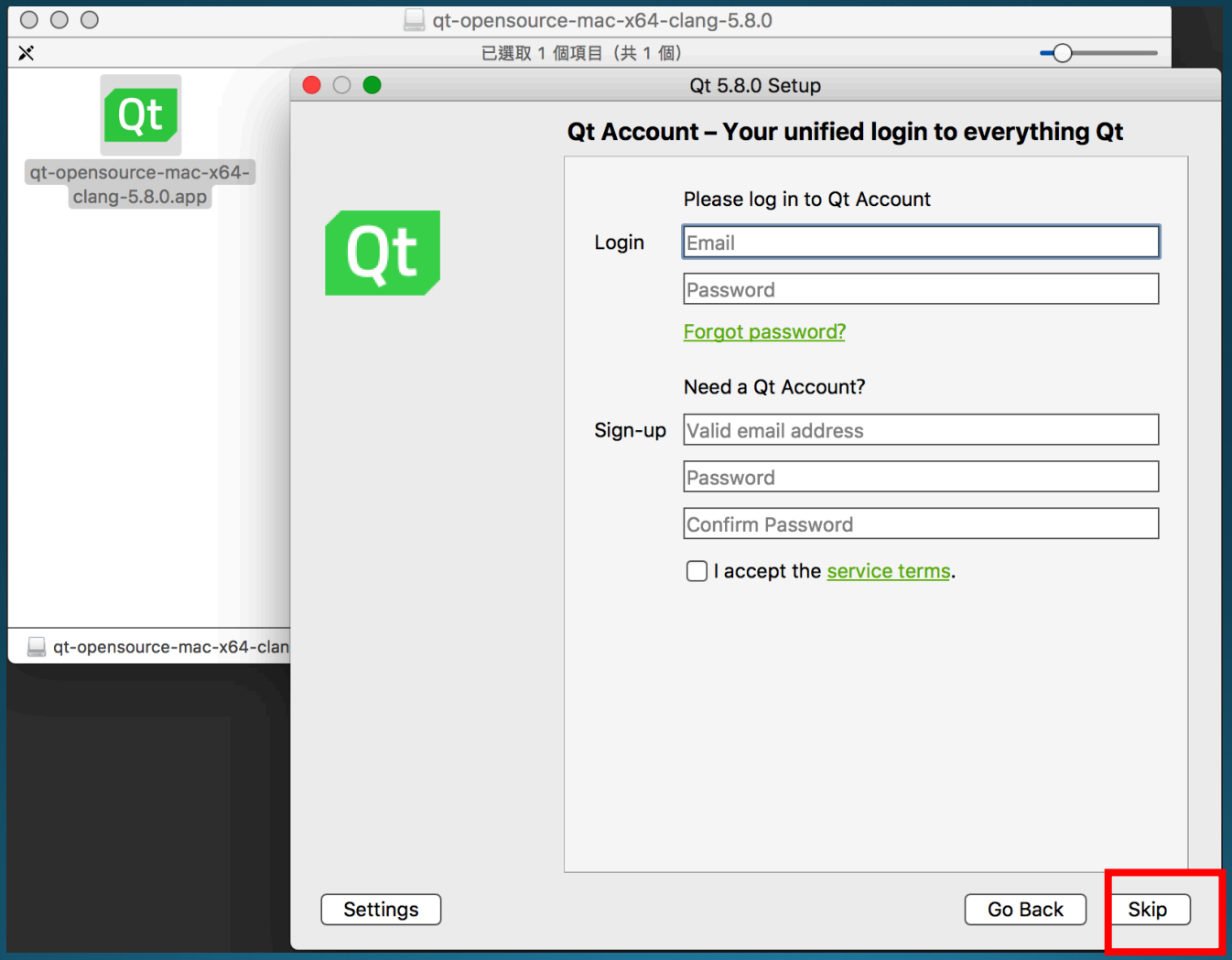




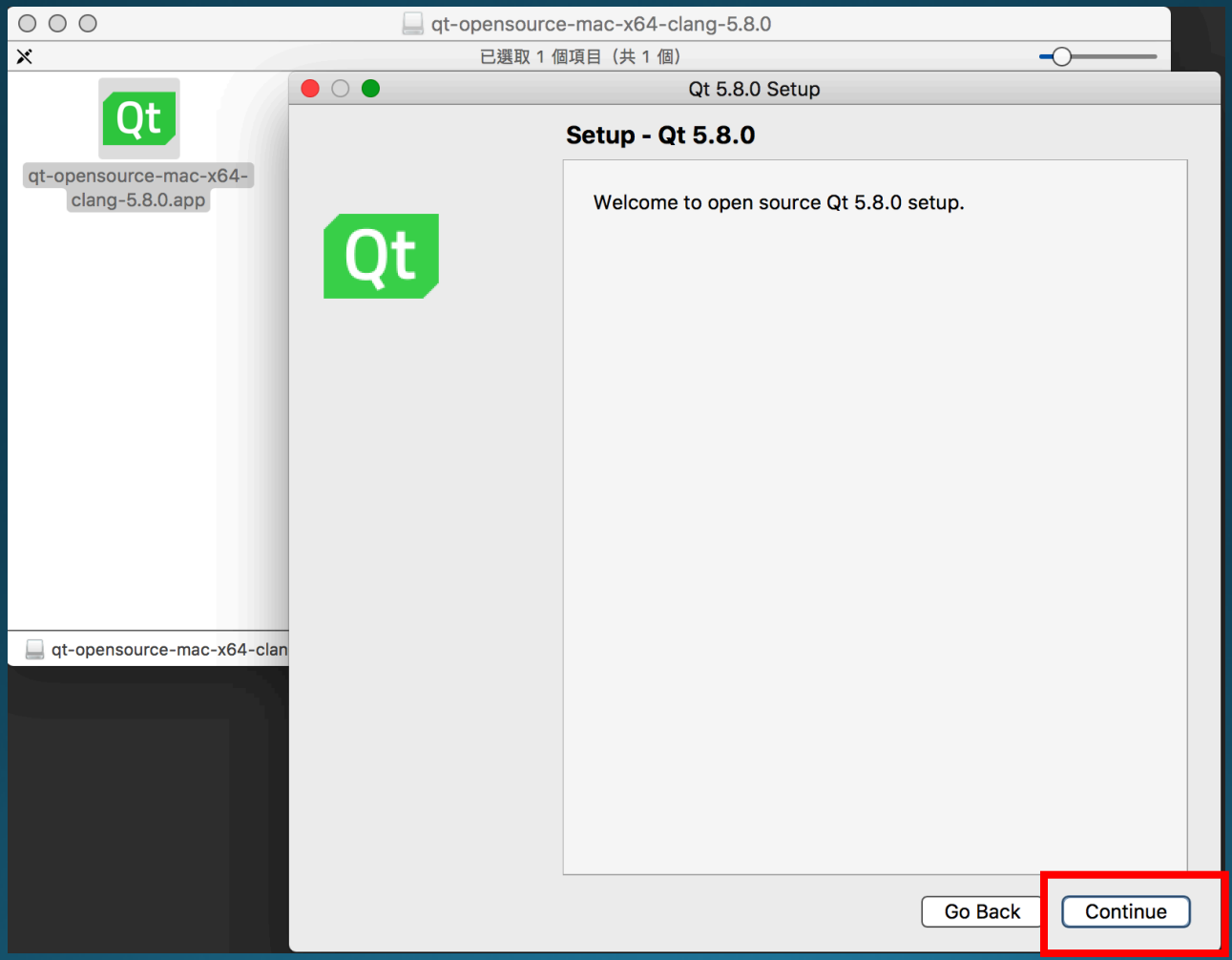
Qt Installation (1/9)



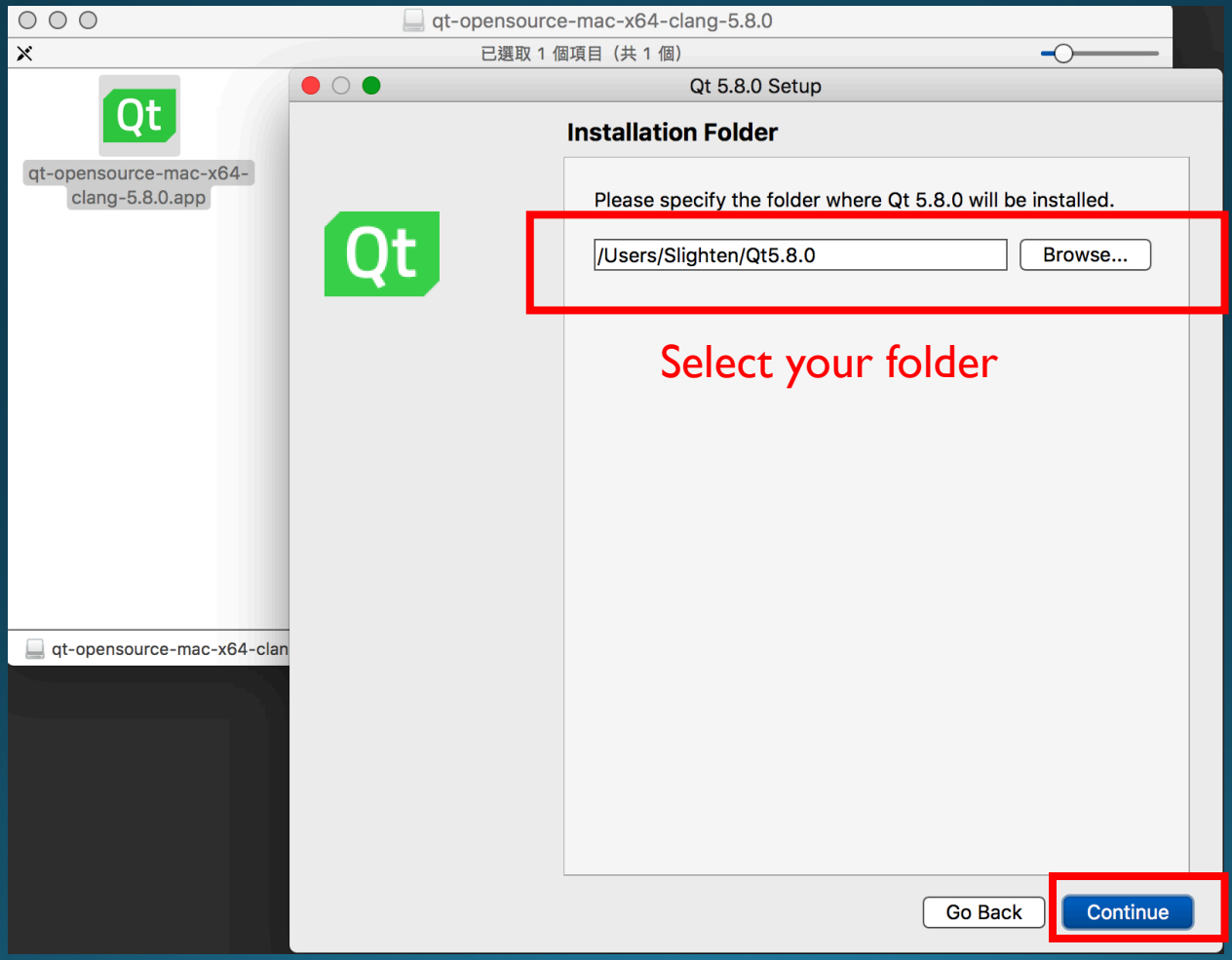
Qt Installation (2/9)



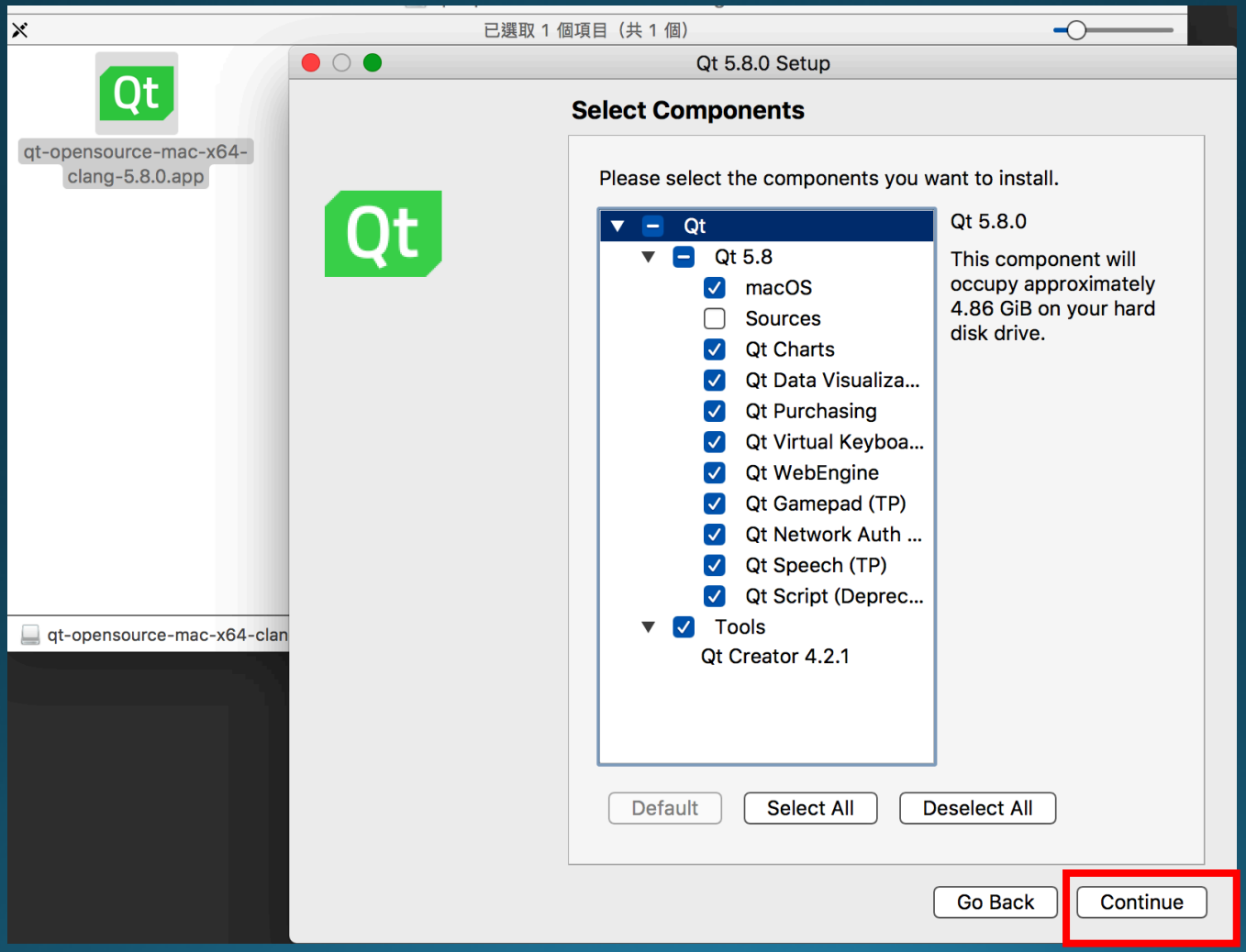
Qt Installation (3/9)



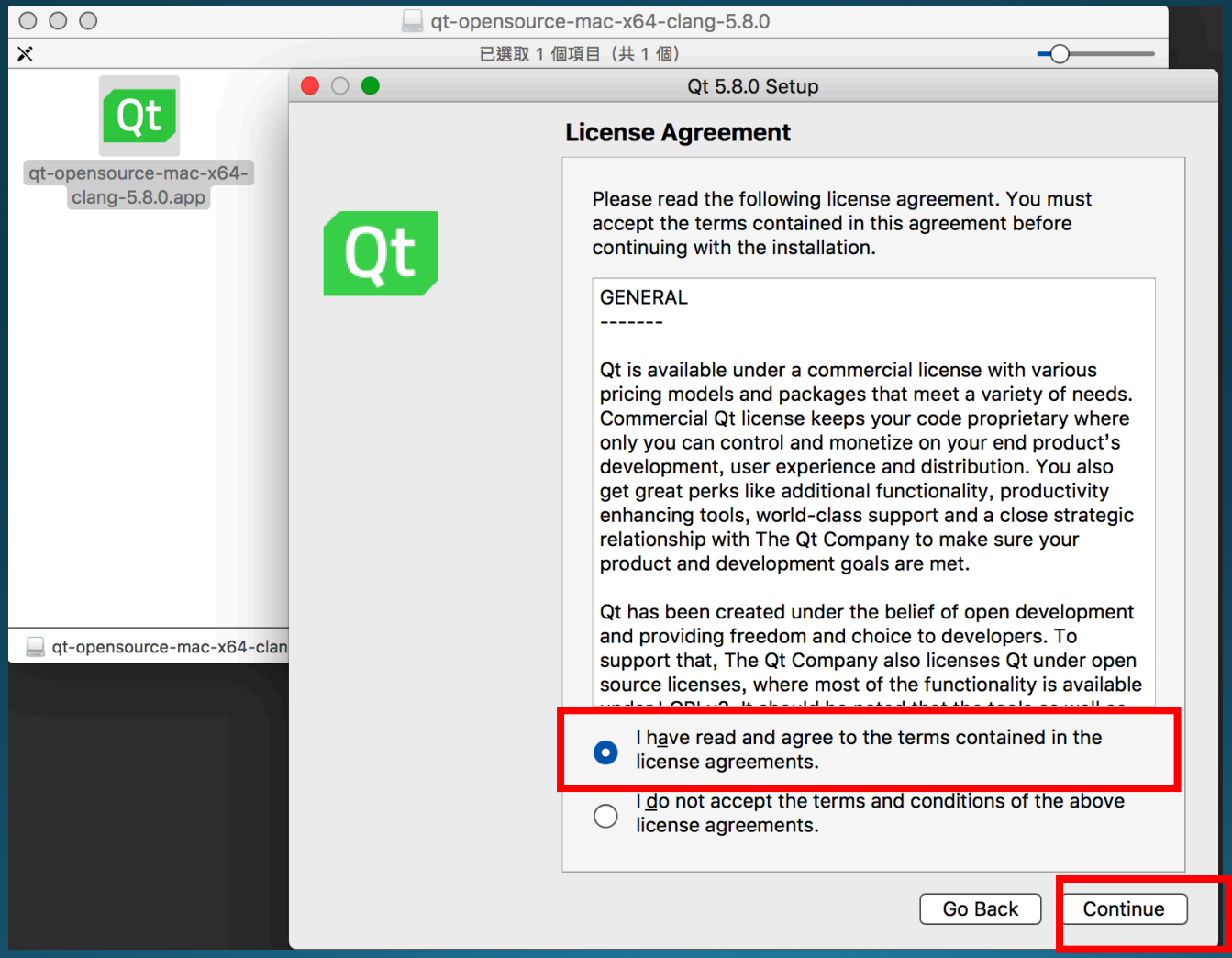
Qt Installation (4/9)



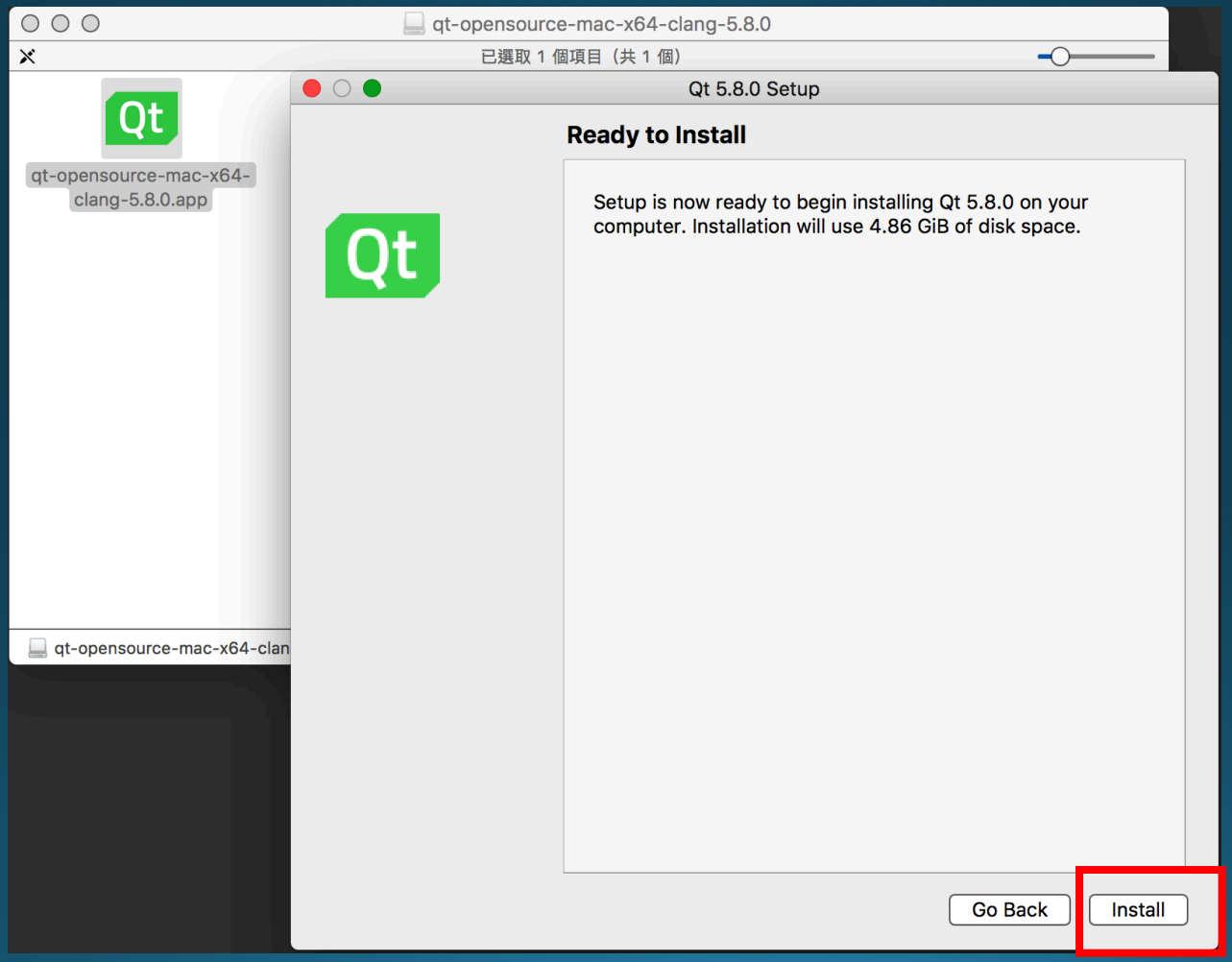
Qt Installation (5/9)



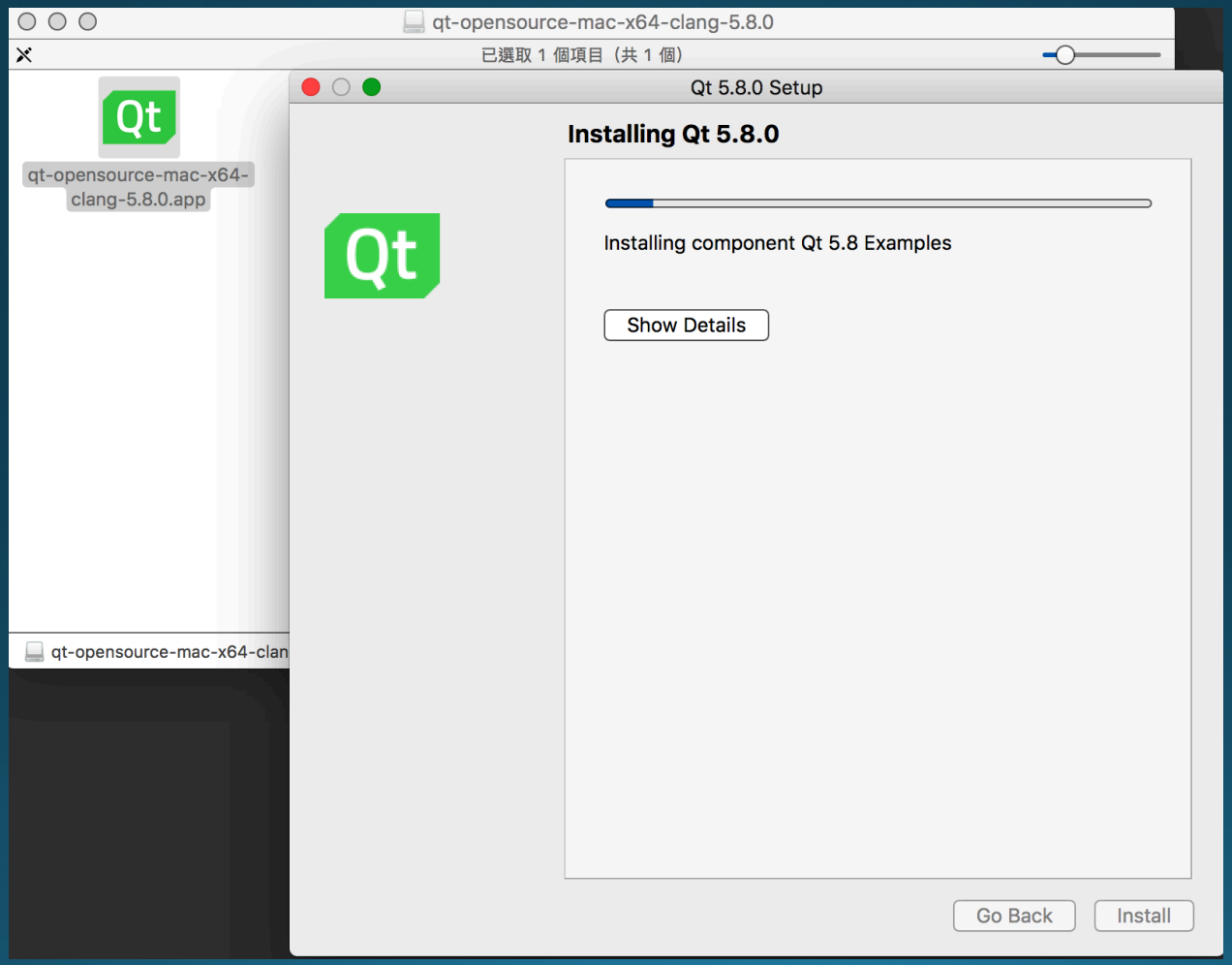
Qt Installation (6/9)



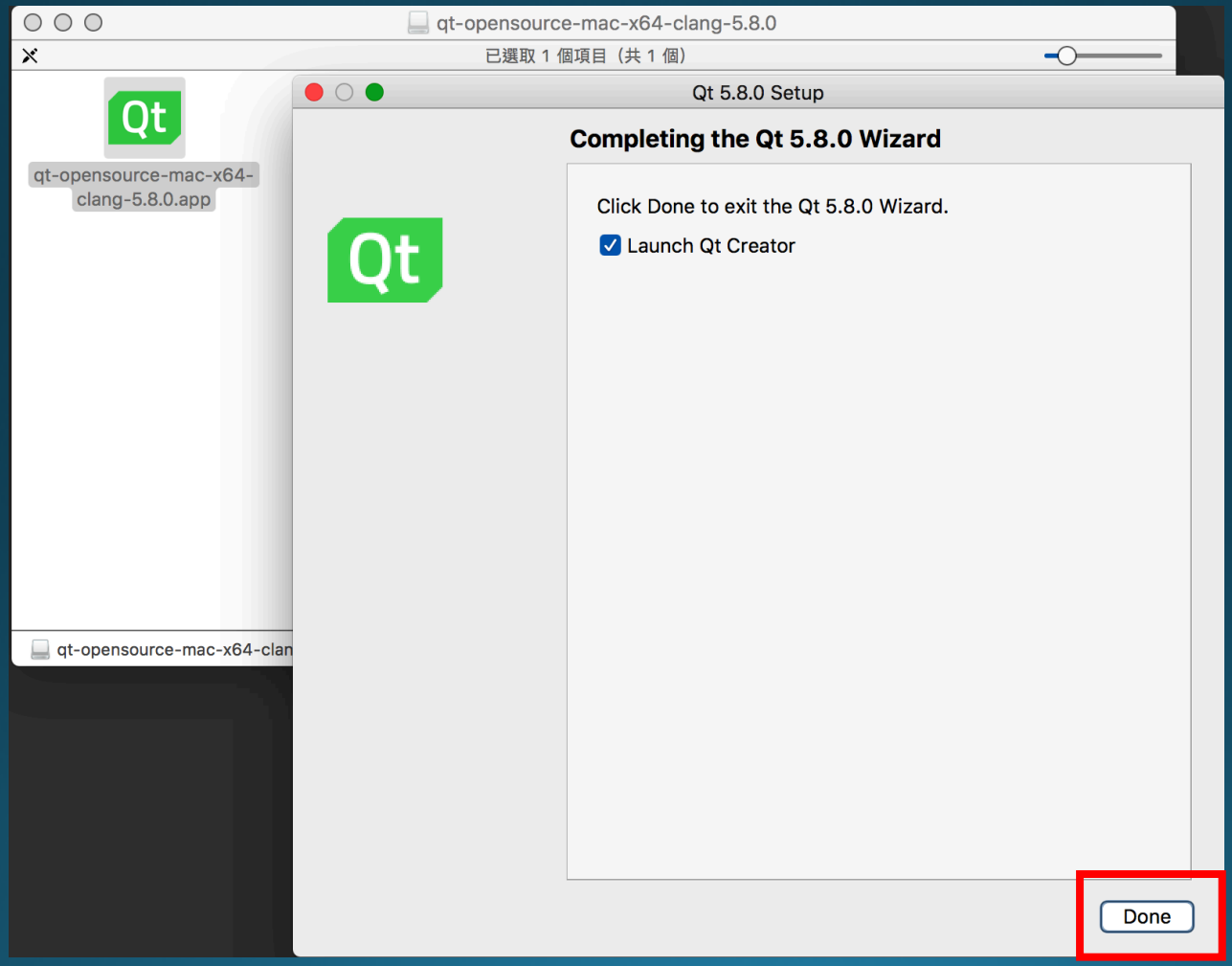
Qt Installation (7/9)



Qt Installation (8/9)

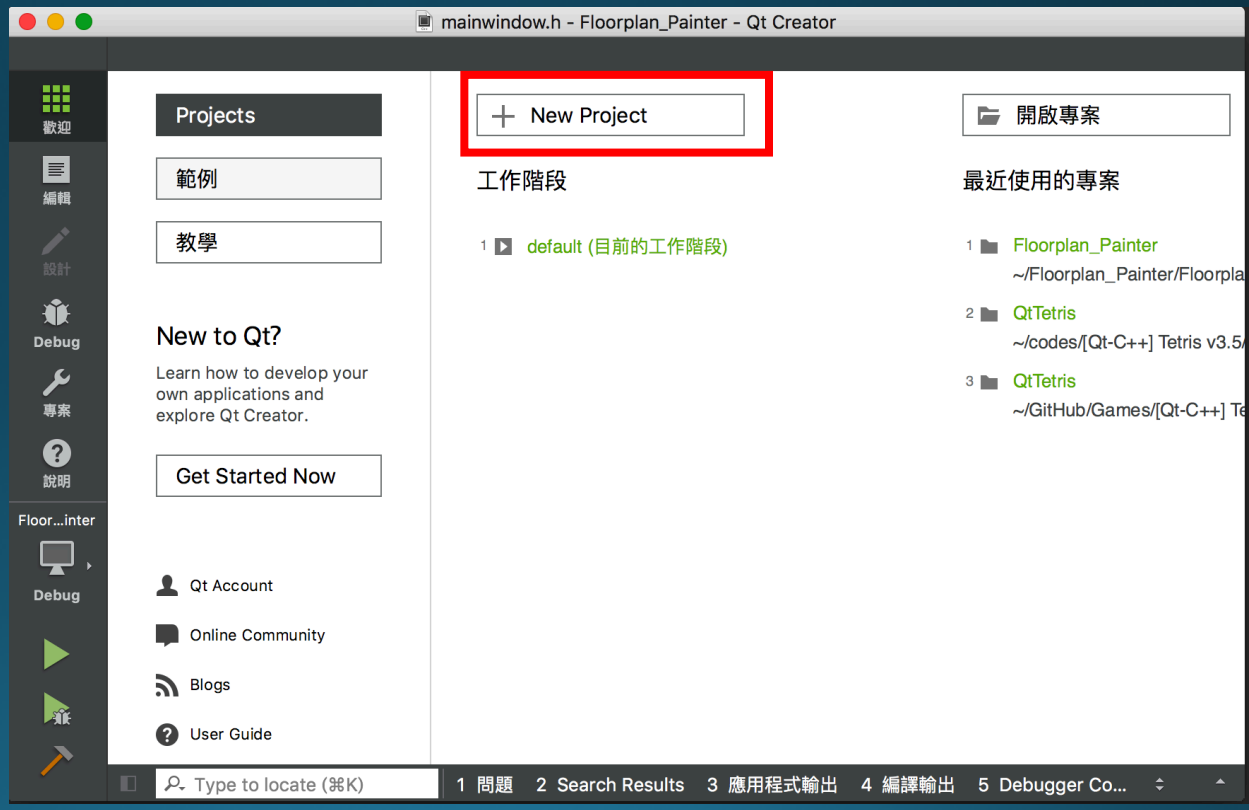


Qt Installation (9/9)



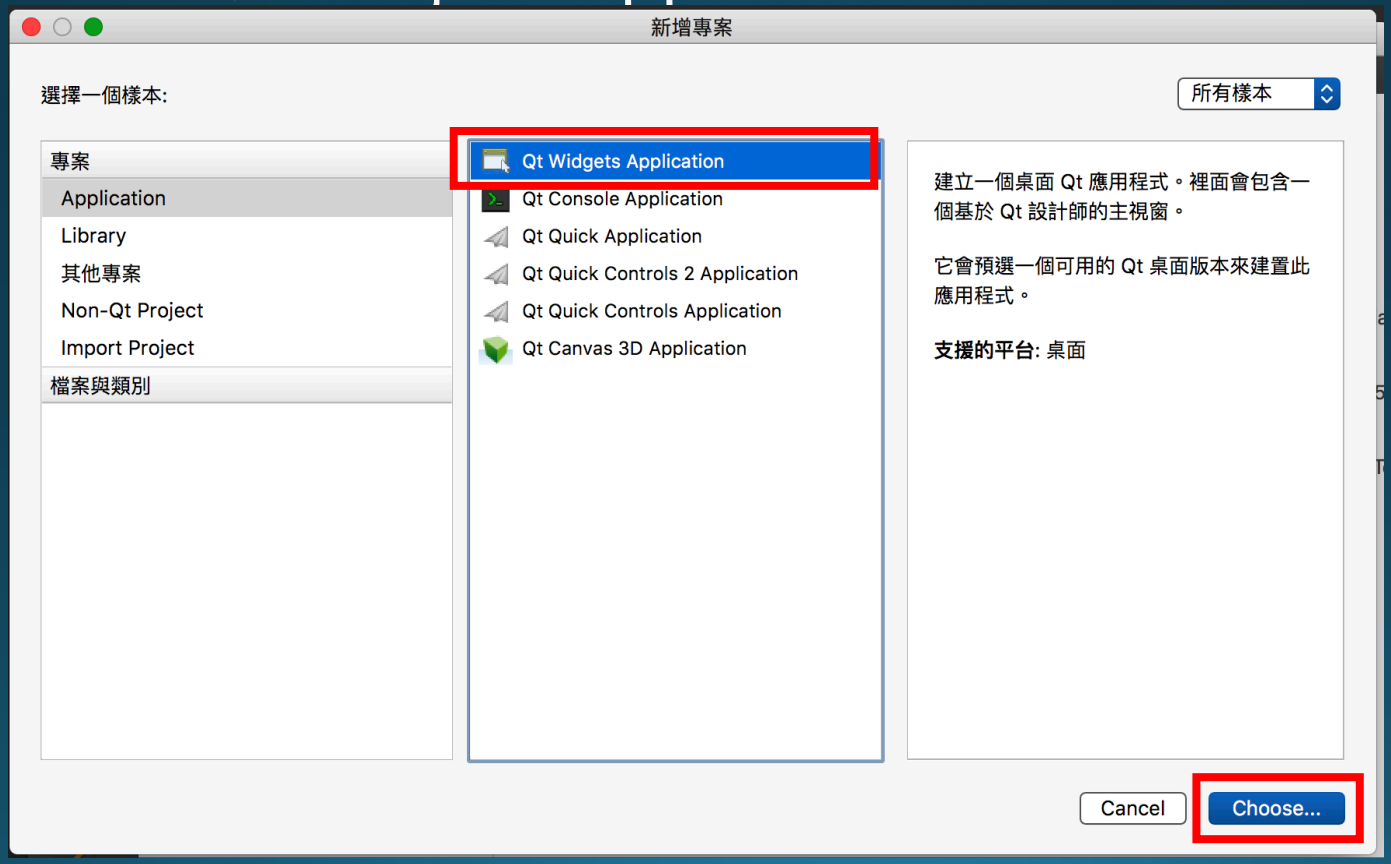
New Qt Project

- Open Qt Creator
- New Project



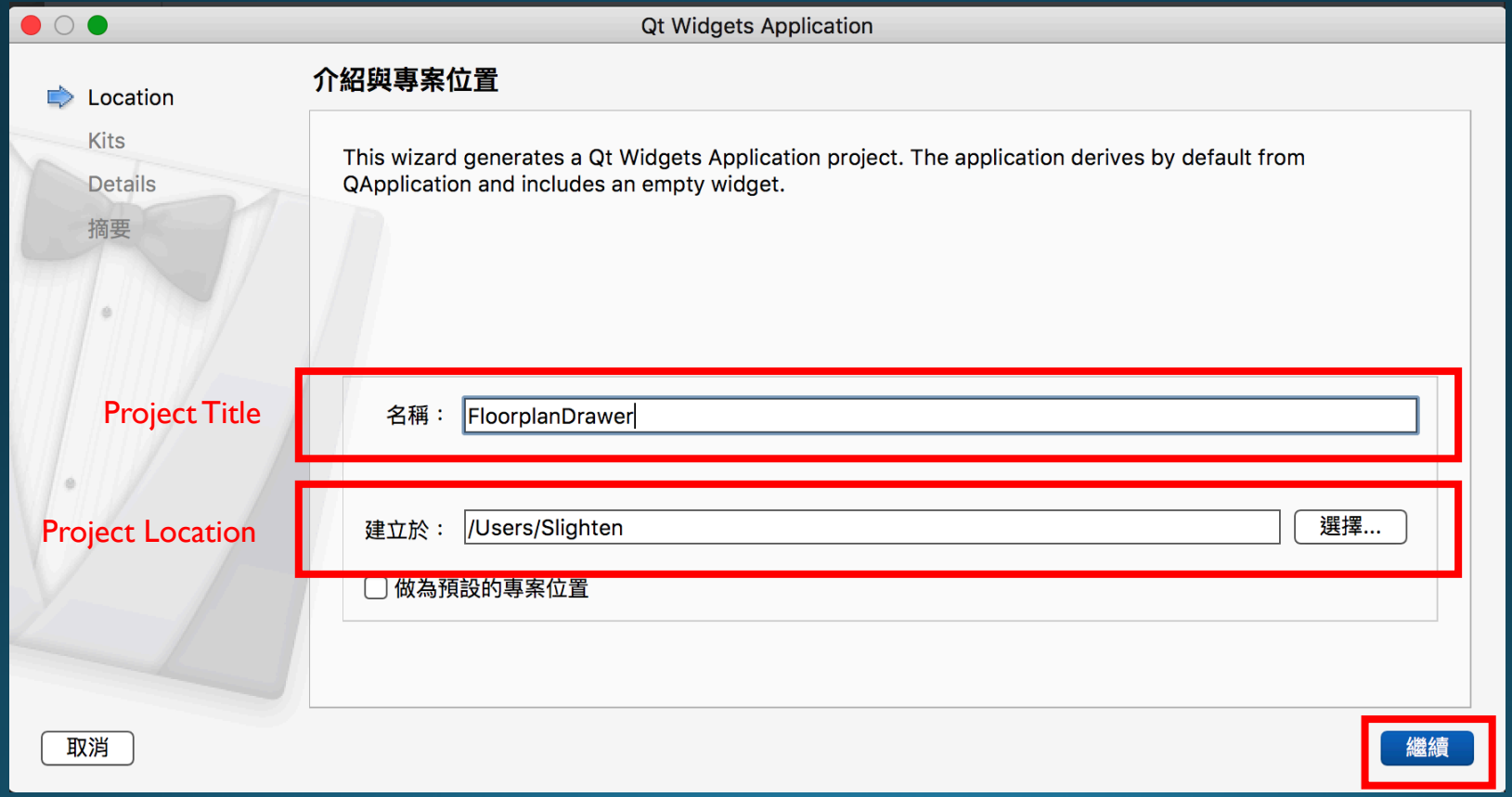
New Qt Project

- Select Qt Widgets Application



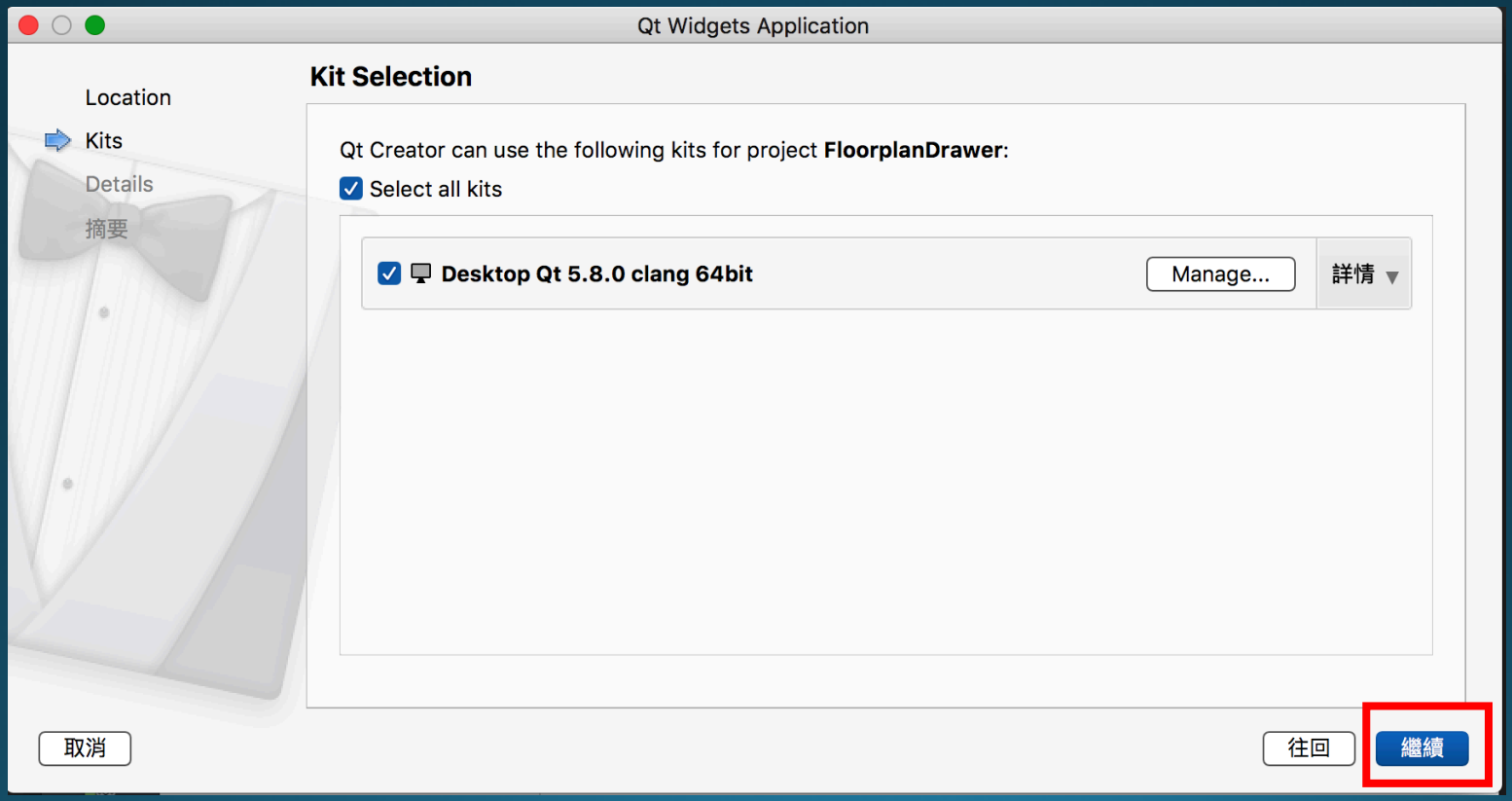
New Qt Project

- No Chinese name and no whitespace is allowed



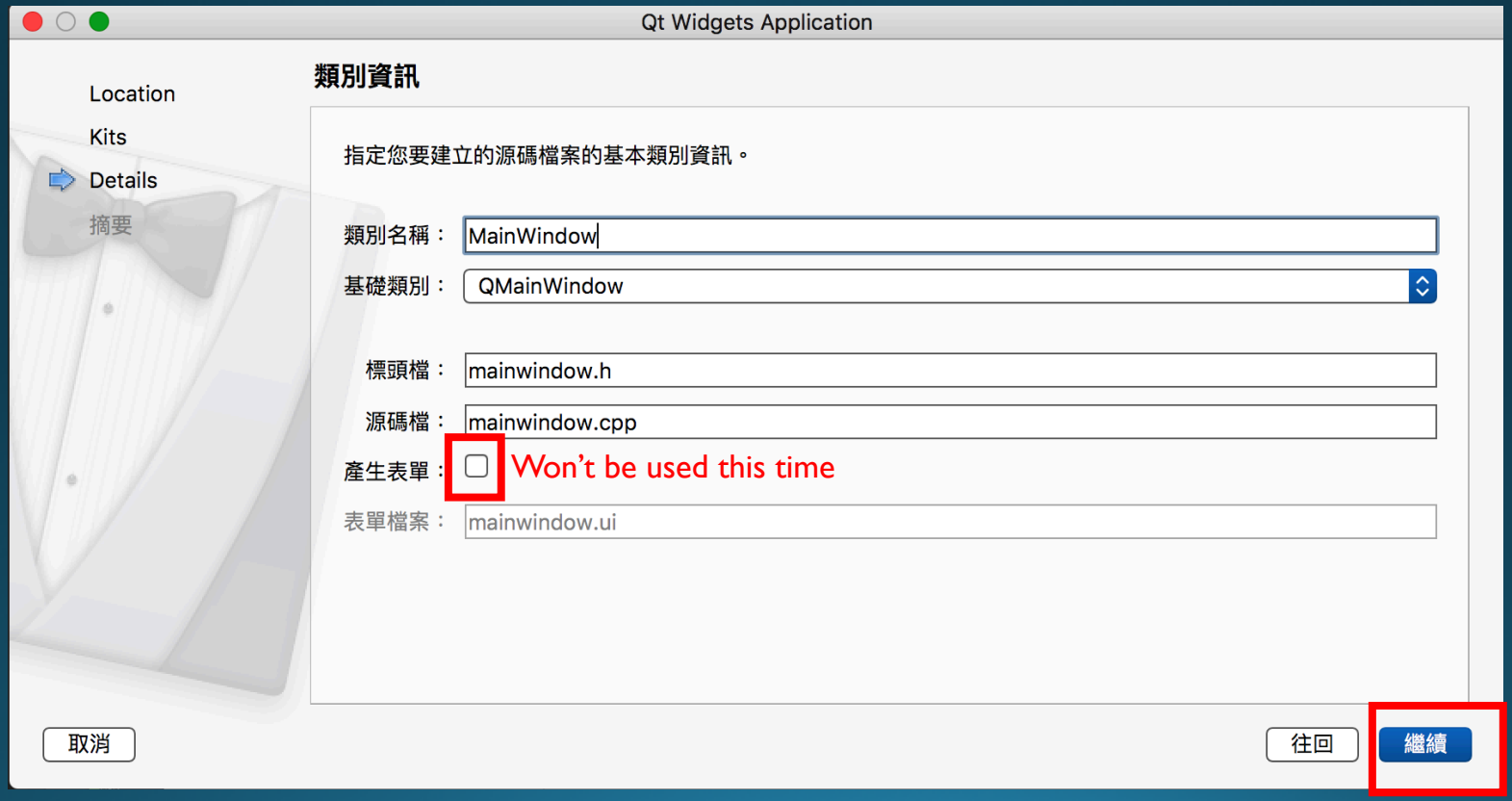
New Qt Project

- Selecting kits



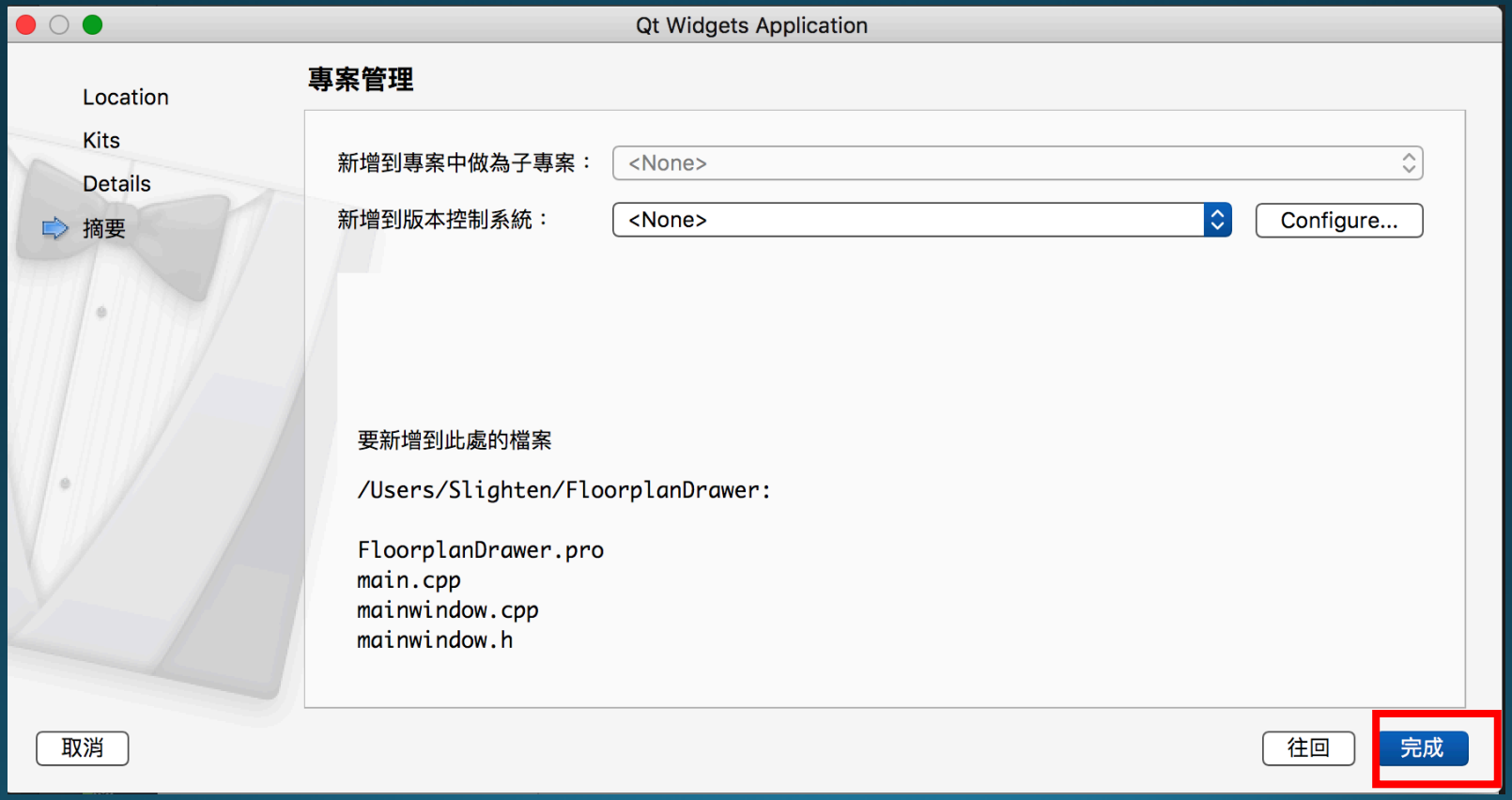
New Qt Project

- Uncheck 產生表單



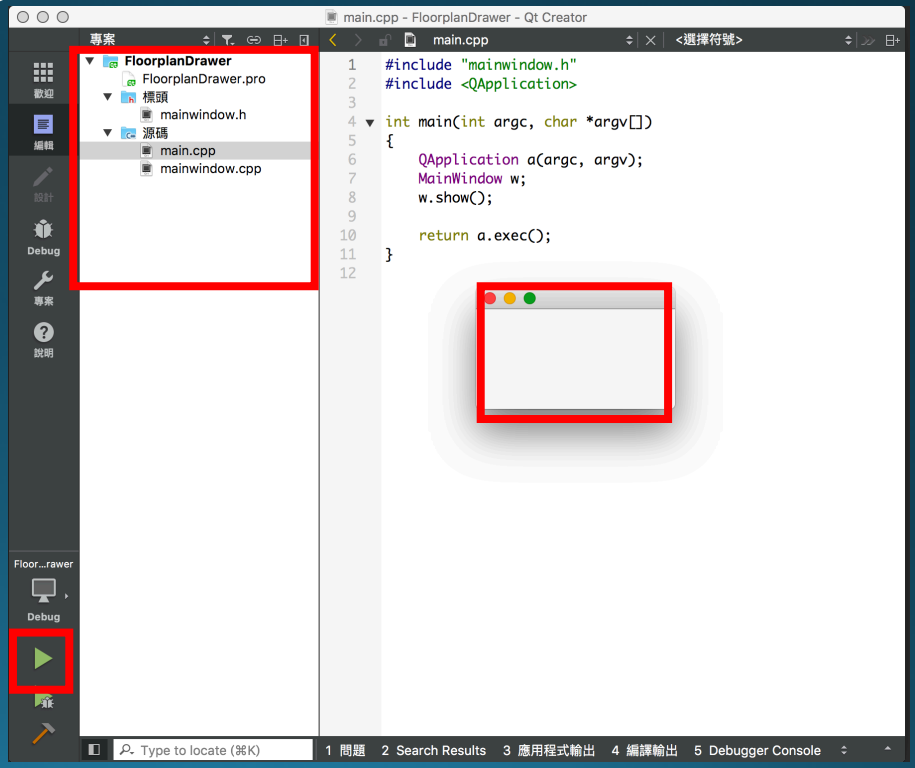
New Qt Project

- Done



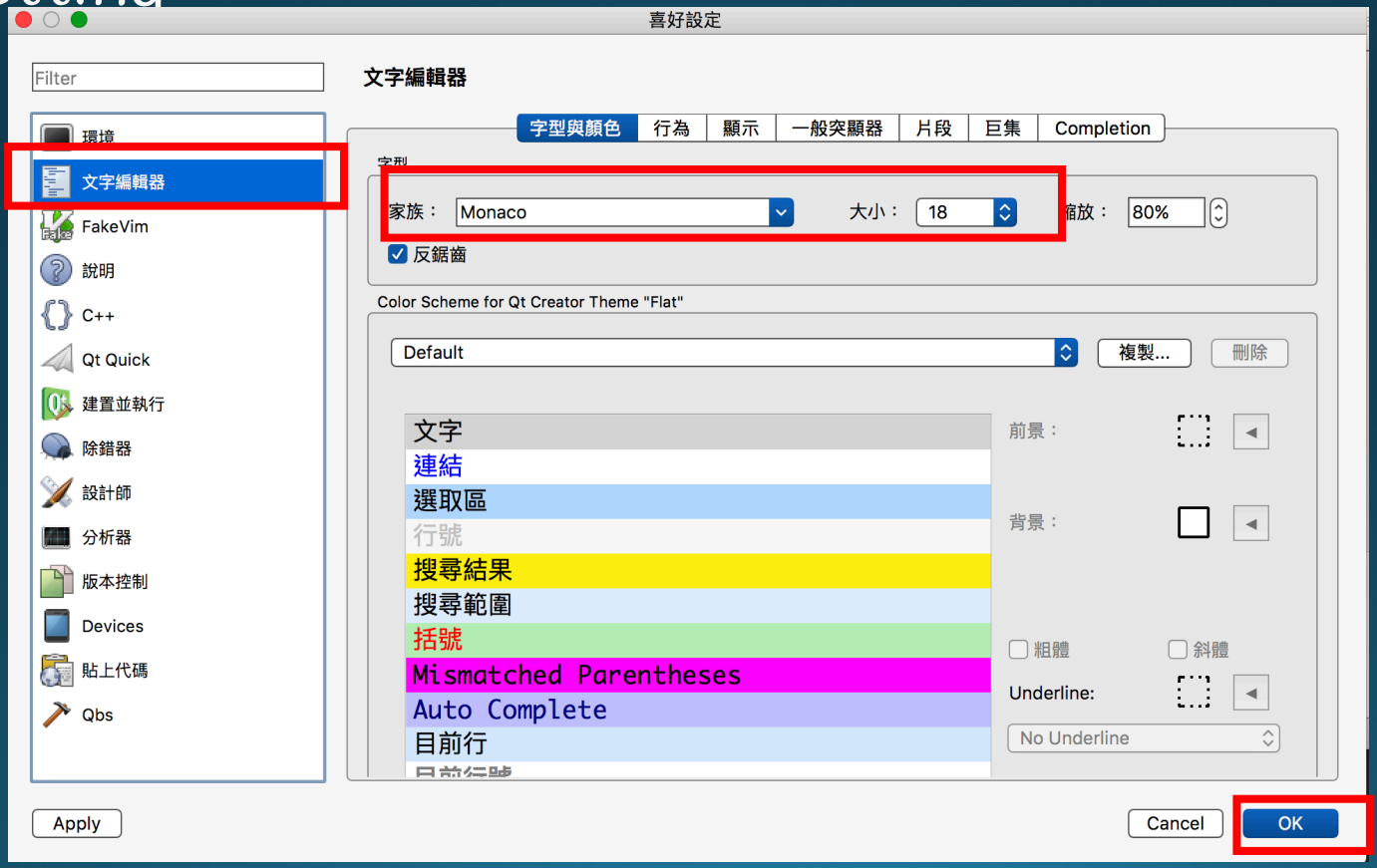
New Qt Project

- See the default template
  - FloorplanDrawer.pro
  - mainwindow.h
  - main.cpp
  - mainwindow.cpp
- Click 執行
  - An empty window will be shown



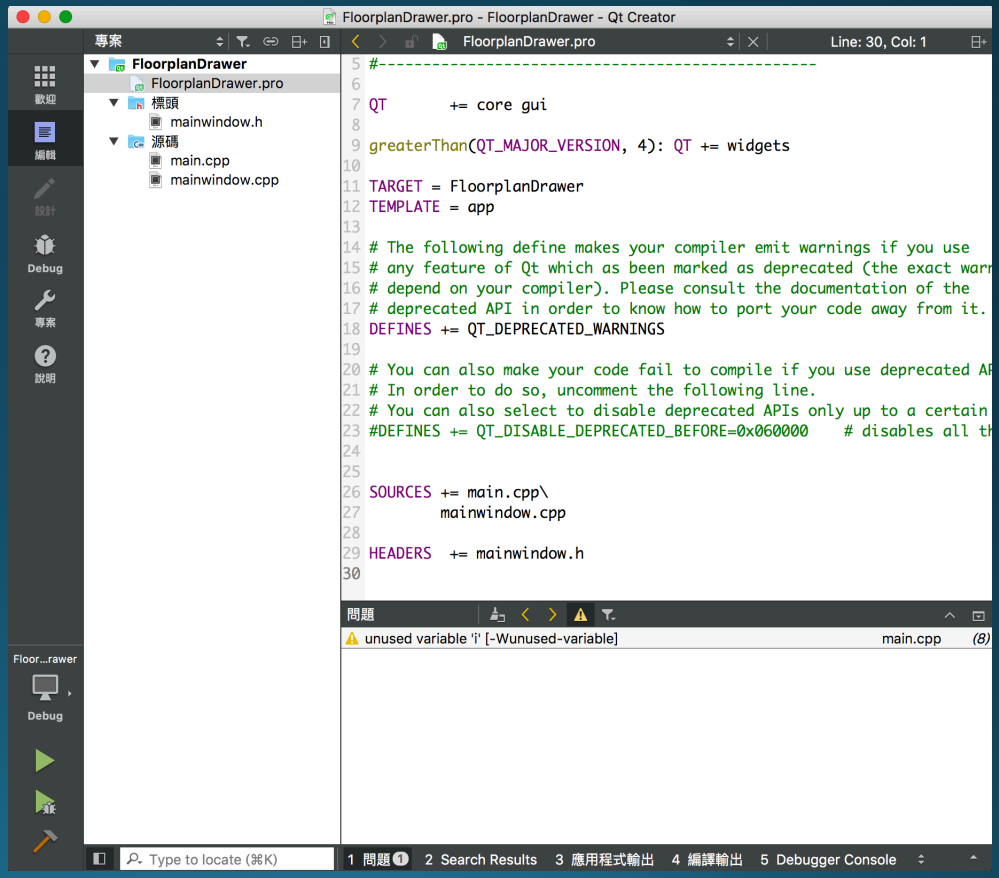
Font Size Configuration

- Setting

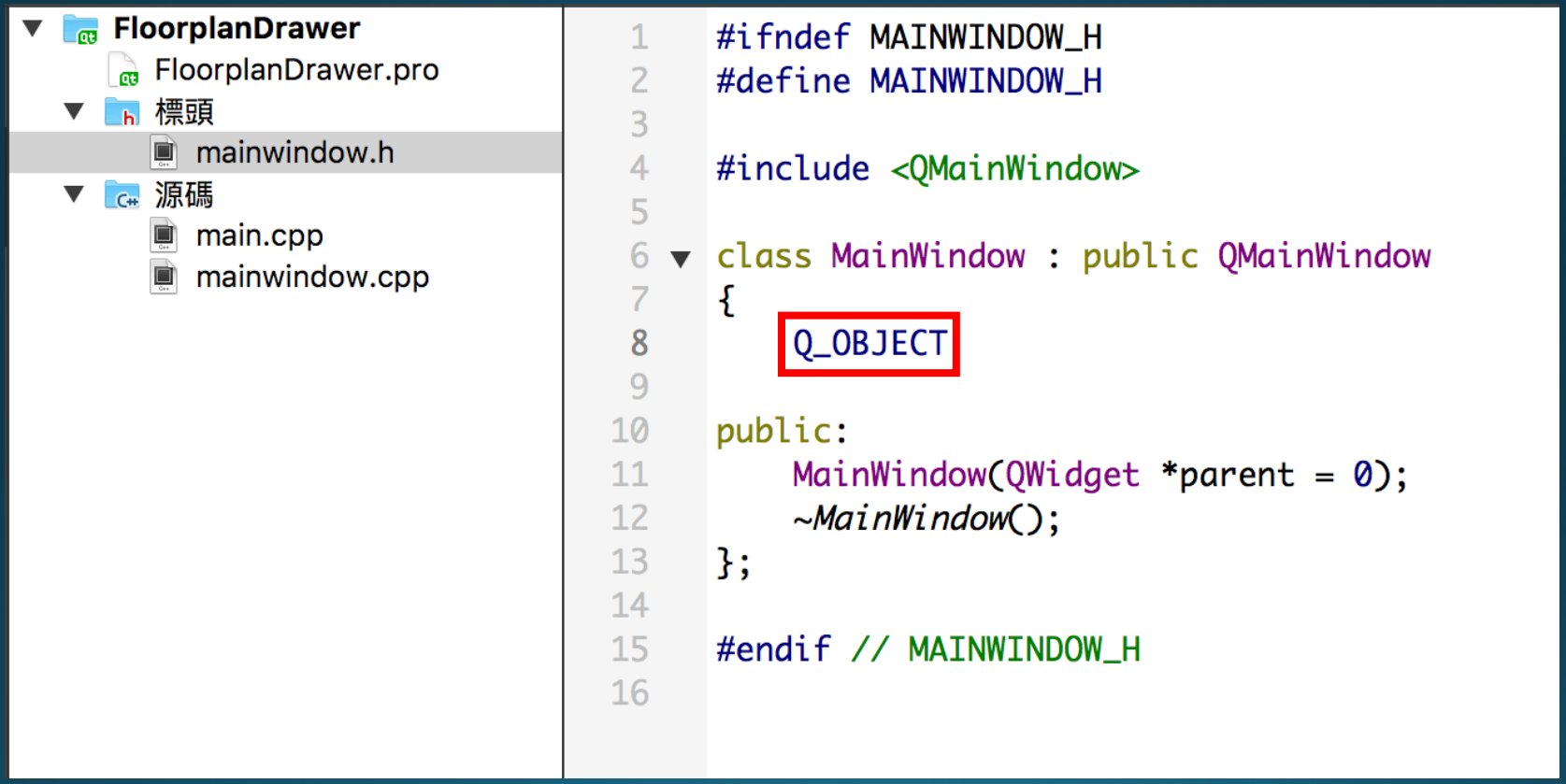


Qt Project File

- It's a Makefile for Qt

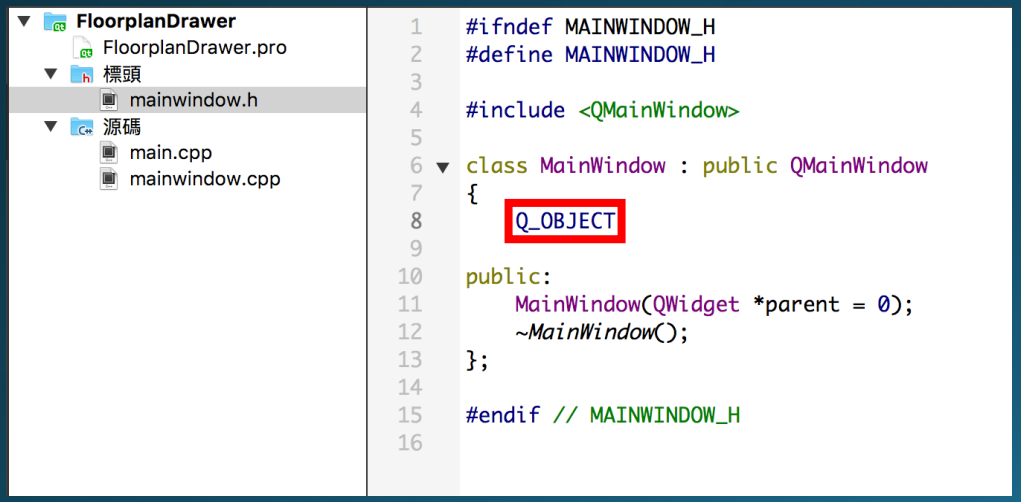


Overview to mainwindow.h



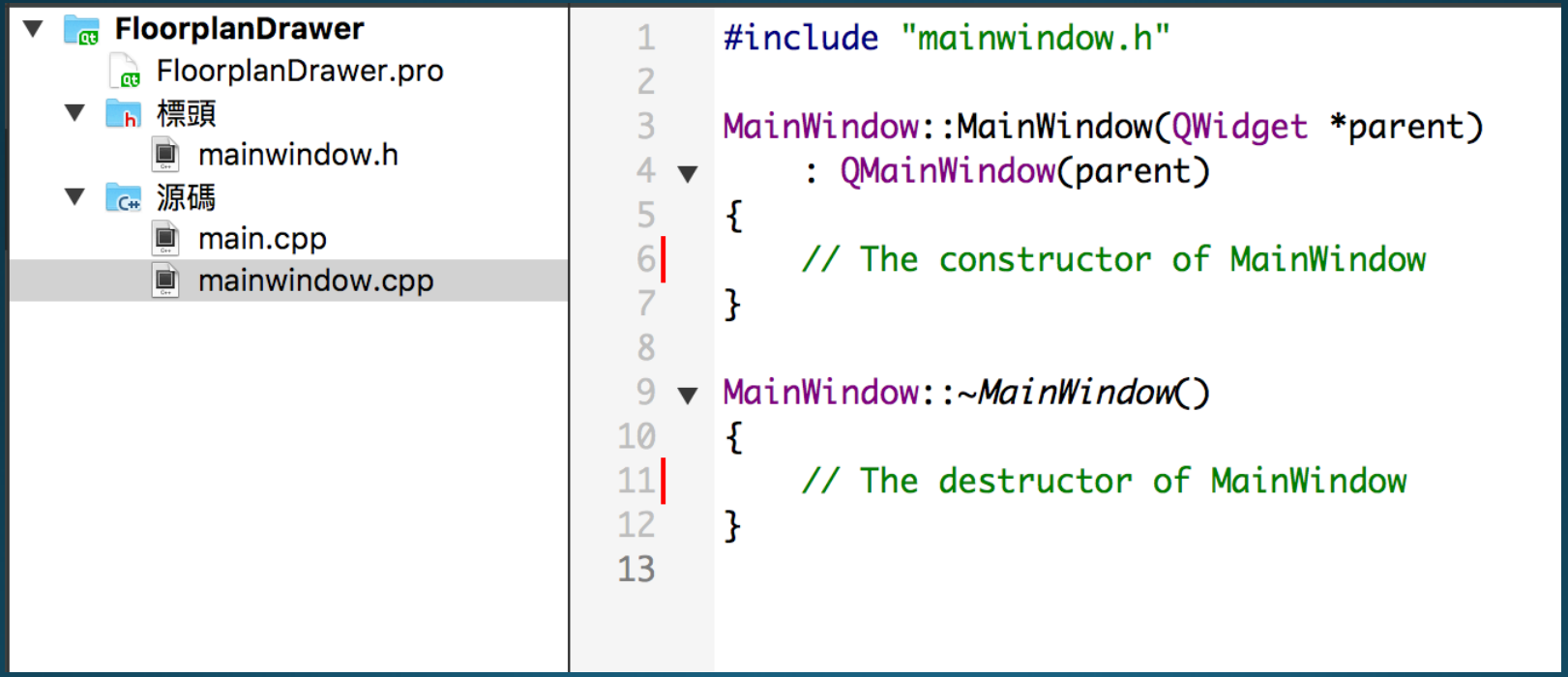
What is Q_OBJECT?

- http://woboq.com/blog/how-qt-signals-slots-work.html
- Control/Command + Left Click to check it thoroughly

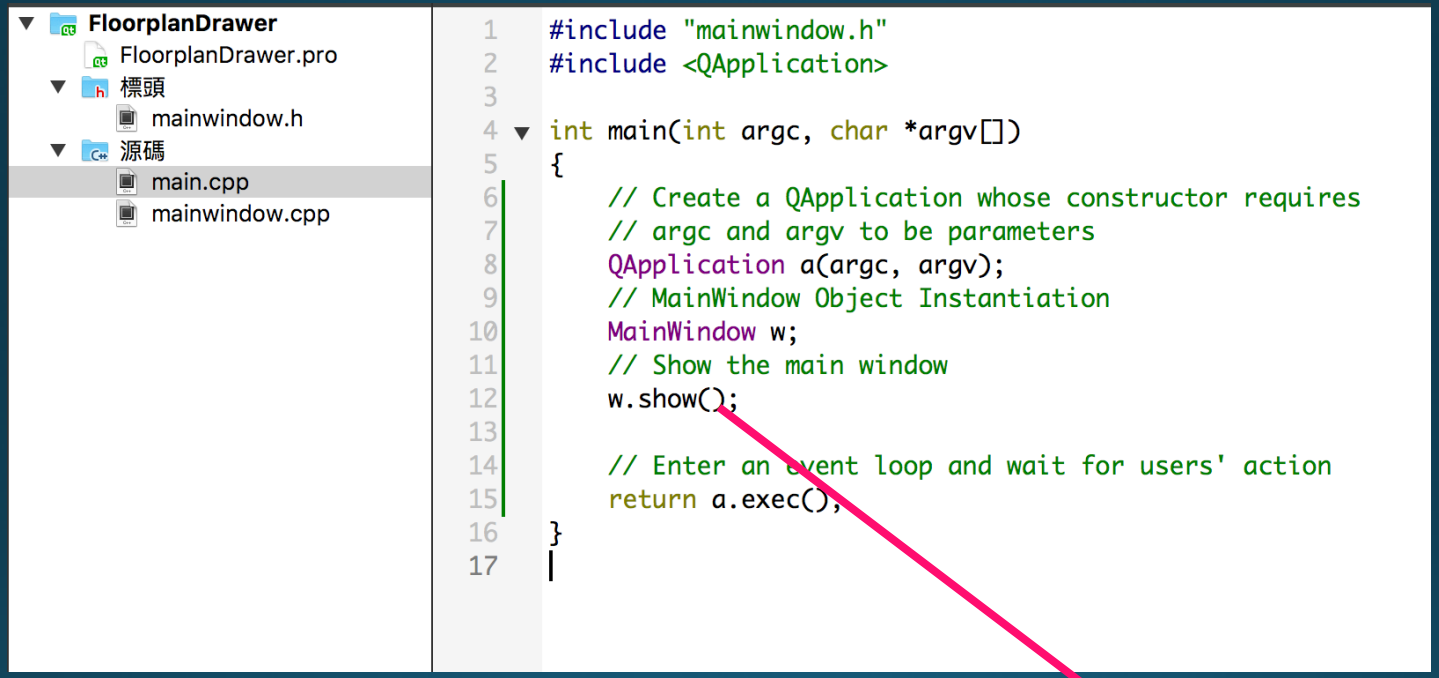



```
194 #if defined(Q_CC_GNU) && !defined(Q_CC_INTEL) && Q_CC_GNU >= 600
195 #  define Q_OBJECT_NO_ATTRIBUTES_WARNING    QT_WARNING_DISABLE_G
196 #else
197 #  define Q_OBJECT_NO_ATTRIBUTES_WARNING
198 #endif
199
200 /* qmake ignore Q_OBJECT */
201 #define Q_OBJECT \
202 public: \
203     Q_OBJECT_CHECK \
204     QT_WARNING_PUSH \
205     Q_OBJECT_NO_OVERRIDE_WARNING \
206     static const QMetaObject staticMetaObject; \
207     virtual const QMetaObject *metaObject() const; \
208     virtual void *qt_metacast(const char *); \
209     virtual int qt_metacall(QMetaObject::Call, int, void **); \
210     QT_TR_FUNCTIONS \
211 private: \
212     Q_OBJECT_NO_ATTRIBUTES_WARNING \
213     Q_DECL_HIDDEN_STATIC_METACALL static void qt_static_metacall
214     QT_WARNING_POP \
215     struct QPrivateSignal {}; \
216     QT_ANNOTATE_CLASS(qt_qobject, "")
217
218 /* qmake ignore Q_OBJECT */
219 #define Q_OBJECT_FAKE Q_OBJECT QT_ANNOTATE_CLASS(qt_fake, "")
```

Overview to mainwindow.cpp



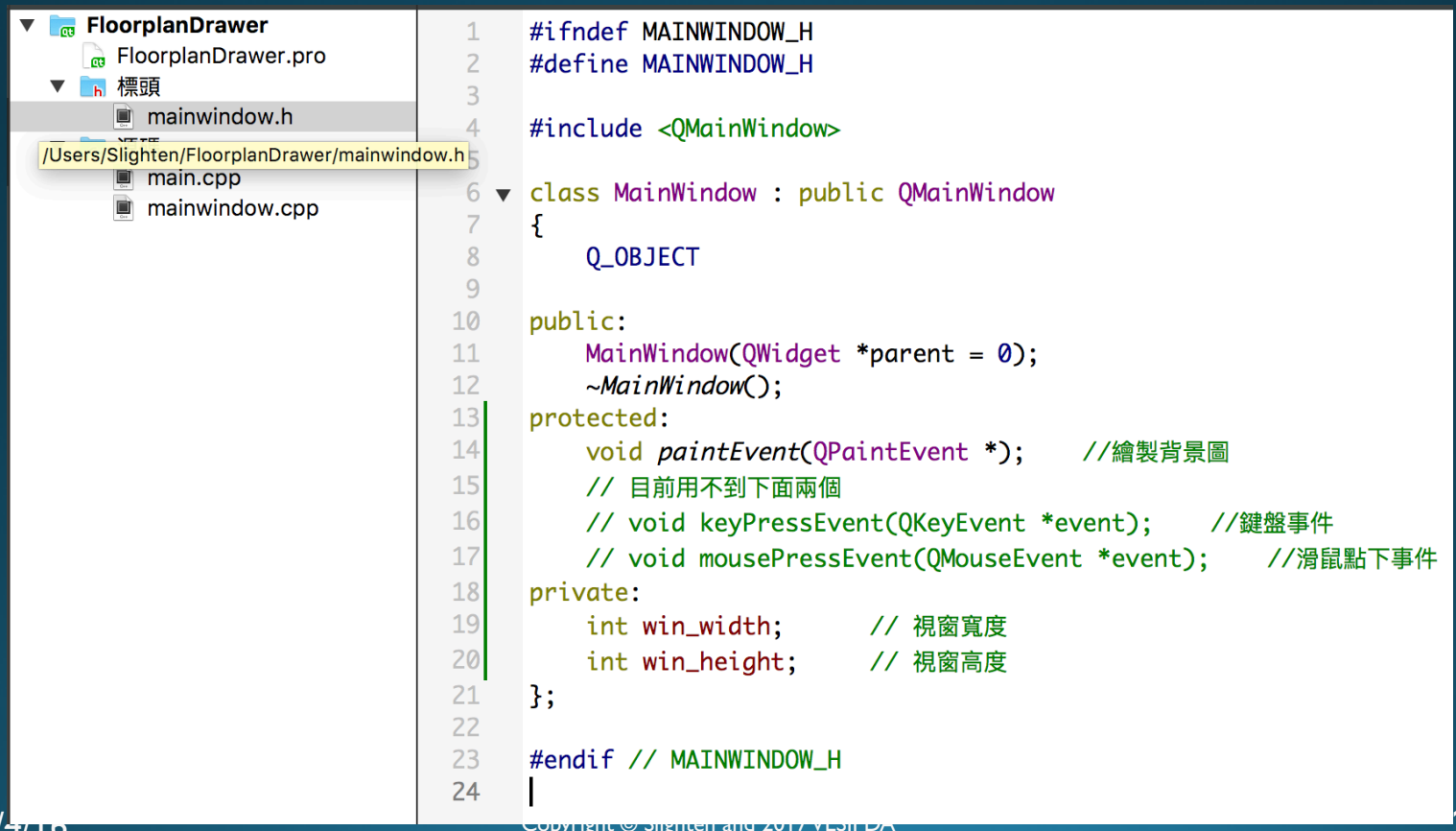
Overview to main.cpp



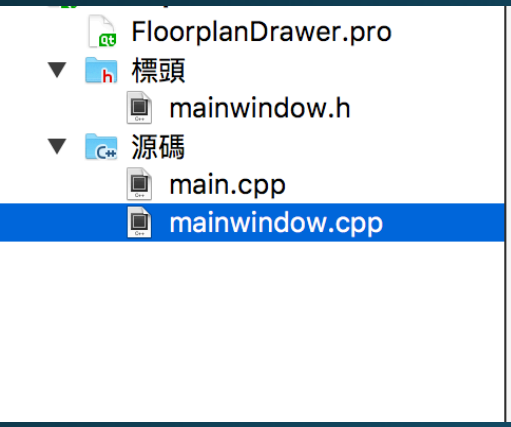
A Simple Floorplan Painter

paintEvent() member function

- Create a member function called paintEvent();



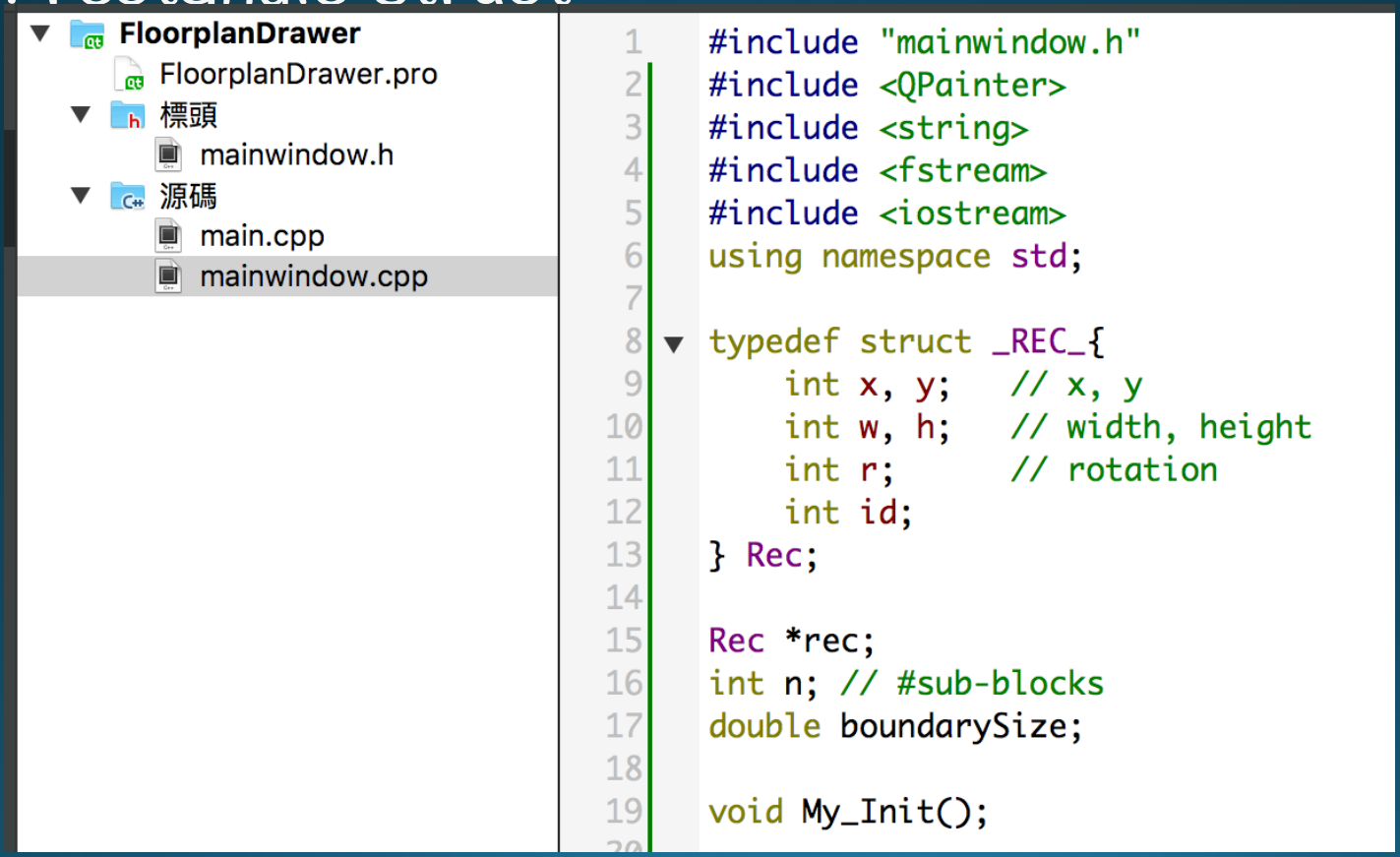
Set Main Window Size in Constructor




```
21  MainWindow::MainWindow(QWidget *parent)
22      : QMainWindow(parent)
23  {
24      // The constructor of MainWindow
25      win_width = 500;
26      win_height = 500;
27      this->setFixedSize(win_width, win_height);  //視窗大小
28      My_Init();
29  }
30
```

A Simple Rectangle Structure

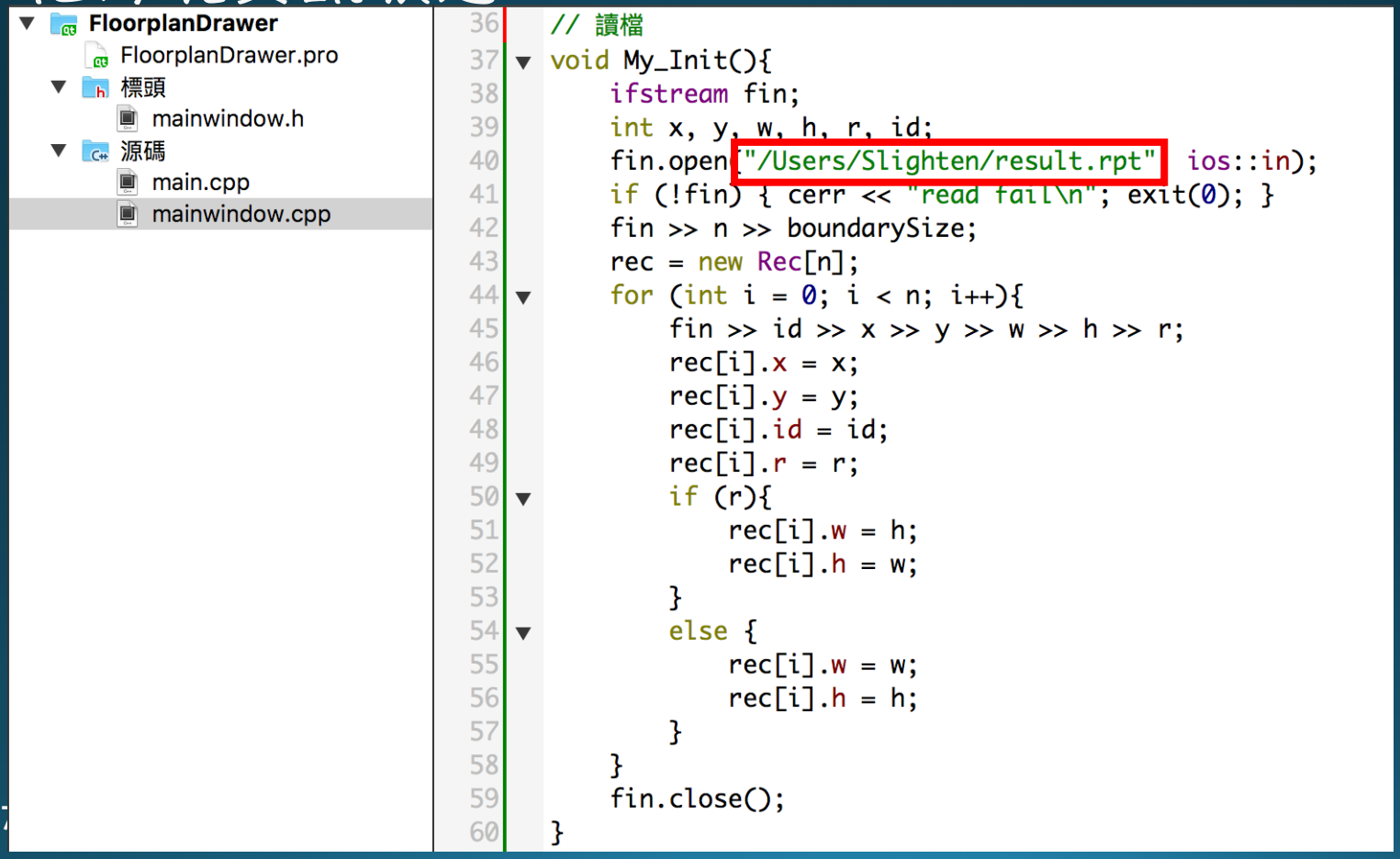
- A rectangle struct




```
1   #include "mainwindow.h"
2   #include <QPainter>
3   #include <string>
4   #include <fstream>
5   #include <iostream>
6   using namespace std;
7
8   typedef struct _REC_{
9       int x, y;    // x, y
10      int w, h;    // width, height
11      int r;       // rotation
12      int id;
13  } Rec;
14
15  Rec *rec;
16  int n; // #sub-blocks
17  double boundarySize;
18
19  void My_Init();
```

My_Init()

- 把方塊資訊放進 struct




```
36  // 讀檔
37  void My_Init(){
38      ifstream fin;
39      int x, y, w, h, r, id;
40      fin.open("/Users/Slighten/result.rpt", ios::in);
41      if (!fin) { cerr << "read fail\n"; exit(0); }
42      fin >> n >> boundarySize;
43      rec = new Rec[n];
44      for (int i = 0; i < n; i++){
45          fin >> id >> x >> y >> w >> h >> r;
46          rec[i].x = x;
47          rec[i].y = y;
48          rec[i].id = id;
49          rec[i].r = r;
50          if (r){
51              rec[i].w = h;
52              rec[i].h = w;
53          }
54          else {
55              rec[i].w = w;
56              rec[i].h = h;
57          }
58      }
59      fin.close();
60  }
```

My result.rpt

- 格式

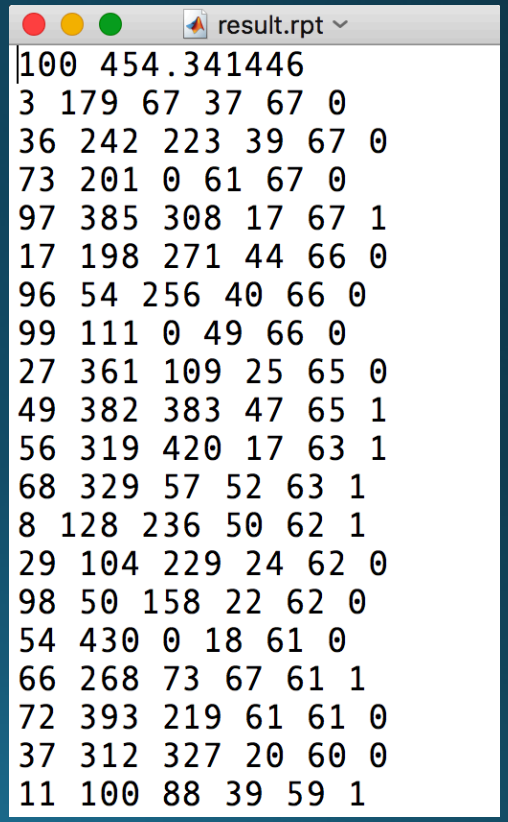
#blocks(=n) boundarySize

id_1 x_1 y_1 w_1 h_1 r_1

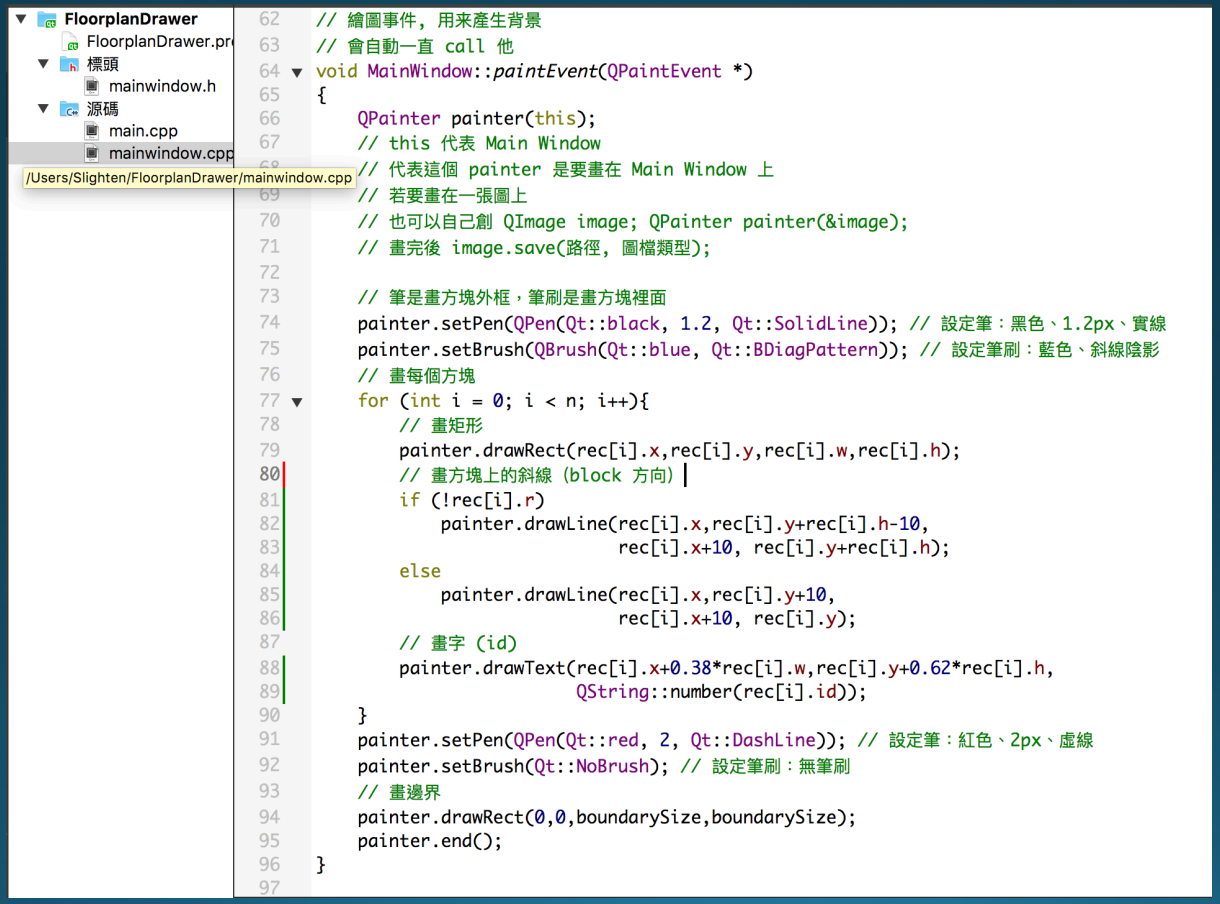
id_2 x_2 y_2 w_2 h_2 r_2

...

id_n x_n y_n w_n h_n r_n



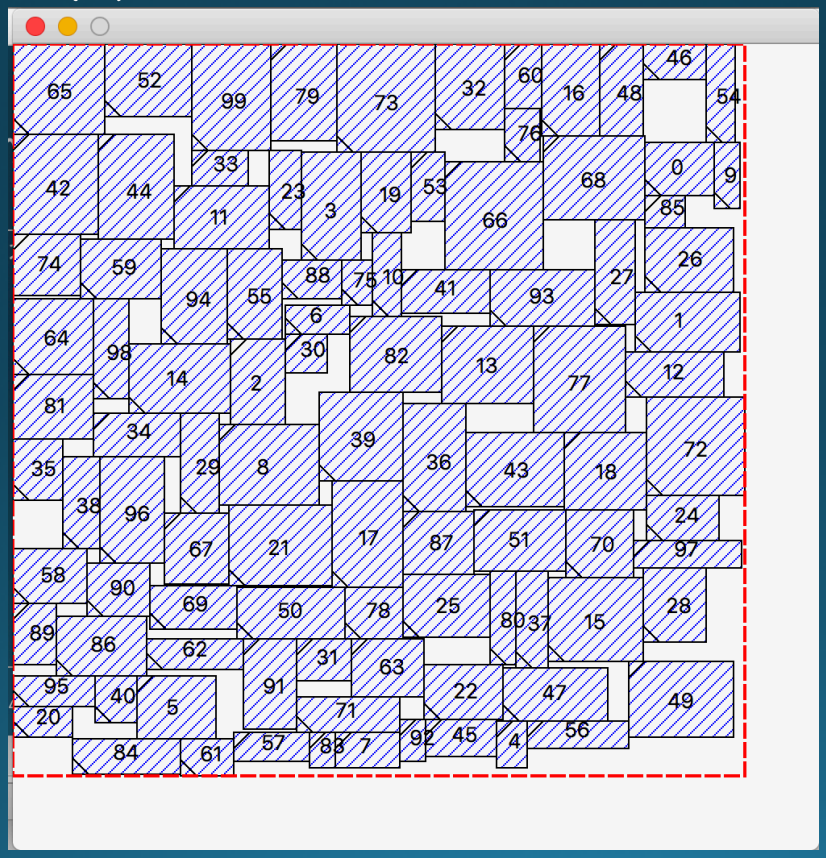
Implement paintEvent()




```
62  // 繪圖事件，用來產生背景
63  // 會自動一直 call 他
64  void MainWindow::paintEvent(QPaintEvent *)
65  {
66      QPainter painter(this);
67      // this 代表 Main Window
68      // 代表這個 painter 是要畫在 Main Window 上
69      // 若要畫在一張圖上
70      // 也可以自己創 QImage image; QPainter painter(&image);
71      // 畫完後 image.save(路徑, 圖檔類型);
72
73      // 筆是畫方塊外框，筆刷是畫方塊裡面
74      painter.setPen(QPen(Qt::black, 1.2, Qt::SolidLine)); // 設定筆：黑色、1.2px、實線
75      painter.setBrush(QBrush(Qt::blue, Qt::BDiagPattern)); // 設定筆刷：藍色、斜線陰影
76      // 畫每個方塊
77      for (int i = 0; i < n; i++){
78          // 畫矩形
79          painter.drawRect(rec[i].x,rec[i].y,rec[i].w,rec[i].h);
80          // 畫方塊上的斜線 (block 方向)
81          if (!rec[i].r)
82              painter.drawLine(rec[i].x,rec[i].y+rec[i].h-10,
83                               rec[i].x+10, rec[i].y+rec[i].h);
84          else
85              painter.drawLine(rec[i].x,rec[i].y+10,
86                               rec[i].x+10, rec[i].y);
87          // 畫字 (id)
88          painter.drawText(rec[i].x+0.38*rec[i].w,rec[i].y+0.62*rec[i].h,
89                           QString::number(rec[i].id));
90      }
91      painter.setPen(QPen(Qt::red, 2, Qt::DashLine)); // 設定筆：紅色、2px、虛線
92      painter.setBrush(Qt::NoBrush); // 設定筆刷：無筆刷
93      // 畫邊界
94      painter.drawRect(0,0,boundarySize,boundarySize);
95      painter.end();
96  }
97
```

Click 執行

- (0,0) 在左上角



Code Template

- Please refer to: https://github.com/Slighten/-Qt-C-FloorplanDrawer
- For more details please refer to reference/ Qt_mini_project/QT_Introduction.pptx