运行自动测试

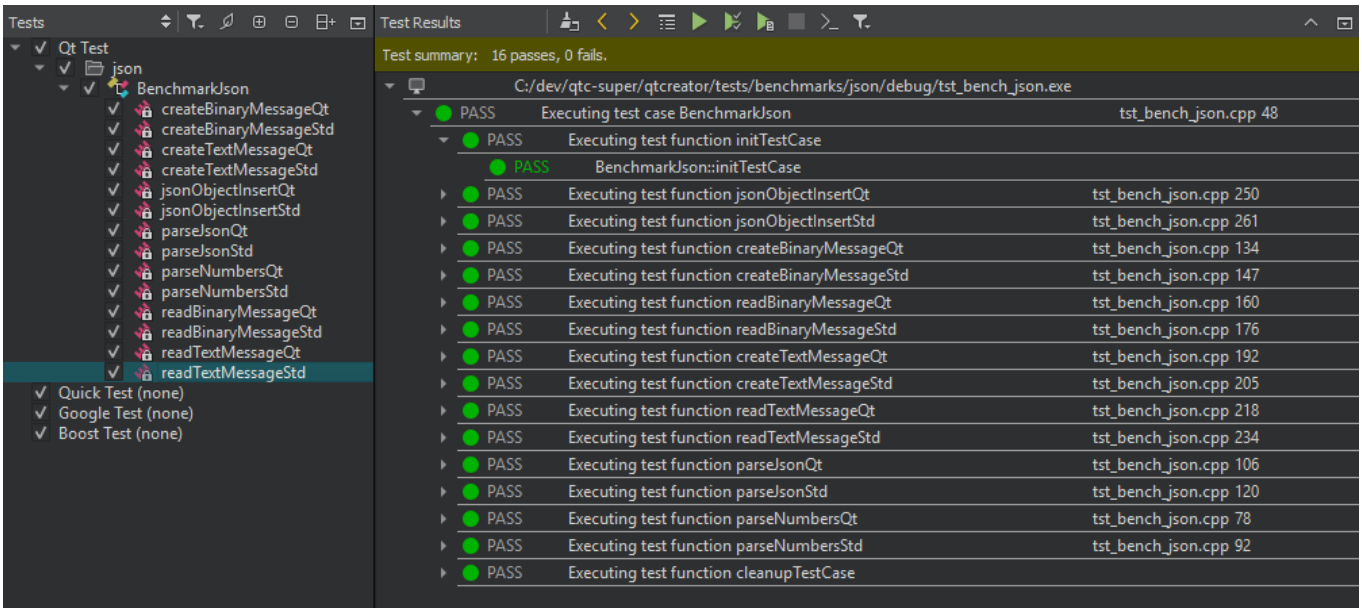
Qt Creator支持*基于代码的测试和基于构建系统的测试*。基于代码的测试为与基础代码模型或专用解析器紧密绑定的特定测试框架提供特殊处理。基于构建系统的测试独立于任何测试框架。它直接从底层构建系统检索信息，并使用它甚至构建系统本身来执行相应的测试。

Qt Creator集成了以下用于单元测试应用程序和库的测试框架：

- 升压测试
- 捕获 2 测试框架
- 谷歌C++测试框架
- Qt测试框架

为 CTest 提供了其他基于生成系统的支持。

您可以使用 Qt Creator 为您的项目创建、构建和运行基于代码的测试。



构建基于系统的测试

默认情况下，基于构建系统的测试的处理处于禁用状态，以避免干扰基于代码的解析器。若要启用基于系统的生成测试，请在“**首选项**”>“测试>**常规**”中选择相应的**测试**工具。

对于基于构建系统的测试，测试的检测通常要快得多，因为这通常不涉及扫描或解析。在使用基于代码的测试时，测试树中提供的信息通常更详细。

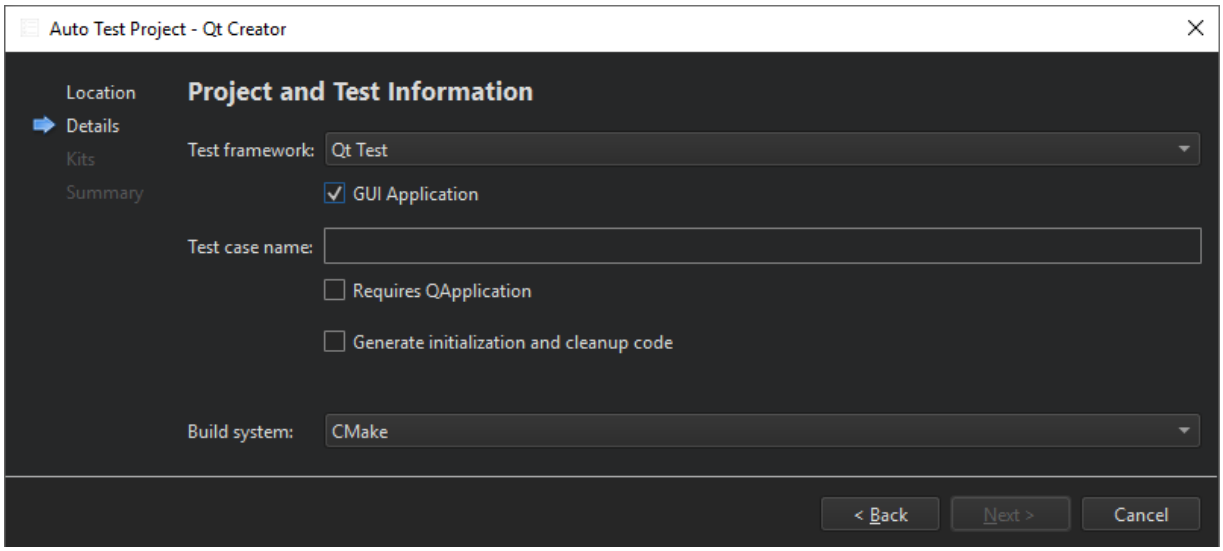
创建测试

可以使用向导创建包含测试的项目。

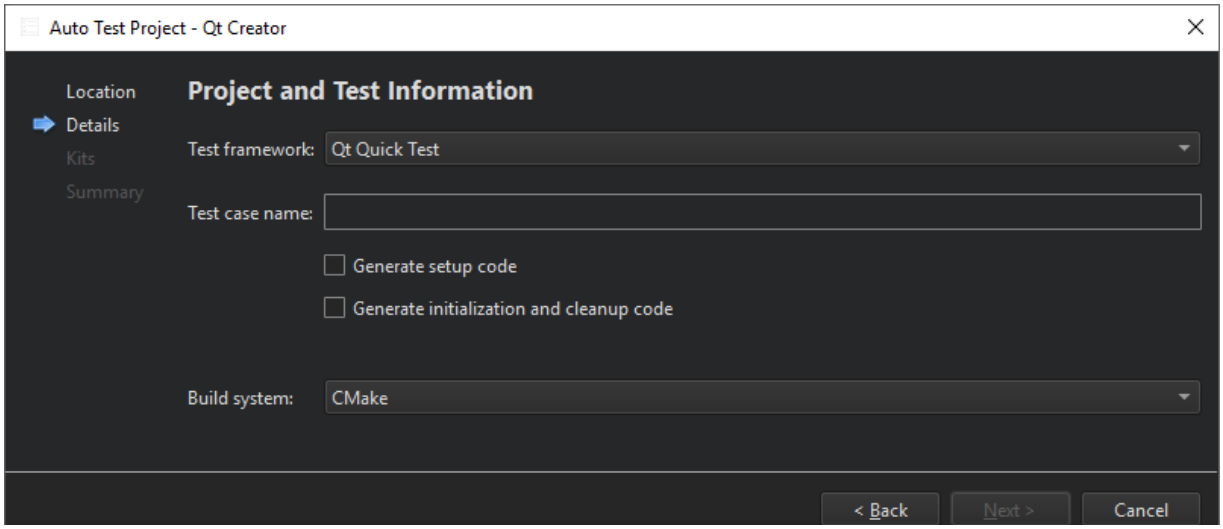
创建 Qt 和 Qt 快速测试

要创建 Qt 或 Qt 快速测试，请执行以下操作：

1. 选择“**文件**>**新项目**>**其他项目**>**自动测试项目**”>**选择**使用 Qt 测试或 Qt 快速测试的样板代码创建项目。
2. 在“**项目和测试信息**”对话框中，指定项目和测试的设置：
    1. 在“**测试框架**”字段中，选择“**Qt 测试**”或“**Qt 快速测试**”。
    2. 对于 Qt 测试，请选中“**GUI 应用程序**”复选框以创建 Qt 应用程序。



3. In the **Test case name** field, enter a name for the test case.
4. For a Qt test, select the **Requires QApplication** check box to add the include statement for QApplication to the main.cpp file of the project.
5. For a Qt Quick test, select the **Generate setup code** check box to execute C++ code before any of the QML tests are run. The testing framework will call slots and invokable functions, as described in Executing C++ Before QML Tests.



executed by the testing framework to initialize and clean up the test.

7. In the **Build system** field, select the build system to use for building the project: qmake, CMake, or Qbs.

Qt Creator creates the test in the specified project directory. Edit the .cpp file to add private slots for each test function in your test. For more information about creating Qt tests, see Creating a Test.

Creating Google Tests

To create a Google test:

1. Select **File** > **New Project** > **Other Project** > **Auto Test Project** > **Choose** to create a project with boilerplate code for a Google test.
2. In the **Project and Test Information** dialog, specify settings for the project and test:
    1. In the **Test framework** field, select **Google Test**.
    2. In the **Test suite name** field, enter a name for the test suite.
    3. In the **Test case name** field, enter a name for the test case.
    4. Select the **Enable C++ 11** check box to support C++ 11 features in the test.
    5. In the **Google test repository** field, select a directory that contains a clone of the googletest repository.

        To use an installed Google C++ Testing framework instead, see Setting Up the Google C++ Testing Framework.

    6. In the **Build system** field, select the build system to use for building the project: qmake, CMake, or Qbs.

Qt Creator creates the test in the specified project directory. For more information about creating Google tests, see the Google Test Primer.

Creating Boost Tests

To build and run Boost tests, you must have the Boost.Test installed on the development host. Typically, it is installed when you install Boost. You can download Boost from Boost.org.

If Boost libraries can be found by the used compiler and build system, you do not need to specify the include directory when creating the test.

To create a Boost test:

1. Select **File** > **New Project** > **Other Project** > **Auto Test Project** > **Choose** to create a project with boilerplate code for a Boost test.
2. In the **Project and Test Information** dialog, specify settings for the project and test:
    1. In the **Test framework** field, select **Boost Test**.
    2. In the **Test suite name** field, enter a name for the test suite.
    3. In the **Test case name** field, enter a name for the test case.
    4. In the **Boost include dir (optional)** field, enter the path to the directory that contains files needed by Boost.Test, such as *version.hpp* and a subfolder called *test* that contains the test header files.
    5. In the **Build system** field, select the build system to use for building the project: qmake, CMake, or Qbs.

Qt Creator creates the test in the specified project directory. For more information about creating Boost tests, see Boost.Test.

Creating Catch2 Tests

If the Catch2 headers can be found by the used compiler and build system automatically, you do not need to specify the include directory when creating the test.

To create a basic Catch2 test:

1. Select **File** > **New Project** > **Other Project** > **Auto Test Project** > **Choose** to create a project with boilerplate code for a Catch2 test.
2. In the **Project and Test Information** dialog, specify settings for the project and test:
    1. In the **Test framework** field, select **Catch2**.
    2. In the **Test case name** field, specify a name to be used for the test case file.
    3. Select the **Use Qt libraries** check box to use a self defined main function and set up the project to use Qt features.
    4. In the **Catch2 include directory (optional)** field, you may enter a path to the directory that contains the Catch2 header files.
    5. In the **Build system** field, select the build system to use for building the project: qmake, CMake, or Qbs.

Qt Creator creates the test in the specified project directory. For more information about creating Catch2 tests, see Catch2.

Creating CTest Based Tests

CTest provides capabilities to execute tests for CMake based projects and is not limited to a special test framework. You simply configure tests inside the project files, usually CMakeLists.txt. Basically this is done by enabling testing for the project and registering the test applications or even special commands.

```
enable_testing()
add_test(NAME test_example COMMAND test_example)
```

`test_example` must of course be added as an executable before trying to register it as test or it may be any command that can be executed including arguments. For detailed information on how to use CTest see Testing with CTest.

Setting Up the Google C++ Testing Framework

To build and run Google tests, you must have the Google C++ Testing framework installed and configured on the development host. You can either clone it from Git Hub or install it from an installation package.

To configure a project to use a cloned Google testing framework, edit the variable in the project file (.pro) to include the source and folders of Google Test's and . Usually, you need to add the following subfolders:`INCLUDEPATHincludegoogletestgooglemock`

- `googletest`
- `googlemock`
- `googletest/include`
- `googlemock/include`

You also need to add the necessary files to the variable. For example:`SOURCES`

- googlemock/src/gmock-all.cc

To configure a project to use an installed Google testing framework package, add the following include paths to the .pro file:

- `<googletest_install_path>/include/gtest`
- `<googletest_install_path>/include/gmock`

Then add linker options to be able to find the libraries and to link against them. For example, for qmake based projects, you typically need to add the following values to the .pro file:

- `LIBS += -lgtest -L<path_to_gtest_lib>`
- `LIBS += -lgmock -L<path_to_gmock_lib>`

Building and Running Tests

To build and run tests:

1. Open a project that contains tests.
2. In the **Tests** view, select the tests to run.
3. In the **Test Results**, select:
   - (**Run All Tests**) to run all tests.
   - (**Run Selected Tests**) to run the selected tests.
   - (**Run Failed Tests**) to re-run the tests which failed in the last run. Depending on the framework this may select additional tests if it is impossible to distinguish or to fully address the test.
   - (**Run Tests for Current File**) to run the tests in the file currently open in the code editor.

By default, Qt Creator builds a project before deploying and running it. To run all tests without building and deploying them again, select **Run All Tests Without Deployment** in the context menu. To run the selected tests without deployment, select **Run Selected Tests Without Deployment**.

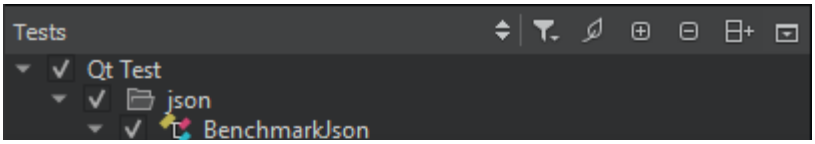
The functions to run tests are also available in the context menu in the **Tests** view and in **Tools** > **Tests**.

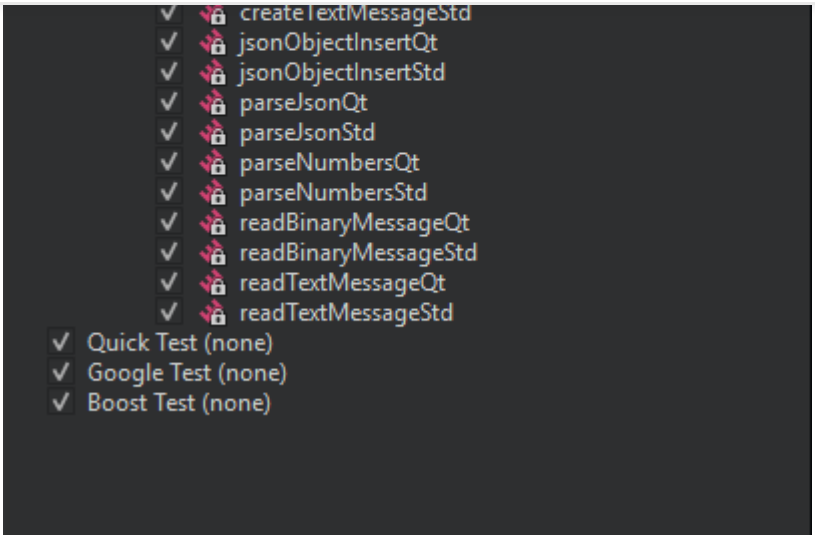
> **Note:** If you have enabled build system based and code based tests, you may run tests twice when using **Run All Tests** or **Run Selected Tests**. This happens if the tests can be found by the code based test frameworks and are registered as test with the build system.

If a test takes more than a minute to execute, the default timeout might stop the test execution. To increase the timeout, select **Edit** > **Preferences** > **Testing** > **General**.

Selecting Tests to Run

The **Tests** view shows all the tests found for the currently active test frameworks in the current project. Select the test cases to run.





If a Qt Quick test case does not have a name, it is marked **Unnamed** in the list. Unnamed test cases are executed when you select **Run All Tests**. You cannot select or deselect them.

Qt Creator scans the project for tests when you open the project and updates the test list for the currently active test frameworks when you edit tests. To refresh the view, select **Rescan Tests** in the context menu.

To show or hide init and cleanup or data functions in the **Tests** view, select (**Filter Test Tree**), and then select **Show Init and Cleanup Functions** or **Show Data Functions**. Double-click a function in the list to open its source code in the code editor.

The test cases are listed in alphabetic, case insensitive order. To list them in the order in which they are defined in the source code, select (**Sort Naturally**).

Running and Debugging Tests from Code Editor

You can run and debug tests in the file currently open in the code editor. To run all tests in the open file, select **Tools** > **Tests** > **Run Tests for Current File**.

> **Note:** Available only for code based test frameworks.

To run the test currently selected in the open file, select **Run Test Under Cursor** in the context menu.

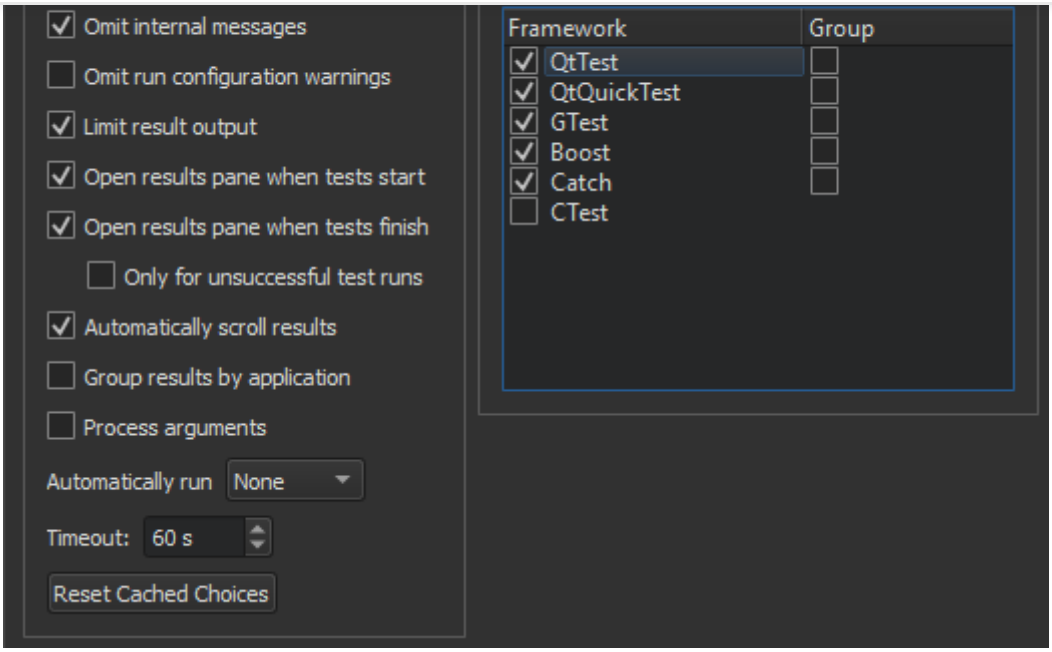
> **Note:** Available only for code based test frameworks.

To debug the currently selected test, select **Debug Test Under Cursor** in the context menu.

> **Note:** Availability for build system based tests depends on the build system tool's abilities.

Specifying Test Settings

To customize the handling of tests, test frameworks, and test tools, select **Edit** > **Preferences** > **Testing** > **General**.



You can customize some settings at project level. To change settings for the current project instead of globally, select **Projects** > **Project Settings** > **Testing**.

In the **Active Test Frameworks** list you can select which tests Qt Creator will handle. To improve the performance of full scans for tests, disable test frameworks you are not using.

To group related test cases for an active test framework, select the **Group** check box next to the framework name in the **Active Test Frameworks** list. By default, tests are grouped based on the directory where they are located.

Internal messages and run configuration warnings for deduced configurations are omitted by default. To view them, deselect the **Omit internal messages** and **Omit run configuration warnings** check boxes.

By default, test result output is limited to 100,000 characters. The view is automatically scrolled down when new results are added. To display full results, deselect the **Limit result output** check box. To disable automatic scrolling, deselect the **Automatically scroll results** check box.

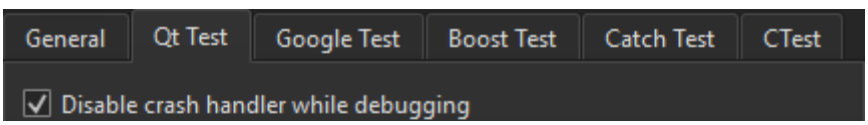
Test results can be grouped by the executable path that was used to run the tests. This is useful if you have multiple test executables and run them all at once. To enable this functionality you need to select the **Group results by application** check box.

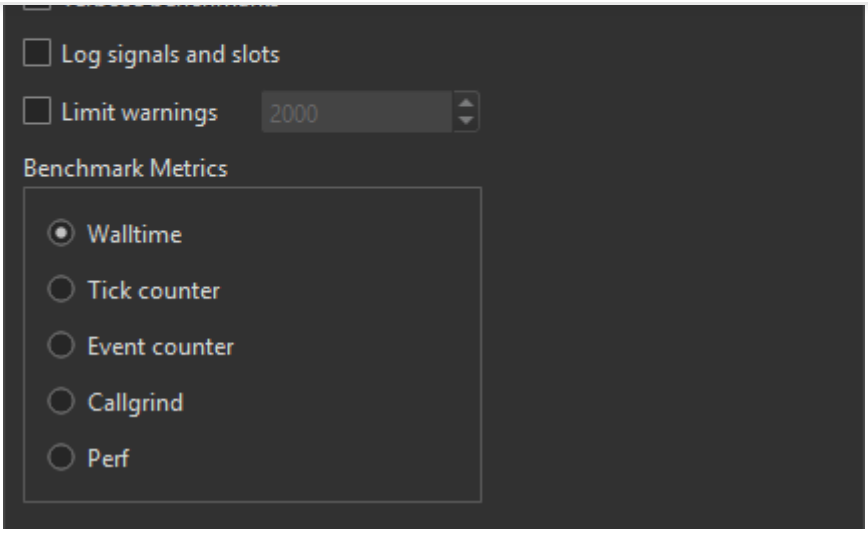
It is possible to automatically run the currently available tests after successfully building the current project. In **Automatically run**, select which tests should be run after a successful build.

In some special setups, Qt Creator cannot deduce which executable or run configuration it should use. If Qt Creator repeatedly asks you to select the tests to run when trying to execute tests, you can enable it to cache your choices and use them were appropriate. The cached information is cleared when you switch to another project, close the current one, or select **Reset Cached Choices**.

Specifying Settings for Running Qt Tests

The code inside a benchmark test is measured, and possibly also repeated several times in order to get an accurate measurement. This depends on the measurement back-end that you can select in the **Benchmark Metrics** group in **Edit** > **Preferences** > **Testing** > **Qt Test**: walltime, CPU tick counter, event counter, Valgrind Callgrind, and Linux Perf. For more information, see Creating a Benchmark.





To receive verbose output when running benchmarks, select the **Verbose benchmarks** check box.

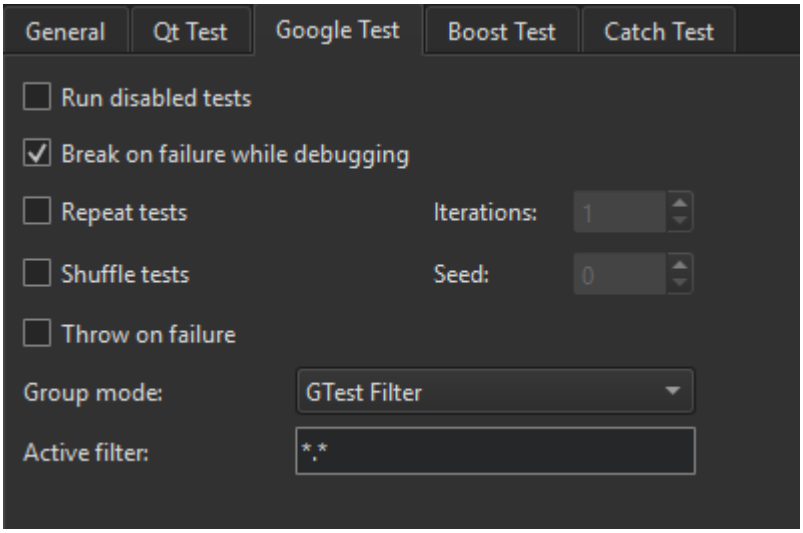
To allow the debugger to interrupt Qt tests on assertions, select the **Disable crash handler while debugging** check box.

To record information about signals and slots in the test log, select the **Log signals and slots** check box.

To explicitly limit the maximum number of warnings in the test log, select the **Limit warnings** check box and specify the intended number inside the spin box next to it. Set the number to 0 if you want no limit at all. The default number is 2000.

Specifying Settings for Running Google Tests

To specify settings for running Google tests, select **Edit** > **Preferences** > **Testing** > **Google Test**.



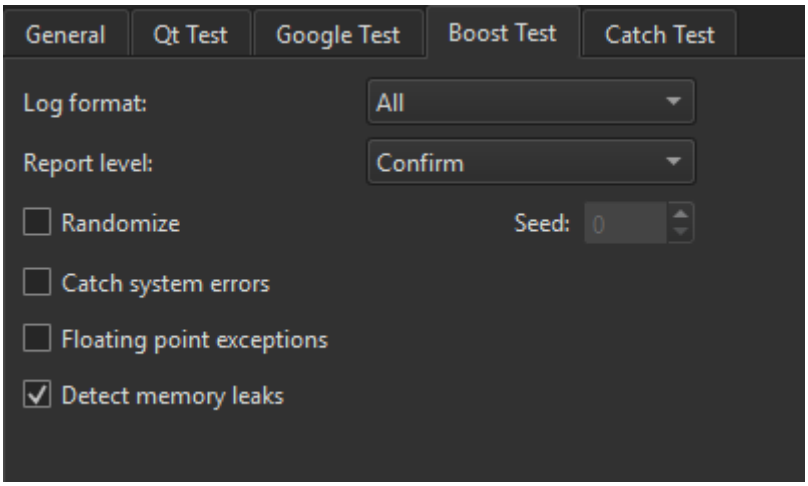
To run disabled tests, select the **Run disabled tests** check box.

To run several iterations of the tests, select the **Repeat tests** check box and enter the number of times the tests should be run in the **Iterations** field. To make sure that the tests are independent and repeatable, you can run them in a different order each time by selecting the **Shuffle tests** check box.

To turn failures into debugger breakpoints, select the **Break on failure while debugging** check box. To turn assertion failures into C++ exceptions, select the **Throw on failure** check box.

To group Google tests by using a GTest filter, select **GTest Filter** in the **Group mode** field, and specify the filter to use in the **Active filter** field. For more information about GTest filters, see Running a Subset of the Tests

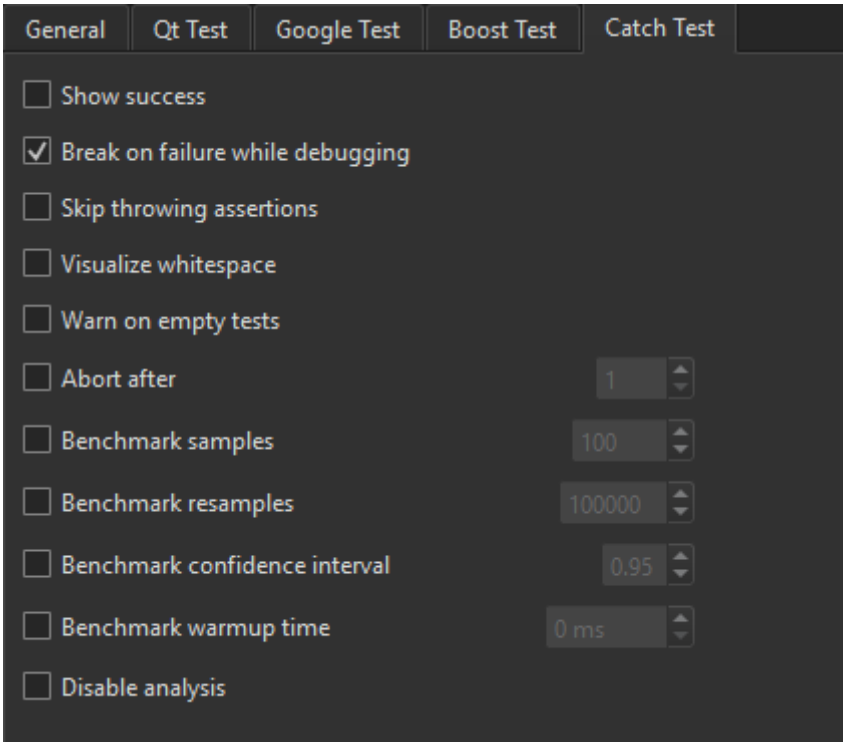
1. To specify settings for running Boost tests, select **Edit** > **Preferences** > **Testing** > **Boost Test**.



2. In the **Log format** field, select the error report format to specify the type of events you want recorded in the test report.
3. In the **Report level** field, select the verbosity level of the test result report. Select **No** if you do not want a report.
4. Select the **Randomize** check box to execute the tests in a random order, using the seed specified in the **Seed** field for initializing the randomizer.
5. Select the **Catch system errors** check box to catch system errors.
6. Select the **Floating point exceptions** check box to detect floating point exceptions.
7. Select the **Detect memory leaks** check box to detect memory leaks.

Specifying Settings for Running Catch2 Tests

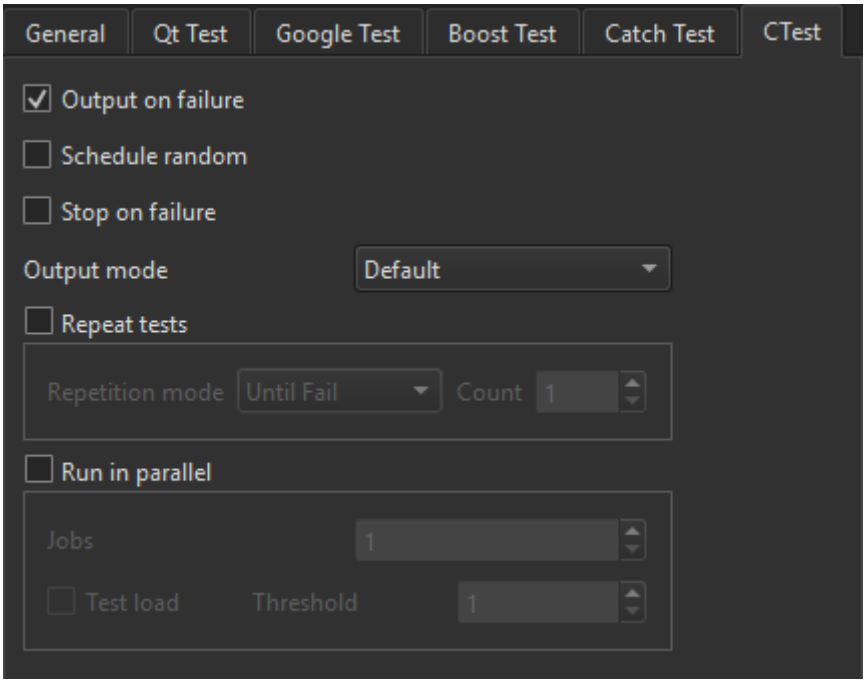
1. To specify settings for running Catch2 tests, select **Edit** > **Preferences** > **Testing** > **Catch Test**.



4. Select the **Skip throwing assertions** check box to skip any assertion that test for throwing an exception.
5. Select the **Visualize whitespace** check box to turn whitespace into escape sequences.
6. Select the **Warn on empty tests** check box to get a warning when a test case does not check any assertion.
7. Select the **Abort after** check box to abort the test after the number of failures specified inside the spin box.
8. Select the **Benchmark samples** check box to specify the number of samples to be collected while running benchmarks.
9. Select the **Benchmark resamples** check box to specify the number of resamples to be used for the statistical bootstrapping performed after the benchmarking.
10. Select the **Benchmark confidence interval** check box to specify the confidence interval used for the statistical bootstrapping.
11. Select the **Benchmark warmup time** check box to specify the warmup time for each test before benchmarking start.
12. Select the **Disable analysis** check box to disable the statistical analysis and bootstrapping.

Specifying Settings for Running CTest-Based Tests

1. To specify settings for running CTest-based tests, select **Edit** > **Preferences** > **Testing** > **CTest**.



2. Select the **Output on failure** check box to show test specific output if a test fails. Contrary to the CTest default this is enabled by default.
3. Select **Schedule random** to execute the tests in random order.
4. Select **Stop on failure** to automatically stop the test execution on the first failing test.
5. In the **Output mode** field, select the verbosity level of the CTest output.

> **Note:** This only influences the output on the text display.

6. Select **Repeat tests** if you want to re-run tests under certain circumstances.
7. In the **Repetition mode** field, select the mode for re-running tests. The maximum count for repeating a test can be specified in the **Count** field.

CPU load to pass the threshold given in **Threshold**.

Viewing Test Output

The test results are displayed in Test Results in XML format. XML can be parsed more easily and reliably than plain text.

However, if a Qt test crashes, it might not produce complete XML code that can be parsed, which might lead to information loss. The lost information might be retrievable when viewing the results as plain text. To view the results of Qt tests as plain text, select **Edit** > **Preferences** > **Testing** > **Qt Test**, and then deselect the **Use XML output** check box. Then select the (**Switch Between Visual and Text Display**) button in **Test Results** to switch to the text display.

The following table lists the messages that **Test Results** displays:

Result	Description
BENCH	Benchmark test.
DEBUG	Debug message.
FAIL	Test case failed. Double-click the line for more information.
FATAL	A fatal error occurred that stops the test case from being run, for example.
INFO	Informative message.
INTERNAL	Internal message.
PASS	Test case passed.
SKIP	Test case was skipped.
SYSTEM	An error message received from or influenced by the OS.
XFAIL	Test case is expected to fail, so it is marked by using the QEXPECT_FAIL macro. If the test case passes instead, an unexpected pass (XPASS) is written to the test log.
XPASS	Test case passed even though it was expected to fail.
WARN	Warning message.

Since Qt 5.4, you can provide a BLACKLIST file for tests. It is mainly used internally by the Qt CI system.

Result	Description
BFAIL	Blacklisted test case failed.
BPASS	Blacklisted test case passed.
BXFAIL	Blacklisted test case failed but was marked to be expected to fail.
BXPASS	Blacklisted test case passed even though it was expected to fail.

To view only messages of a particular type, select (**Filter Test Results**), and then select the types of messages to show. To show all messages, select **Check All Filters**. To deselect all message types, select **Uncheck All Filters**.

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