

ROS开发环境之Qt Creator

📅 2013-12-29 (2013-12-29T00:00:00)

👤 Yuanbo She (<http://my.phirobot.com/about.html>)

📁 ROS (<http://my.phirobot.com/blog/category/ros.html>)

🔖 turtlebot (<http://my.phirobot.com/blog/tag/turtlebot.html>), ros (<http://my.phirobot.com/blog/tag/ros.html>), qt (<http://my.phirobot.com/blog/tag/qt.html>),

Summary:

可以用于ROS开发的IDE很多(可以参考 <http://wiki.ros.org/IDEs> (<http://wiki.ros.org/IDEs>)), ROS的调试依赖环境变量, 与外部程序有通讯, 因此要求启动IDE的时候加载ROS环境参数, 其他方面并无太多限制。最常用的IDE是eclipse, 本人也是如此, eclipse调试环境的配置可以参照作者旧博客 [Configure Eclipse IDE in catkin of Ros Groovy](http://www.cnblogs.com/freedomshe/archive/2013/05/16/configure_eclipse_in_catkin.html) (http://www.cnblogs.com/freedomshe/archive/2013/05/16/configure_eclipse_in_catkin.html), Qt Creator 比Eclipse要轻量级, 配置起来也更方便简洁。本文记录ROS开发环境, Qt Creator的配置过程。

环境: ROS Hydro, Qt Creator 5.2.0.

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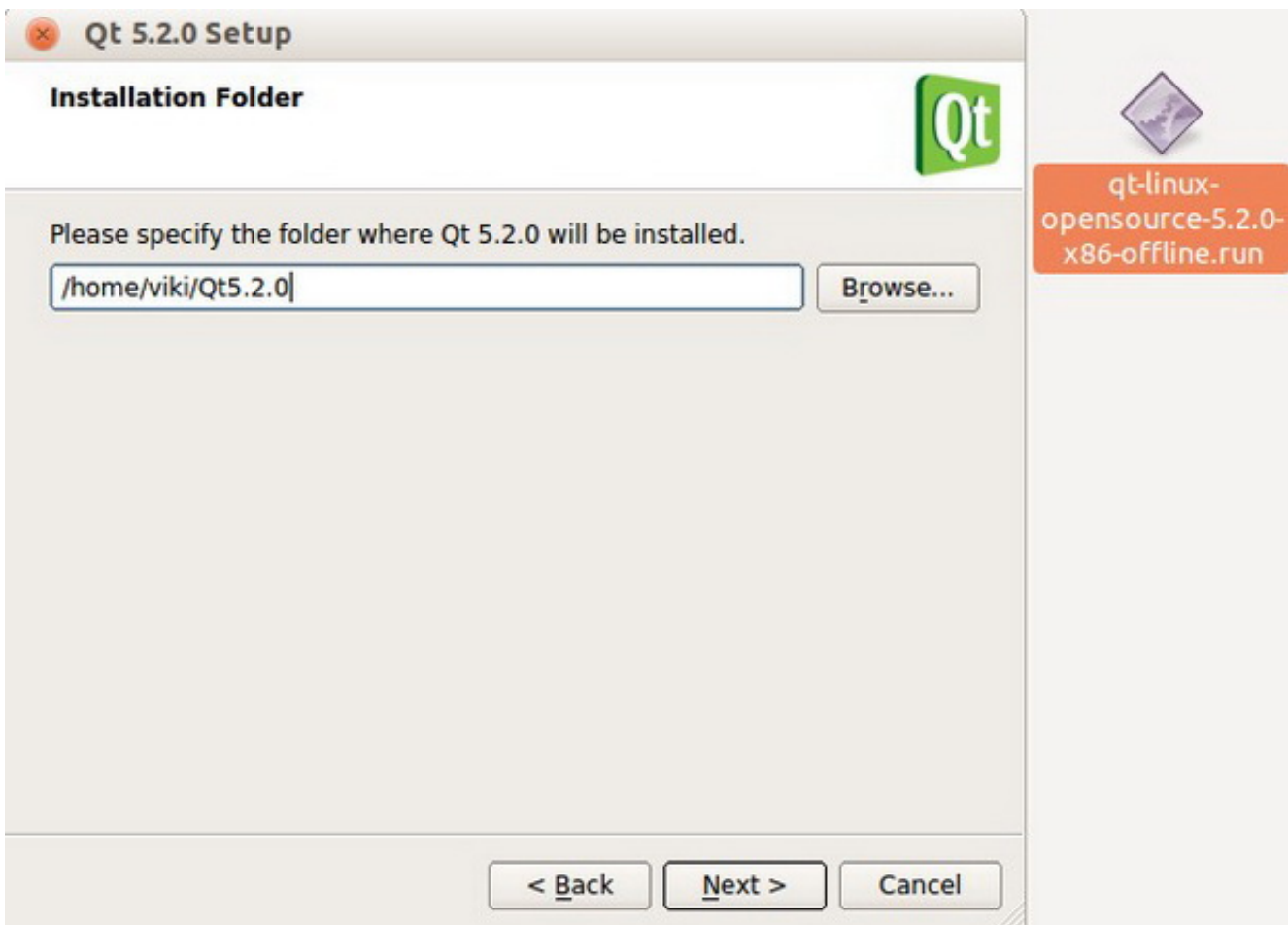
QtCreator安装 (http://my.phirobot.com/blog/2013-12-ros_ide_qtcreator.html#id6)

QtCreator安装方式很多, 本文以Qt 5.2.0为例, 我直接下载离线安装程序安装。

下载安装 (http://my.phirobot.com/blog/2013-12-ros_ide_qtcreator.html#id7)

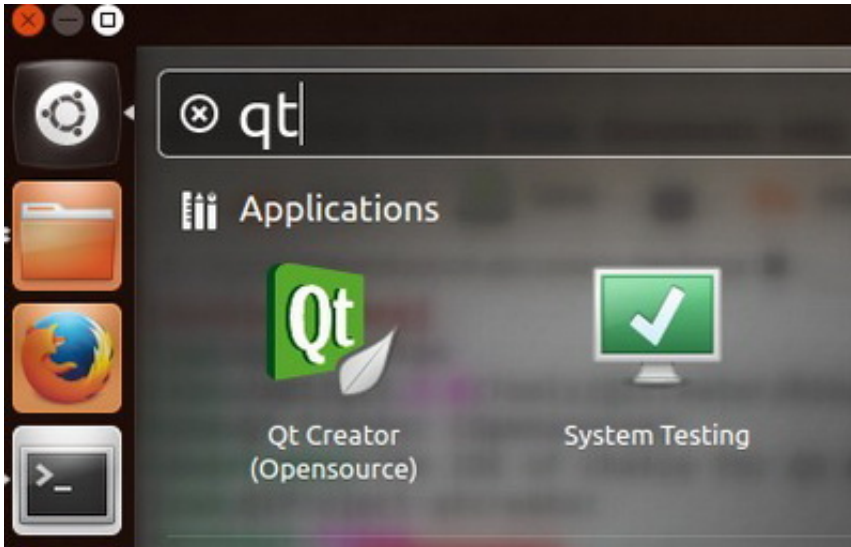
从<http://qt-project.org/downloads>下载QtCreator安装程序。对于Ubuntu 32位系统, 点击 *Qt 5.2.0 for Linux 32-bit (425 MB)* 将下载离线安装程序 (*Qt Online Installer for Linux 32-bit (23 MB)* 为在线安装程序, 不推荐), 下载后的文件名为 *qt-linux-opensource-5.2.0-x86-offline.run*。

双击 *.run* 安装文件直接图形界面安装, 默认安装在 */home/<user>/Qt5.2.0* 下 (*<user>* 为你的用户名, 这里为 *viki*)。



按照指示一路Next即可安装完成。

安装完成后点左上角的 *Dash home*, 输入“qt”如果看到 *Qt Creator* 图标则安装成功。



设置快捷方式 (http://my.phirobot.com/blog/2013-12-ros_ide_qtcreator.html#id8)

这一步将要修改Qt Creator快捷方式, 使从快捷方式启动Qt Creator的同时加载ROS环境变量。

打开terminal, 输入下面的命令:

```
gedit ~/.local/share/applications/DigiaQtOpenSource-qtcreator.desktop
```

这条命令将打开DigiaQtOpenSource-qtcreator.desktop快捷方式文件, 可以看到文件内容如下:

```
[Desktop Entry]
Type=Application
Exec=/home/viki/Qt5.2.0/Tools/QtCreator/bin/qtcreator
Name=Qt Creator (Opensource)
GenericName=The IDE of choice for Qt development.
Icon=QtProject-qtcreator
Terminal=false
Categories=Development;IDE;Qt;
MimeType=text/x-c++src;text/x-c++hdr;text/x-xsrc;application/x-designer;application/vnd.qt.qmakeprofile;application/vnd.qt.xml.resource;text/x-qml;text/x-qt.qml;text/x-qt.qbs;
```

修改 *Exec* 变量一行, 在中间添加 `bash -i -c` 即改为 `Exec=bash -i -c /home/viki/Qt5.2.0/Tools/QtCreator/bin/qtcreator`, 保存并退出。添加 `bash -i -c` 是为了在通过快捷方式启动Qt Creator的同时加载ROS环境变量 (ROS环境变量加载脚本配置在 `~/.bashrc` 文件内)。

Warning: 如果打开的文件是空, 则表示没有找到DigiaQtOpenSource-qtcreator.desktop文件, 可能是安装路

径不在本地用户目录下, 或者版本不同导致的文件名不一致。可以在 `~/.local/share/applications/` 和 `/usr/share/applications/` 两个路径下用 `ls *qt*` 命令找找看。

Tip: 如果没有上述快捷方式文件, 自己新建一个, 只要文件内容类似上面的类容, 路径正确即可。快捷方式可以放在 `~/.local/share/applications/` 和 `/usr/share/applications/` 两个位置。当然也可以放在任意其他位置, 功能跟放在上面两个位置一样, 但左边的任务栏不会正确显示图标。

用Qt Creator调试C++工程 (http://my.phirobot.com/blog/2013-12-ros_ide_qtcreator.html#id9)

可以自己建立包做实验, 为求简洁, 这里直接从GitHub下载现有的源码包, 即大家熟悉的 *ros_tutorials* 包。

新建catkin工作空间 (http://my.phirobot.com/blog/2013-12-ros_ide_qtcreator.html#id10)

如果已经有自己的catkin工作空间则跳过, 否则新建catkin工作空间:

```
mkdir -p ~/catkin_ws/src
cd ~/catkin_ws/src
catkin_init_workspace
cd ~/catkin_ws/
catkin_make
echo "source ~/catkin_ws/devel/setup.bash" >> ~/.bashrc
```

对应解释参照《配置ROS工作空间catkin+rosbuild (http://my.phirobot.com/blog/2013-12-overlay_catkin_and_rosbuild.html)》。关闭所有的terminal在重新打开, 使环境变量生效。

向catkin工作空间添加源码包 (http://my.phirobot.com/blog/2013-12-ros_ide_qtcreator.html#id11)

这里添加 *ros_tutorials* 源码包。

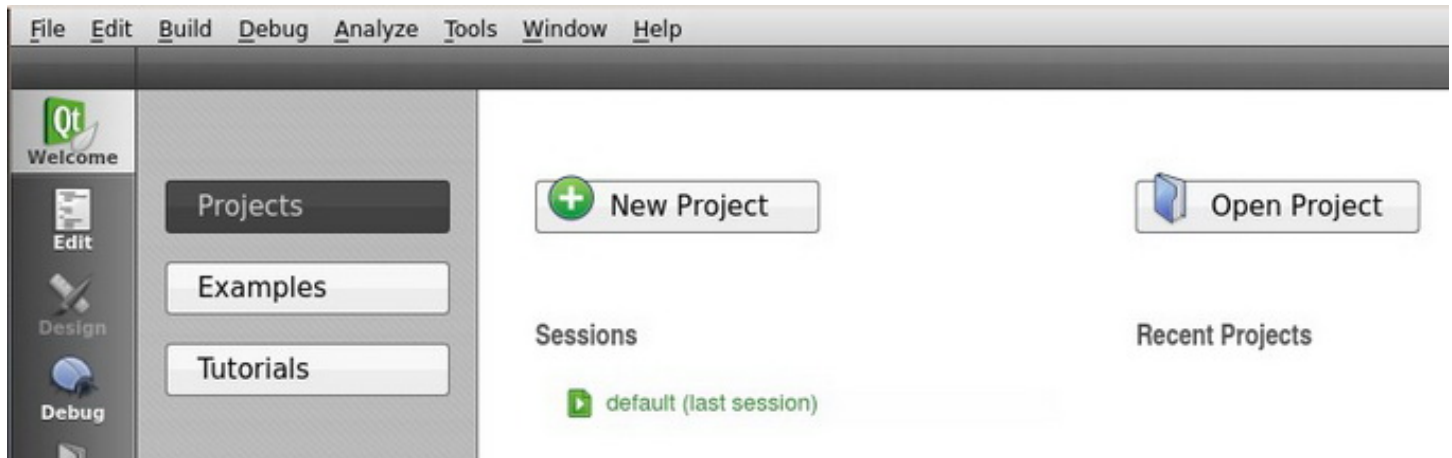
```
cd ~/catkin_ws/src
git clone git@github.com:ros/ros_tutorials.git -b hydro-devel
ls
```

可以看到下面的信息, 表示 *ros_tutorials* 已经被下载到了 `~/catkin_ws/src` 目录下。

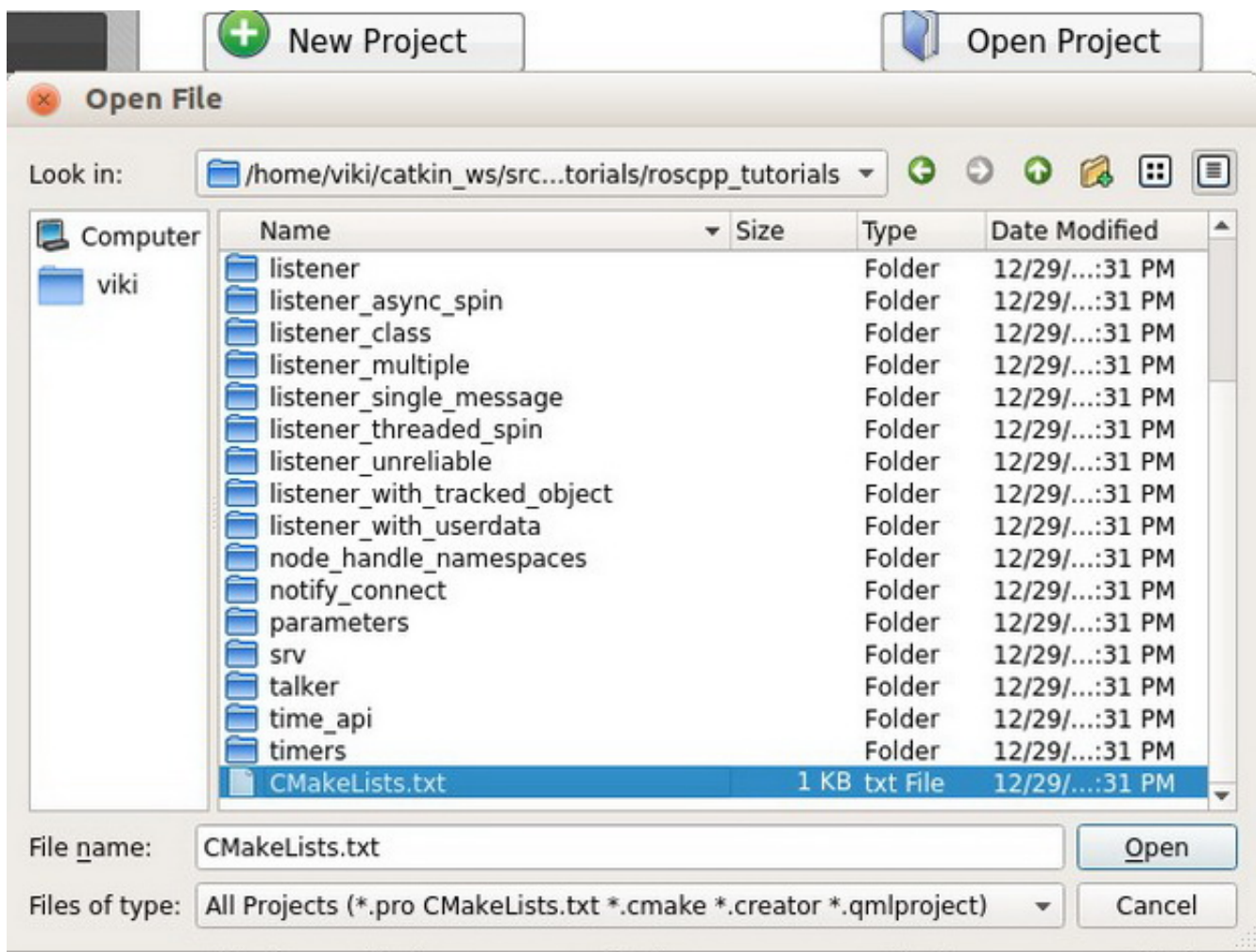
```
viki@ROS:~/catkin_ws/src$ ls
CMakeLists.txt  ros_tutorials
```

向Qt Creator里添加工程 (http://my.phirobot.com/blog/2013-12-ros_ide_qtcreator.html#id12)

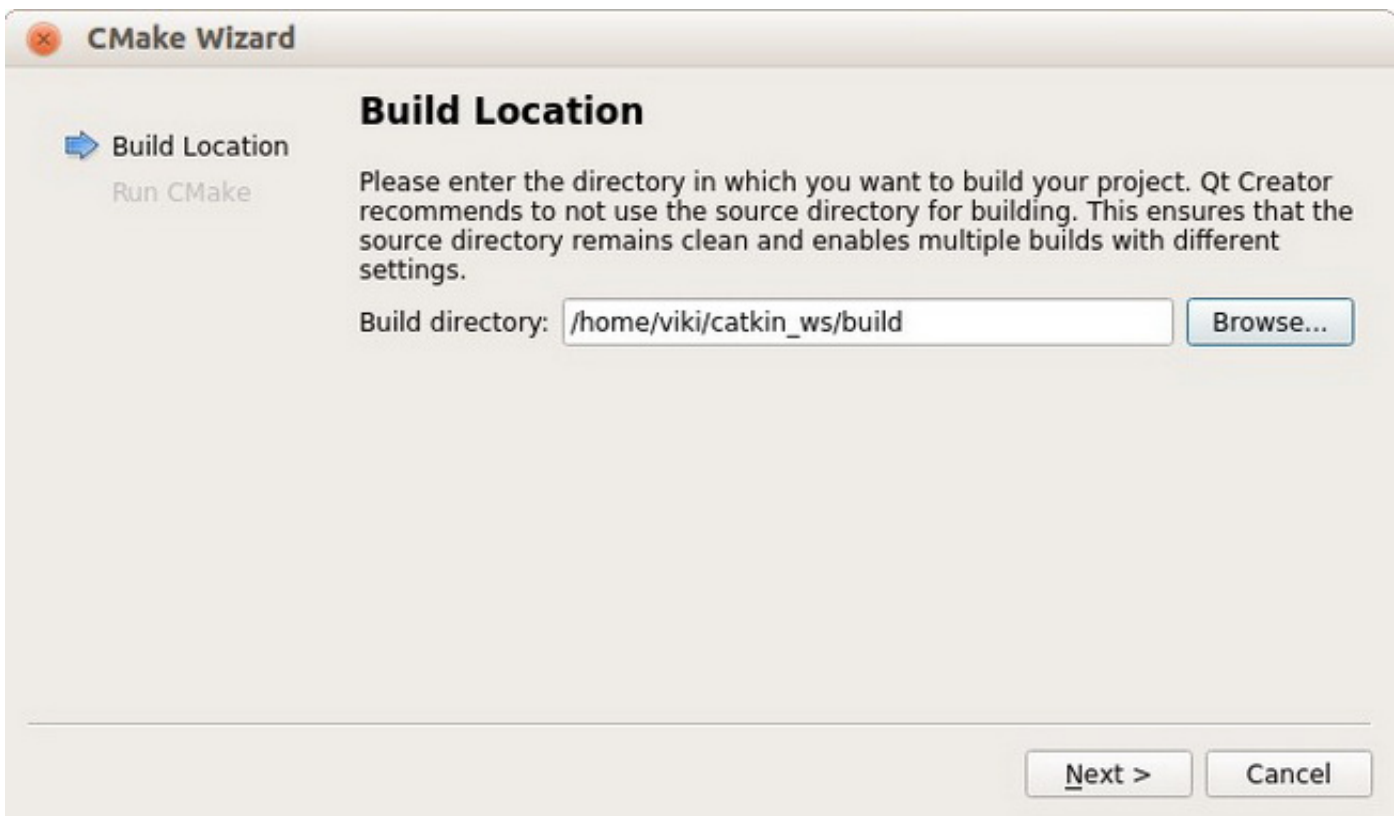
从 *Dash home* 里启动Qt Creator, 将看到下面的Welcome界面:



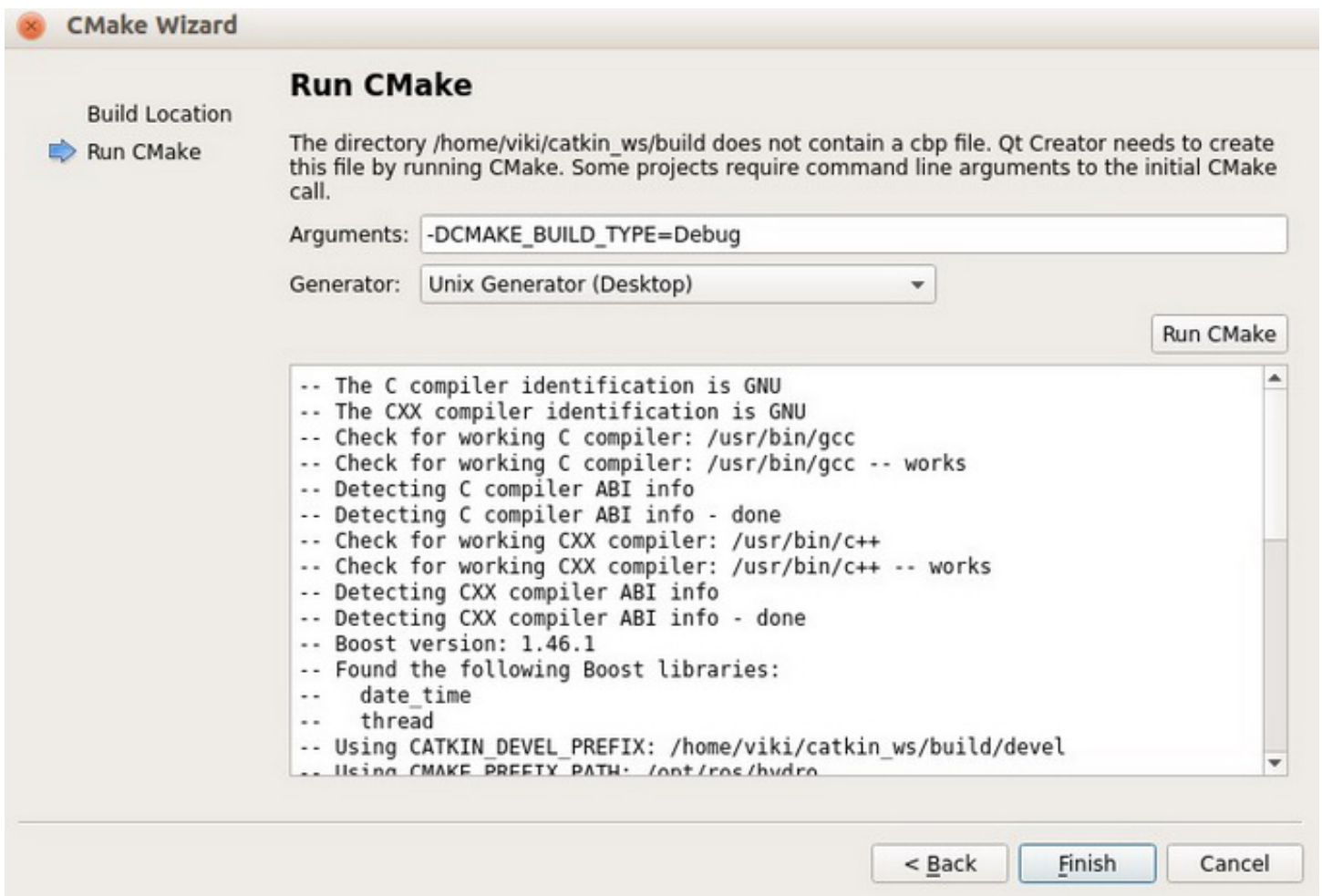
这里我们导入 *roscpp_tutorials* 包, 使之成为Qt Creator的C++工程。点击 **Open Project** 按钮, 在弹出的对话框中选择 `~/catkin_ws/src/ros_tutorials/roscpp_tutorials/` 路径下的 **CMakeLists.txt** 文件, 如下图:



点击 *Open*, 将会出现编译路径选择对话框。这里要注意了, 需要 *Browse* 将路径修改为 `~/catkin_ws/build/` 的路径, 如下图:



点击 *Next* 后, 在出现的对话框的 *Arguments* 一栏填入 `-DCMAKE_BUILD_TYPE=Debug` (不填后面将无法调试), 然后点击 *Run CMake* 即可开始编译, 结果如下图:

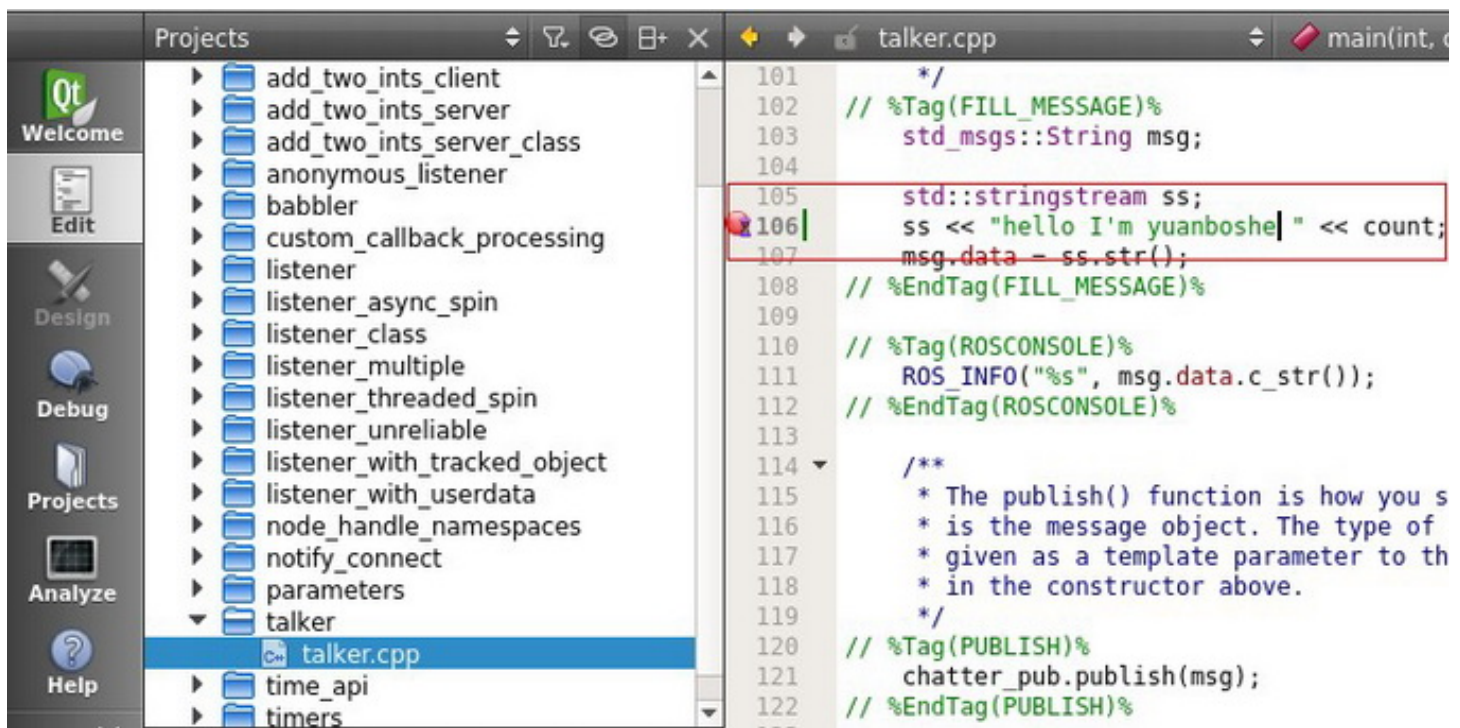


如果没有错误信息,则点击 *Finish* 完成,在 *Edit* 界面可以看到工程结构,可以开始编辑工程了。

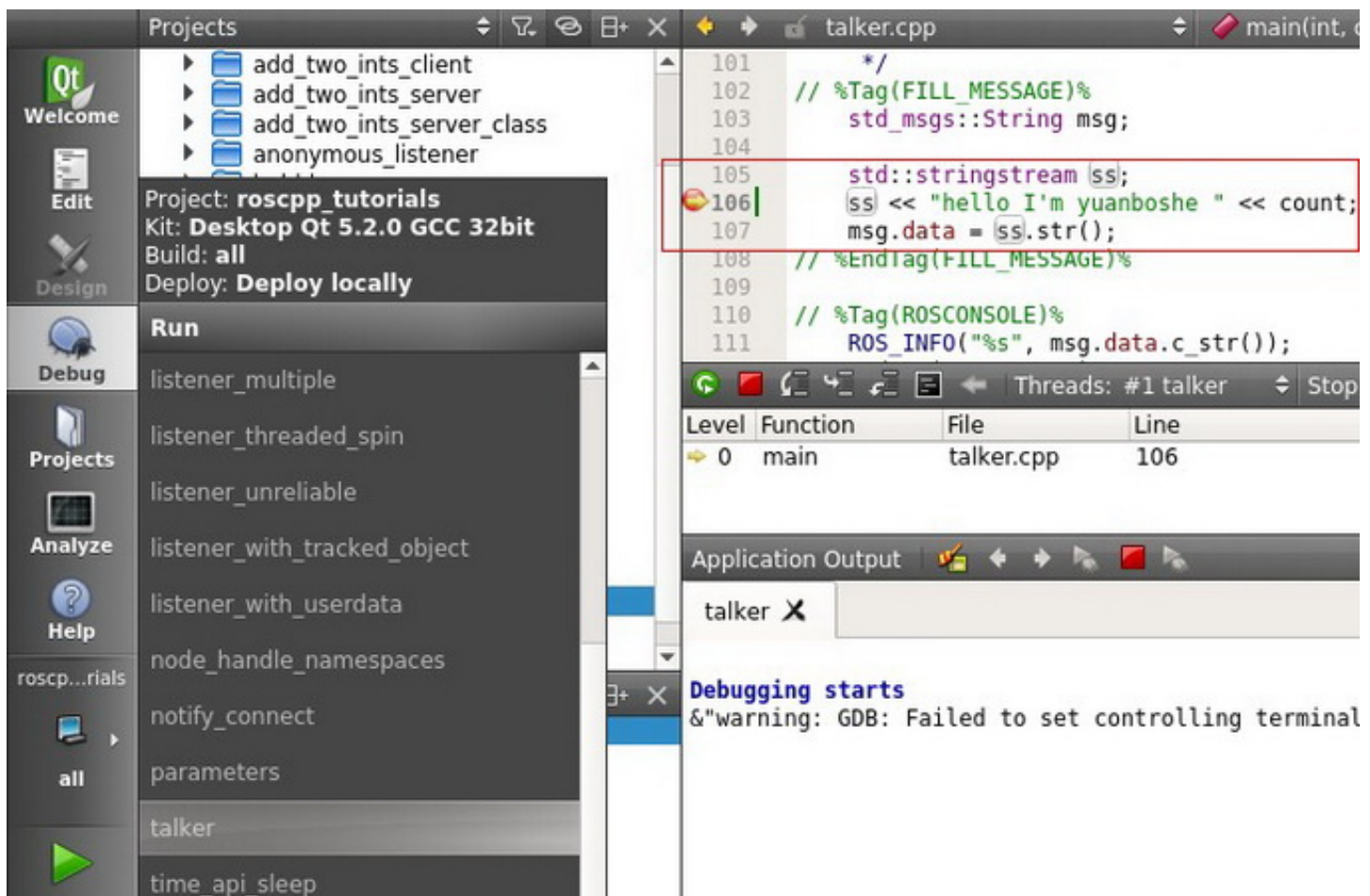
调试 (http://my.phirobot.com/blog/2013-12-ros_ide_qtcreator.html#id13)

先打开一个terminal,输入 `roscore` 命令启动ROS Master。

在Qt Creator的 *Edit* 界面工程目录中,找到 *talker.cpp* 文件,打开。然后找到“hello world”所在的位置,修改为“hello I'm yuanboshe”,并设置断点,如下图:



保存后, 从左下角的工程面板里选择 *talker* 可执行程序项, 然后按 **F5** 快捷键运行调试。稍等片刻, Qt Creator 会需要一点时间编译所有程序, 编译完成后, 会运行到断点处停下来:



取消断点, 按 **F5** 继续运行, 在弹出的 *Application Output* 界面能够看到修改后的信息, 如下:

```
105     std::stringstream ss;
106     ss << "hello I'm yuanboshe " << count;
107     msg.data = ss.str();
108     // %EndTag(FILL_MESSAGE)%
109
110     // %Tag(ROSCONSOLE)%
111     ROS_INFO("%s", msg.data.c_str());
```

Level	Function	File	Line
0	main	talker.cpp	106

Application Output

talker X

```
[ INFO] [1388358023.558633412]: hello I'm yuanboshe 54
[ INFO] [1388358023.658694747]: hello I'm yuanboshe 55
[ INFO] [1388358023.758616817]: hello I'm yuanboshe 56
[ INFO] [1388358023.858613532]: hello I'm yuanboshe 57
[ INFO] [1388358023.958613535]: hello I'm yuanboshe 58
[ INFO] [1388358024.058670776]: hello I'm yuanboshe 59
[ INFO] [1388358024.158642345]: hello I'm yuanboshe 60
[ INFO] [1388358024.258633135]: hello I'm yuanboshe 61
[ INFO] [1388358024.358645837]: hello I'm yuanboshe 62
[ INFO] [1388358024.458630690]: hello I'm yuanboshe 63
[ INFO] [1388358024.558653867]: hello I'm yuanboshe 64
[ INFO]
```

2 Search Results 3 Application Output 4 Compile Output

回到桌面, 再开一个terminal窗口, 输入 `roslaunch roscpp_tutorials listener` 命令, 可以看到正确的监听消息, 如下图:


```
❌ - viki@ROS: ~
roscore http://ROS:11311/ viki@ROS: ~
viki@ROS:~$ rosruncpp_tutorials_listener
[ INFO] [1388344461.196362473]: I heard: [hello I'm yuanboshe 2899]
[ INFO] [1388344461.296413036]: I heard: [hello I'm yuanboshe 2900]
[ INFO] [1388344461.398277174]: I heard: [hello I'm yuanboshe 2901]
[ INFO] [1388344461.496524950]: I heard: [hello I'm yuanboshe 2902]
[ INFO] [1388344461.596436269]: I heard: [hello I'm yuanboshe 2903]
[ INFO] [1388344461.696470081]: I heard: [hello I'm yuanboshe 2904]
[ INFO] [1388344461.796490920]: I heard: [hello I'm yuanboshe 2905]
[ INFO] [1388344461.896462626]: I heard: [hello I'm yuanboshe 2906]
[ INFO] [1388344461.996405720]: I heard: [hello I'm yuanboshe 2907]
[ INFO] [1388344462.096398741]: I heard: [hello I'm yuanboshe 2908]
[ INFO] [1388344462.196335193]: I heard: [hello I'm yuanboshe 2909]
[ INFO] [1388344462.296457289]: I heard: [hello I'm yuanboshe 2910]
[ INFO] [1388344462.396948349]: I heard: [hello I'm yuanboshe 2911]
[ INFO] [1388344462.496404560]: I heard: [hello I'm yuanboshe 2912]
[ INFO] [1388344462.596463009]: I heard: [hello I'm yuanboshe 2913]
[ INFO] [1388344462.696957918]: I heard: [hello I'm yuanboshe 2914]
[ INFO] [1388344462.796418315]: I heard: [hello I'm yuanboshe 2915]
[ INFO] [1388344462.896644939]: I heard: [hello I'm yuanboshe 2916]
[ INFO] [1388344462.996614037]: I heard: [hello I'm yuanboshe 2917]
[ INFO] [1388344463.096602054]: I heard: [hello I'm yuanboshe 2918]
[ INFO] [1388344463.196527713]: I heard: [hello I'm yuanboshe 2919]
[ INFO] [1388344463.296594140]: I heard: [hello I'm yuanboshe 2920]
[ INFO] [1388344463.397460418]: I heard: [hello I'm yuanboshe 2921]
```

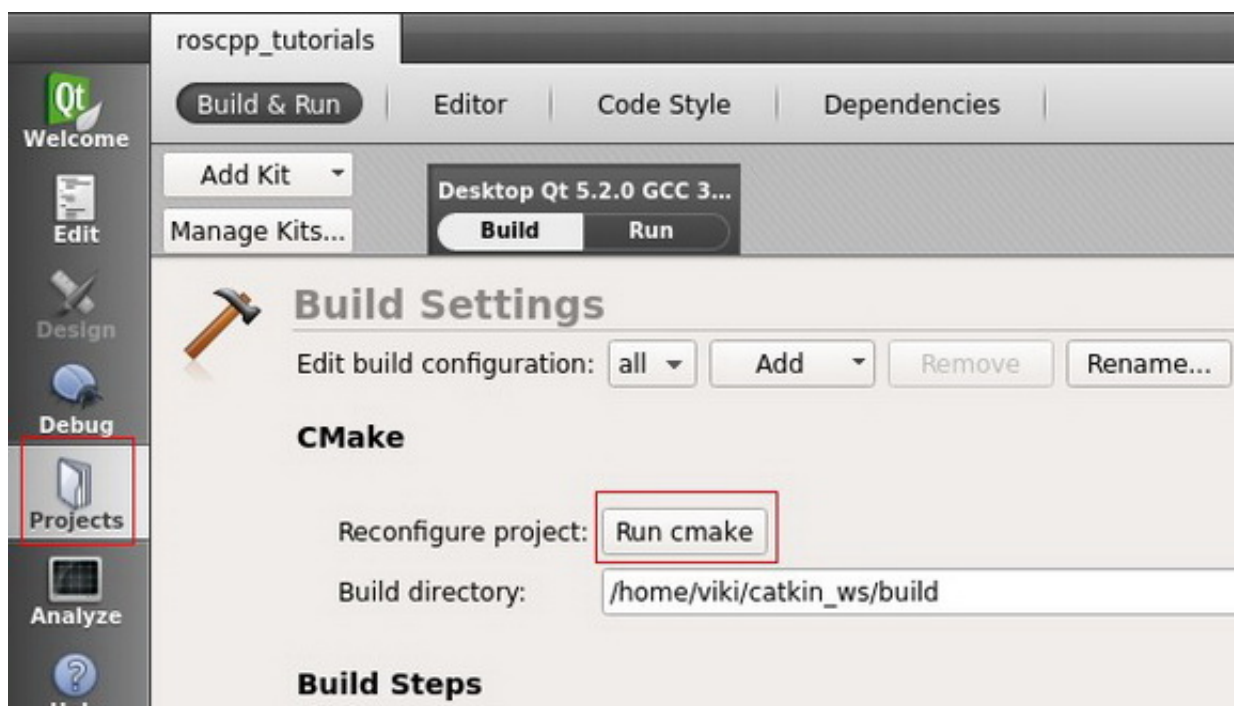
关于Debug问题 (http://my.phirobot.com/blog/2013-12-ros_ide_qtcreator.html#id14)

如果之前在CMake的时候没有填写 `-DCMAKE_BUILD_TYPE=Debug` 参数, 则编译出来的程序不可用于调试。
按下调试快捷键 **F5** 的时候, 可能会出现下面的警告信息:

This does not seem to be a "Debug" build.
Setting breakpoints by file name and line number may fail.

Section .debug_info: Not found.
Section .debug_abbrev: Not found.
Section .debug_line: Not found.
Section .debug_str: Not found.
Section .debug_loc: Not found.
Section .debug_range: Not found.
Section .gdb_index: Not found.
Section .note.gnu.build-id: Found.
Section .gnu.hash: Found.
Section .gnu_debuglink: Not found.

可以通过左边的"Projects"-">"Run CMake"重新设置参数, 并make, 如下图:



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