

How to Create a TouchGFX project for the STM32F746G-DISCO board using SW4STM32

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Purpose:

The purpose of this document is to describe a procedure to create a TouchGFX project for the STM32F746G-DISCO board using SW4STM32. At the conclusion of this document, you will have created a project with a TouchGFX GUI. The controls on the GUI will be fully operational.

This document does not describe how to control micro controller peripherals from the GUI.

At this time, ST's CubeMX project does not generate TouchGFX projects with a touch controller. Until the touch controller is added, the GUI is static and does not respond to the user's touch. To get the touch controller working, additional files must be added to the project and other bugs must be squashed.

This procedure is made more difficult by the rather complicated folder structure created by CubeMX. The basic CubeMX project includes numerous folders and linked files and the apparent folder structure as viewed from Eclipse does not match the folder structure on the hard drive. Some important folders are not visible from Eclipse. Hopefully this will be fixed in the future.

Please note that since the addition of TouchGFX, CubeMX and the underlying firmware package have been undergoing rapid change. There will probably be additional revisions. This document may not be applicable to future revisions. Hopefully this document may not be needed at all and CubeMX will create fully working displays with touch controllers. This document is intended for use only with the software versions at the time of the writing of this document.

Note: This procedure must be performed using the Windows 7 or Windows 10 operating system. At this time the TouchGFX Designer runs only on Windows.

The procedure is broken into two sections. The first section shows how to use CubeMX to create a static display without a touch controller. The second section shows how to get the touch controller working.

How to Create a TouchGFX project for the STM32F746G-DISCO board using SW4STM32

Prerequisites:

1. An STM32F746G-DISCO board
2. STM32CubeMX version 5.0.0
3. STM32CubeF7 Firmware Package V1.14.0 / 23-November-2018
4. TouchGFX version 4.10.0
5. SW4STM32 version 2.7.2.201812190825

Procedure:

Section 1. Create a basic TouchGFX project using STM32CubeMX

1. Open STM32CubeMX
2. Press "ACCESS TO BOARD SELECTOR" button
3. In the Board List, select the 32F746GDISCOVERY board. You can narrow the list by checking Discovery under the Type section and STM32F7 under the MCU Series section.
4. A dialog box will pop up asking "Initialize all peripherals with their default mode?" Press "Yes"
5. After a 5 or 10 second delay, CubeMX will display the component list (on left side of CubeMX) and the pinout view (on right side of CubeMX).

How to Create a TouchGFX project for the STM32F746G-DISCO board using SW4STM32

6. Select Middleware, then Graphics. The GRAPHICS Mode and Configuration frame will pop up between the component list and the pinout view. Configure the Graphics Mode as follows:
 - a. In the Mode area, Set Graphics Framework to “TouchGFX”. Set Display Interface to “Display Parallel Interface using LTDC”.
 - b. In the Configuration area, select the Parameter Settings tab and under Physical Display Size, set the Width to 480 and the Height to 272
 - c. In the Configuration area, select the TouchGFX tab and under Location, set the Executable full name to the location of the TouchGFX Designer. If you installed TouchGFX in its default location, the Designer will be located at

C:\TouchGFX\4.10.0\designer\TouchGFXDesigner-4.10.0.exe.
 - d. In the Configuration area, select Platform Settings tab and set the LCD Reset Pin XREA to GPIO:Output and PI12[LCD_DISP...]
7. At the top of CubeMX, select the Project Manager tab. Configure the Project Manager tab as follows:
 - a. Enter a Project Name and Project Location.
 - b. Change the Toolchain / IDE to SW4STM32
 - c. Uncheck Generate Under Root.
 - d. Make note of the path to the Default Firmware Location. You will need this path in Section 2.
8. In the top right of CubeMX, press the Generate Code button. When CubeMX has completed code generation, a dialog box will be shown. Press the Close button.

How to Create a TouchGFX project for the STM32F746G-DISCO board using SW4STM32

9. In the Configuration area of the GRAPHICS Mode and Configuration area, select the TouchGFX tab and press the Execute button. The TouchGFX Designer will now be opened. Perform the following steps with the TouchGFX Designer:
 - a. Design the GUI to be displayed on the STM32F746G-DISCO display. The GUI can be as simple or complicated as you wish.
 - b. You may also import a previously created GUI by selecting the Edit menu, then Import GUI.
 - c. You may optionally test your GUI using the Run Simulator button at the top right of the Designer.
 - d. When the design of the GUI is completed, press the Generate Code button at the top right of the Designer. Wait a few seconds until the status bar at the bottom of the designer says Code Generation complete.
 - e. Close the Designer.
10. Back in CubeMX, press the Generate Code button. When CubeMX has completed code generation, a dialog box will be shown.
11. Congratulations! At this point you have now created a simple TouchGFX project for your STM32F746G-DISCO board. Let's build and flash the project.
12. Press the Open Project button. SW4STM32 will now load. After SW4STM32 opens, close or minimize CubeMX.

How to Create a TouchGFX project for the STM32F746G-DISCO board using SW4STM32

13. Perform the following procedure in SW4STM32:
 - a. If a dialog box is shown asking you to select a workspace, press the OK button.
 - b. When the dialog box opens that tells you your project has been imported, press OK.
 - c. You should see your new project in the Project Explorer. Perform the following actions:
 - 1) Right click on your project and select Build Project. Your project should build.
 - 2) If you have not already done so, plug your STM32F746G-DISCO board into one of your computer's USB ports.
 - 3) Once again, right click on your project. This time select Target -> Program Chip. When the Select binary file dialog box appears, verify the proper binary is shown and press OK.
 - 4) After the Programming chip dialog box is cleared, press the black reset button on your DISCO board.
 - 5) After a few seconds, your new display should be shown on your DISCO board. Congratulations!
 - 6) Oops, there is one problem, the buttons and controls on your screen don't do anything! That's because CubeMX did not configure the touch controller. Your GUI is probably working perfect but it is not being told you have touched the display.
 - 7) This completes Section 1. In the next section, we will configure the Touch Controller.

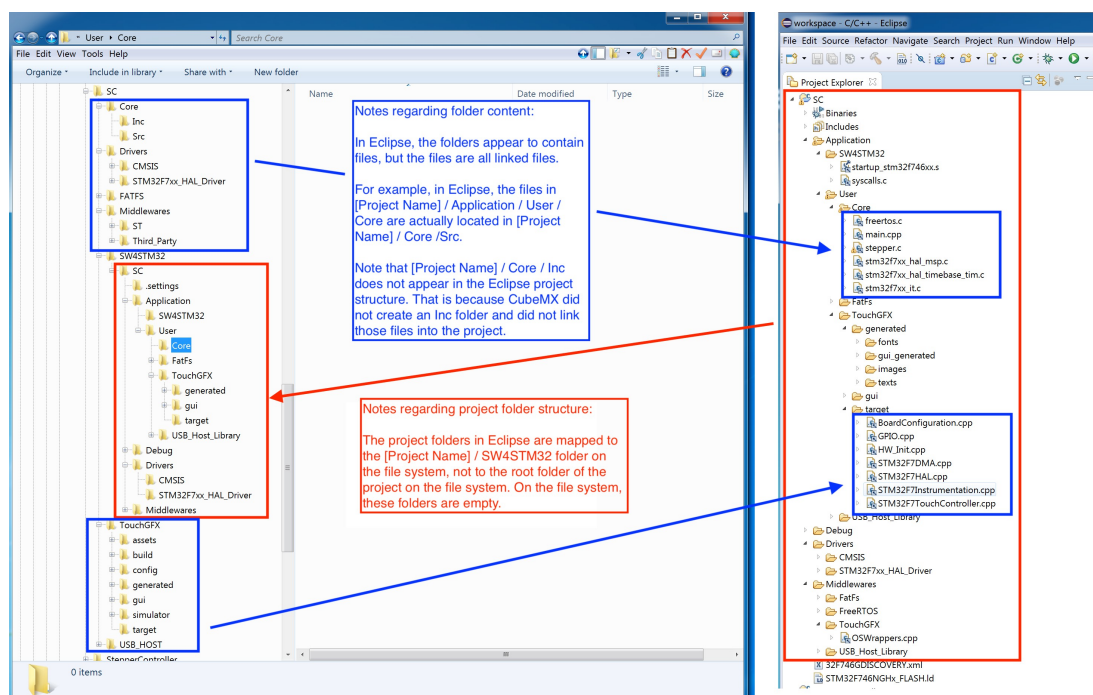
How to Create a TouchGFX project for the STM32F746G-DISCO board using SW4STM32

Section 2. Implement the touch controller in your TouchGFX project

In order to get the touch controller working we must add additional files to the project. Before we do this we must first understand the file structure of the project we created in Section 1.

Unfortunately the file structure of our CubeMX project is complicated. This is because CubeMX has created folders with linked files. This causes the folder structure on the hard drive to be different from the apparent project structure seen in the Project Explorer folder inside Eclipse. It also means that some project files, such as include files, are not even visible in the Eclipse project structure.

Here is a graphic comparing the project structure on the hard drive with the project structure as viewed in Eclipse.



The above image shows that the file structure in Eclipse is actually located at [Project Name] / SW4STM32 on the hard drive. However those folders on the hard drive are actually empty. That's because the files in Eclipse are links, not actual files. Most of the files in Eclipse are linked in from other locations within the project folder on the hard drive.

How to Create a TouchGFX project for the STM32F746G-DISCO board using SW4STM32

In order to get the touch controller working, we will be copying files and folders from the STM32Cube repository to the project folder on the hard drive. To do this you must first locate the folder containing the correct version of the STM32F7 firmware. As listed in the prerequisites, the correct firmware version is STM32Cube_FW_V1.14.0. The easiest way to determine where this folder is located is to refer to the CubeMX Project Manager tab and locate the Default Firmware Location path. You should have noted this path in Section 1. On my computer the path to my default firmware location is:

C:/Users/Administrator/STM32Cube/Repository/STM32Cube_FW_F7_V1.14.0.

Depending on where you installed CubeMX, your location may differ.

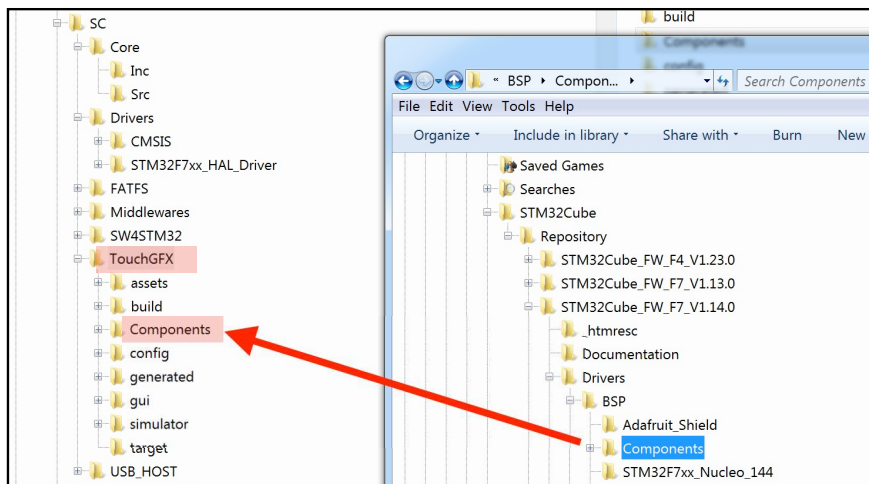
Once you know the location of your firmware, perform the following procedure to implement the touch controller:

1. Using Windows Explorer, copy the Components folder from the repository to the project folder.

The Components folder is located at:

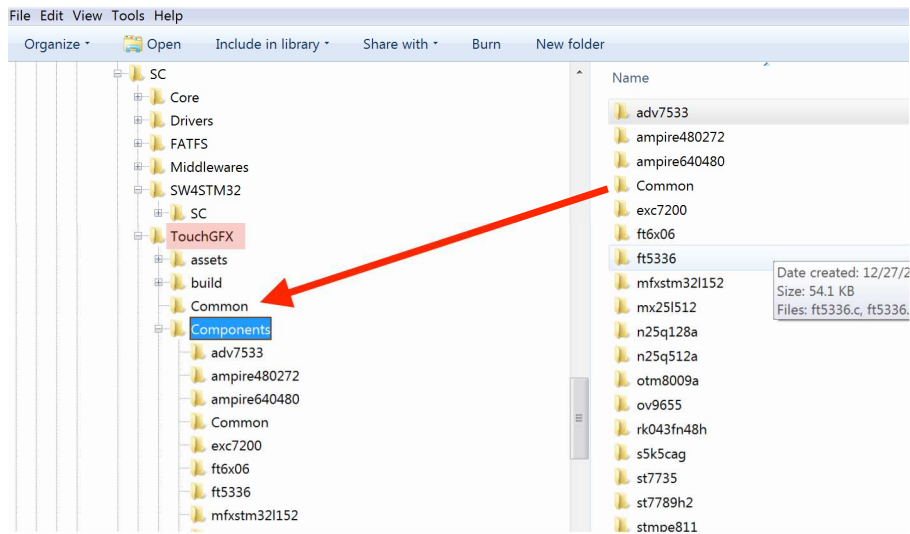
[Default FW Location]/Drivers/BSP/Components

Copy the Components folder from this location to [Project Folder]/TouchGFX as shown below:

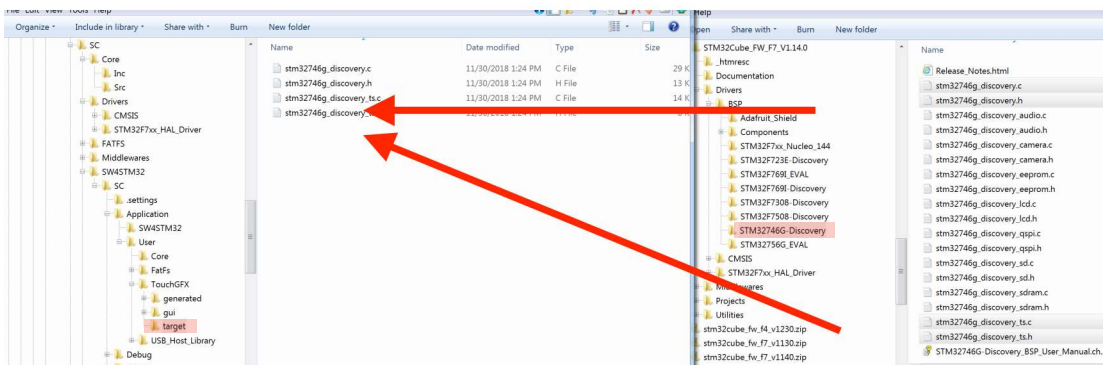


How to Create a TouchGFX project for the STM32F746G-DISCO board using SW4STM32

- Using Windows Explorer, copy the following Common folder from the Components folder you just placed into the project to the [Project Folder]/TouchGFX folder as shown below:

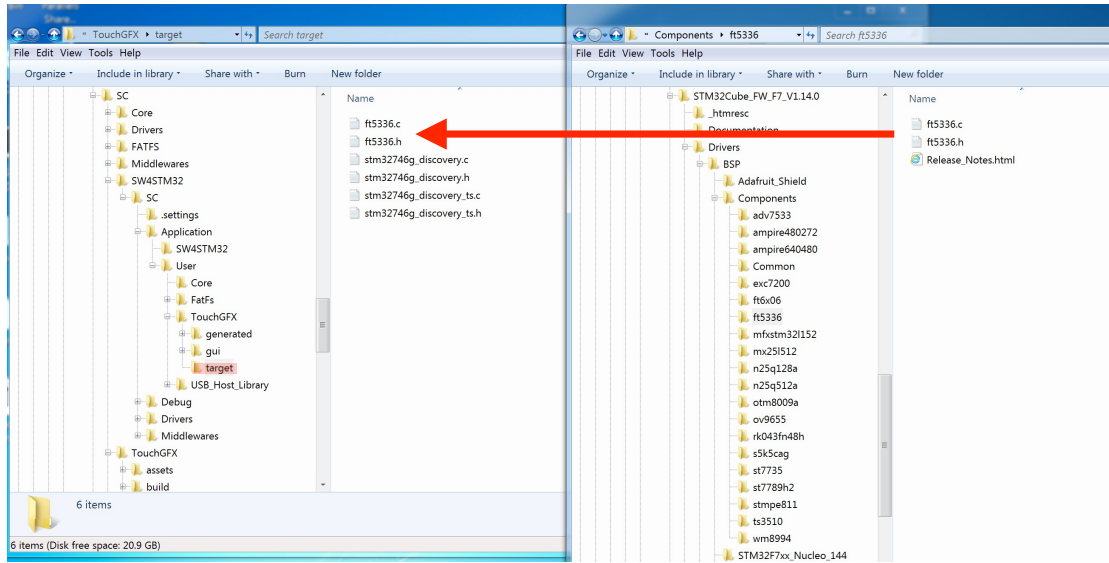


- Using Windows Explorer, copy the following four files from the repository to the [Project Folder]/SW4STM32/[ProjectName]/Application/User/TouchGFX/target as shown below:



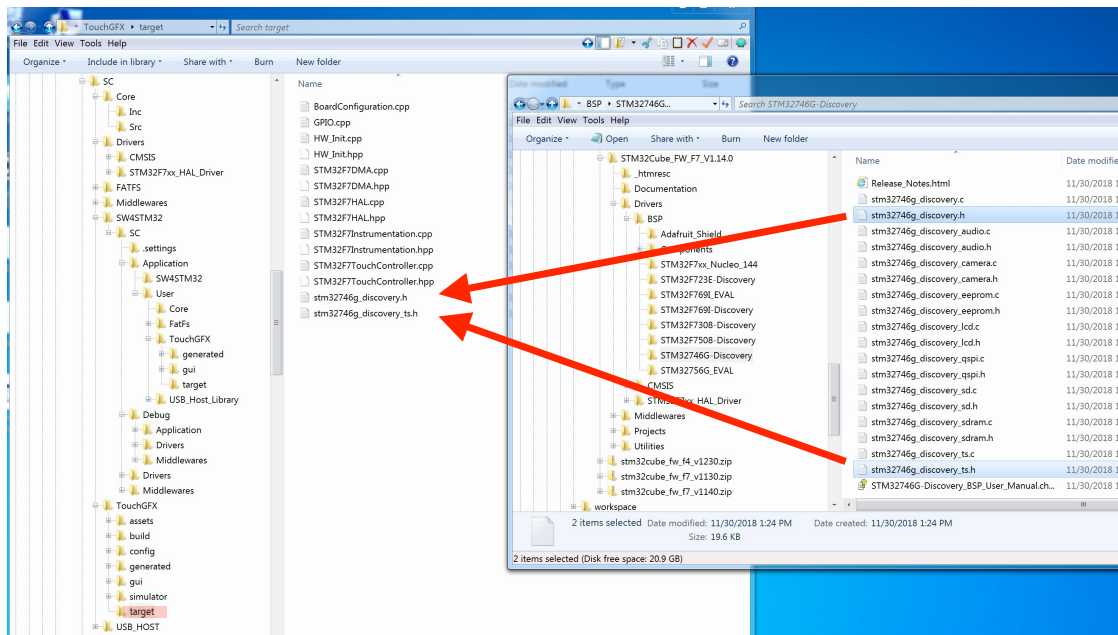
How to Create a TouchGFX project for the STM32F746G-DISCO board using SW4STM32

- Using Windows Explorer, copy the following two files from the repository to the [Project Folder]/SW4STM32/[ProjectName]/Application/User/TouchGFX/target as shown below:



How to Create a TouchGFX project for the STM32F746G-DISCO board using SW4STM32

- Using Windows Explorer, copy the following two files from the repository to the [Project Folder]/TouchGFX/target as shown below:



- Close Windows Explorer. Open SW4STM32.

How to Create a TouchGFX project for the STM32F746G-DISCO board using SW4STM32

7. Edit STM32F7TouchController.cpp and change as shown:



The image shows a code editor window titled 'STM32F7TouchController.cpp'. The code is as follows:

```
1 #include "STM32F7TouchController.hpp"
2
3 /* USER CODE BEGIN BSP user includes */
4 #include <stm32746g_discovery_ts.h>
5 /* USER CODE END BSP user includes */
6
7 extern "C"
8 {
9     uint32_t LCD_GetXSize();
10    uint32_t LCD_GetYSize();
11 }
12
13 using namespace touchgfx;
14
15
16 void STM32F7TouchController::init()
17 {
18     /* USER CODE BEGIN F4TouchController_init */
19
20     /* Add code for touch controller Initialization */
21     BSP_TS_Init(LCD_GetXSize(), LCD_GetYSize());
22
23     /* USER CODE END F4TouchController_init */
24 }
25
26 bool STM32F7TouchController::sampleTouch(int32_t& x, int32_t& y)
27 {
28     /* USER CODE BEGIN F4TouchController_sampleTouch */
29
30     TS_StateTypeDef state = { 0 };
31     BSP_TS_GetState(&state);
32     if (state.touchDetected)
33     {
34         x = state.touchX[0];
35         y = state.touchY[0];
36
37         return true;
38     }
39     return false;
40
41     /* USER CODE END F4TouchController_sampleTouch */
42 }
```

Annotations with red arrows:

- An arrow points to line 4, `#include <stm32746g_discovery_ts.h>`, with the text "Add this include".
- An arrow points to lines 20-21, `/* Add code for touch controller Initialization */` and `BSP_TS_Init(LCD_GetXSize(), LCD_GetYSize());`, with the text "Un-comment these two code blocks".
- An arrow points to the block of code from line 30 to line 39, with the text "Un-comment these two code blocks".

How to Create a TouchGFX project for the STM32F746G-DISCO board
using SW4STM32

8. Perform the following procedure in SW4STM32:
 - a. In your project in the Project Explorer., perform the following actions:
 - 1) Right click on your project and select Build Project. Your project should build.
 - 2) If you have not already done so, plug your STM32F746G-DISCO board into one of your computer's USB ports.
 - 3) Once again, right click on your project. This time select Target -> Program Chip. When the Select binary file dialog box appears, verify the proper binary is shown and press OK.
 - 4) After the Programming chip dialog box is cleared, press the black reset button on your DISCO board.
 - 5) After a few seconds, your new display should be shown on your DISCO board. Congratulations, because now the touch controller is working! Your controls should now work properly.
9. You are now have a working display. You are now ready to add your backend code to your project. For assistance in that, see the TouchGFX website.