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TouchGFX Presentation

AL Development – Hands-on

Agenda

1 Introduction

3 Summary

2 Tool Chain

3 Work Flow

Introduction

Goal of this workshop: *To get hands on experience with developing a TouchGFX AL for the STM32H7B-DK.*

We'll be going through the following topics:

- Introduction
- Abstraction Layer Architecture
- TouchGFX Generator

Further reading

- You will find a lot of help on the TouchGFX documentation site:
<https://support.touchgfx.com/>
- Slides in this workshop will refer to relevant documentation pages. Links will be in the lower right corner of the slides
- A good place to start reading following this workshop is:

TouchGFX Development

- Main Components:



- Main Activities:



- In this workshop we will focus on all main activities, from hardware selection (we'll choose the STM32H7B3I-DK) through UI Development.

Introduction

We'll work from a prepared CubeMX project and do the TouchGFX AL Development necessary to run a TouchGFX application on an STM32H7B3I-DK

Comes with complete LTDC Pin configuration, OCTOSPI, Clock tree, etc to run TouchGFX.

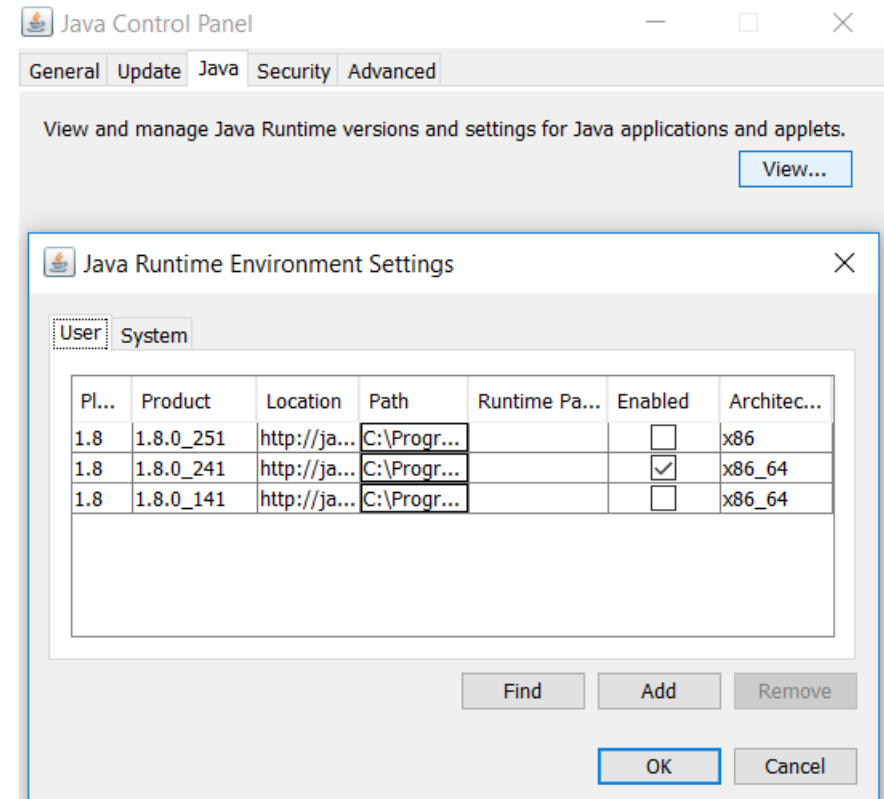
Our focus will be to configure the TouchGFX Generator for AL development.

Tool chain

At this point you've already installed and verified the following tools:

- **64-bit Java** to support *CubeMX*. Latest version is *v251*, but older versions work.
- *CubeMX 5.6.1* to configure the MCU + *Cube FW H7* pack *v1.7.0*
- *TouchGFX Generator v4.13.0* to generate and configure the TouchGFX AL
- *CubeIDE v1.3.0* for your IDE and target compiler (arm-gcc)
- *STM32CubeProgrammer v2.4.0* to program the STM32H7B3I-DK

Verify your installation by attempting to generate a CubeIDE project from within CubeMX. If no “STM32CubeIDE” folder is created, check your java version with “Configure java”.



Documentation Link: todo

Workflow

Generally, two workflows exist:

1. Start from CubeMX/CubeIDE (Custom hardware)
2. Start from TouchGFX Designer (STM32 Development Kits)

We'll be using a pre-configured project.

WF-1: Add TouchGFX Generator through *Additional Software*

Packs

[Collapse all](#)

Pack / Bundle / Component	Version	Selection
> <input type="checkbox"/> ARM.CMSIS	5.6.0 🔗	
> <input type="checkbox"/> STMicroelectronics.X-CUBE-AI	5.0.0 🔗	
> <input type="checkbox"/> STMicroelectronics.X-CUBE-BLE1	4.4.0	
> <input type="checkbox"/> STMicroelectronics.X-CUBE-BLE2	1.0.0 🔗	
> <input type="checkbox"/> STMicroelectronics.X-CUBE-GNSS1	4.0.0 🔗	
> <input type="checkbox"/> STMicroelectronics.X-CUBE-MEMS1	7.0.0 🔗	
> <input type="checkbox"/> STMicroelectronics.X-CUBE-NFC4	1.5.1 🔗	
> <input type="checkbox"/> STMicroelectronics.X-CUBE-SUBG2	1.0.0 🔗	
✓ <input checked="" type="checkbox"/> STMicroelectronics.X-CUBE-TOUCHGFX	4.13.0	
✓ <input checked="" type="checkbox"/> Graphics Application	4.13.0	
<input checked="" type="checkbox"/> Application		TouchGFX Generator ▾
		Not selected
		TouchGFX Generator

Security	>
Computing	>
Middleware	>
Trace and Debug	>
Power and Thermal	>
Additional Software	▾

STMicroelectronics.X-CUBE-TOUCHGFX.4.13.0

WF-2: Enable TouchGFX Generator by selecting “Graphics Application”.

The screenshot displays the 'Pinout & Configuration' interface. At the top, there is a search bar and a settings icon. Below the search bar, the 'Categories' section is visible, with 'A->Z' selected. The categories listed are: System Core, Analog, Timers, Connectivity, Multimedia, Security, Computing, Middleware, Trace and Debug, Power and Thermal, and Additional Software. The 'Graphics Application' option is checked under the 'Additional Software' category. The interface also shows the text 'STMicroelectronics.X-CUBE-TO' and 'Co'.

WF-3: Enable CRC

Additional Software ▼ Pinout

STMicroelectronics.X-CUBE-TOUCHGFX.4.13.0 Mode and Configuration

Mode

Graphics Application

Configuration

Reset Configuration

TouchGFX Generator User Constants

Configure the below parameters :

Search (Ctrl+F) ⏪ ⏩ i

⌵ **Dependencies**

CRC	<input checked="" type="checkbox"/> Please Enable CRC IP
⌵ Display	
Interface	Parallel RGB (LTDC)
Framebuffer Pixel Format	RGB888
Width (LTDC)	480 pixels
Height (LTDC)	272 pixels
Framebuffer Strategy	Double Buffer
Buffer Location	By Allocation
⌵ Driver	
Application Tick Source	LTDC
Graphics Accelerator	ChromART (DMA2D)
Real-Time Operating System	CMSIS_RTOS_V2

WF-4: Verify LTDC settings

Workflow

LTDC Mode and Configuration

Mode

Display Type

Configuration

Reset Configuration

Parameter Settings Layer Settings User Constants NVIC Settings

Configure the below parameters :

Search (Ctrl+F)

- ✓ Synchronization for Width
 - Horizontal Synchronization Width 41 pixels
 - Horizontal Back Porch 2 pixels
 - Active Width 480 pixels
 - Horizontal Front Porch 32 pixels
 - HSync Width 40
 - Accumulated Horizontal Back Porch Width 42
 - Accumulated Active Width 522
 - Total Width 554
- ✓ Synchronization for Height
 - Vertical Synchronization Height 10 lines
 - Vertical Back Porch 2 lines
 - Active Height 272 lines
 - Vertical Front Porch 2 lines
 - VSync Height 9
 - Accumulated Vertical Back Porch Height 11
 - Accumulated Active Height 283
 - Total Height 285

LTDC Mode and Configuration

Mode

Display Type

Configuration

Reset Configuration

Parameter Settings Layer Settings User Constants NVIC Settings

Configure the below parameters :

Search (Ctrl+F)

- ✓ Number of Layers
 - Number of Layers 1 layer
- ✓ Windows Position
 - Layer 0 - Window Horizontal Start 0
 - Layer 0 - Window Horizontal Stop 480
 - Layer 0 - Window Vertical Start 0
 - Layer 0 - Window Vertical Stop 272
- ✓ Pixel Parameters
 - Layer 0 - Pixel Format RGB888
- ✓ Blending
 - Layer 0 - Alpha constant for blending 255
 - Layer 0 - Default Alpha value 0
 - Layer 0 - Blending Factor1 Alpha constant
 - Layer 0 - Blending Factor2 Alpha constant
- ✓ Frame Buffer
 - Layer 0 - Color Frame Buffer Start Adress 0
 - Layer 0 - Color Frame Buffer Line Length (Image ... 480
 - Layer 0 - Color Frame Buffer Number of Lines (Im... 272

WF-4: Verify NVIC settings 1/2

Ensure LTDC Global interrupt enabled.

NVIC Mode and Configuration

Configuration

NVIC Code generation

Priority Group 4 bits for pre-emption priority 0 bits for subpriority Sort by Preemption Priority and Sub Priority

Search Show only enabled interrupts Force DMA channels Int

NVIC Interrupt Table	Enabled	Preemption Priority	Sub Priority	Uses FreeRTOS fur
Non maskable interrupt	<input checked="" type="checkbox"/>	0	0	<input type="checkbox"/>
Hard fault interrupt	<input checked="" type="checkbox"/>	0	0	<input type="checkbox"/>
Memory management fault	<input checked="" type="checkbox"/>	0	0	<input type="checkbox"/>
Pre-fetch fault, memory access fault	<input checked="" type="checkbox"/>	0	0	<input type="checkbox"/>
Undefined instruction or illegal state	<input checked="" type="checkbox"/>	0	0	<input type="checkbox"/>
System service call via SWI instruction	<input checked="" type="checkbox"/>	0	0	<input type="checkbox"/>
Debug monitor	<input checked="" type="checkbox"/>	0	0	<input type="checkbox"/>
Pendable request for system service	<input checked="" type="checkbox"/>	15	0	<input checked="" type="checkbox"/>
System tick timer	<input checked="" type="checkbox"/>	15	0	<input checked="" type="checkbox"/>
PVD and PVM interrupts through EXTI line	<input type="checkbox"/>	5	0	<input checked="" type="checkbox"/>
Flash global interrupt	<input type="checkbox"/>	5	0	<input checked="" type="checkbox"/>
RCC global interrupt	<input type="checkbox"/>	5	0	<input checked="" type="checkbox"/>
EXTI line2 interrupt	<input checked="" type="checkbox"/>	5	0	<input checked="" type="checkbox"/>
Time base: TIM6 global interrupt, DAC1_CH1 and DAC1_CH2 underrun error interrupts	<input checked="" type="checkbox"/>	0	0	<input type="checkbox"/>
FPU global interrupt	<input type="checkbox"/>	5	0	<input checked="" type="checkbox"/>
LTDC global interrupt	<input checked="" type="checkbox"/>	5	0	<input checked="" type="checkbox"/>
LTDC Error global Interrupt	<input type="checkbox"/>	5	0	<input checked="" type="checkbox"/>
DMA2D global interrupt	<input checked="" type="checkbox"/>	5	0	<input checked="" type="checkbox"/>
OCTOSPI1 global interrupt	<input checked="" type="checkbox"/>	5	0	<input checked="" type="checkbox"/>

WF-5: Verify NVIC settings 2/2

Ensure code generation is enabled. "Generate IRQ" and "Call HAL Handler".

NVIC Mode and Configuration

Configuration

<input checked="" type="checkbox"/> NVIC <input checked="" type="checkbox"/> Code generation			
Enabled interrupt table	<input type="checkbox"/> Select for init sequ...	<input checked="" type="checkbox"/> Generate IRQ handler	Call HAL hand
Non maskable interrupt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Hard fault interrupt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Memory management fault	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pre-fetch fault, memory access fault	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Undefined instruction or illegal state	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
System service call via SWI instruction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Debug monitor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pendable request for system service	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
System tick timer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EXTI line2 interrupt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Time base: TIM6 global interrupt, DAC1_CH1 and DAC1_CH2 underrun er...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LTDC global interrupt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
DMA2D global interrupt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
OCTOSPI1 global interrupt	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

WF-6: Configure TouchGFX Generator

STMicroelectronics.X-CUBE-TOUCHGFX.4.13.0 Mode and Configuration

Mode

Graphics Application

Configuration

Reset Configuration

TouchGFX Generator User Constants

Configure the below parameters :

Search (Ctrl+F) < >

Display

Interface	Parallel RGB (LTDC)
Framebuffer Pixel Format	RGB888
Width (LTDC)	480 pixels
Height (LTDC)	272 pixels
Framebuffer Strategy	Double Buffer
Buffer Location	By Allocation

Driver

Application Tick Source	LTDC
Graphics Accelerator	ChromART (DMA2D)
Real-Time Operating System	CMSIS_RTOS_V2

WF-7: Configure project generation.

Pinout & Configuration	Clock Configuration	Project Manager
Project Settings		
Project Name STM32H7B3I-DK		
Project Location C:\TouchGFXProjects\HandsOnSeminar\		
Application Structure Advanced <input type="checkbox"/> Do not generate the main()		
Toolchain Folder Location C:\TouchGFXProjects\HandsOnSeminar\		
Toolchain / IDE STM32CubeIDE <input type="checkbox"/> Generate Under Root		
Linker Settings		
Minimum Heap Size 0x1000		
Minimum Stack Size 0x1000		
Mcu and Firmware Package		
Mcu Reference STM32H7B3LIHxQ		
Firmware Package Name and Version STM32Cube FW_H7 V1.7.0		
<input checked="" type="checkbox"/> Use Default Firmware Location C:/Users/kjeldsem/STM32Cube/Repository/STM32Cube_FW_H7_V1.7.0 <input type="button" value="Browse"/>		

WF-8: Generate code from CubeMX

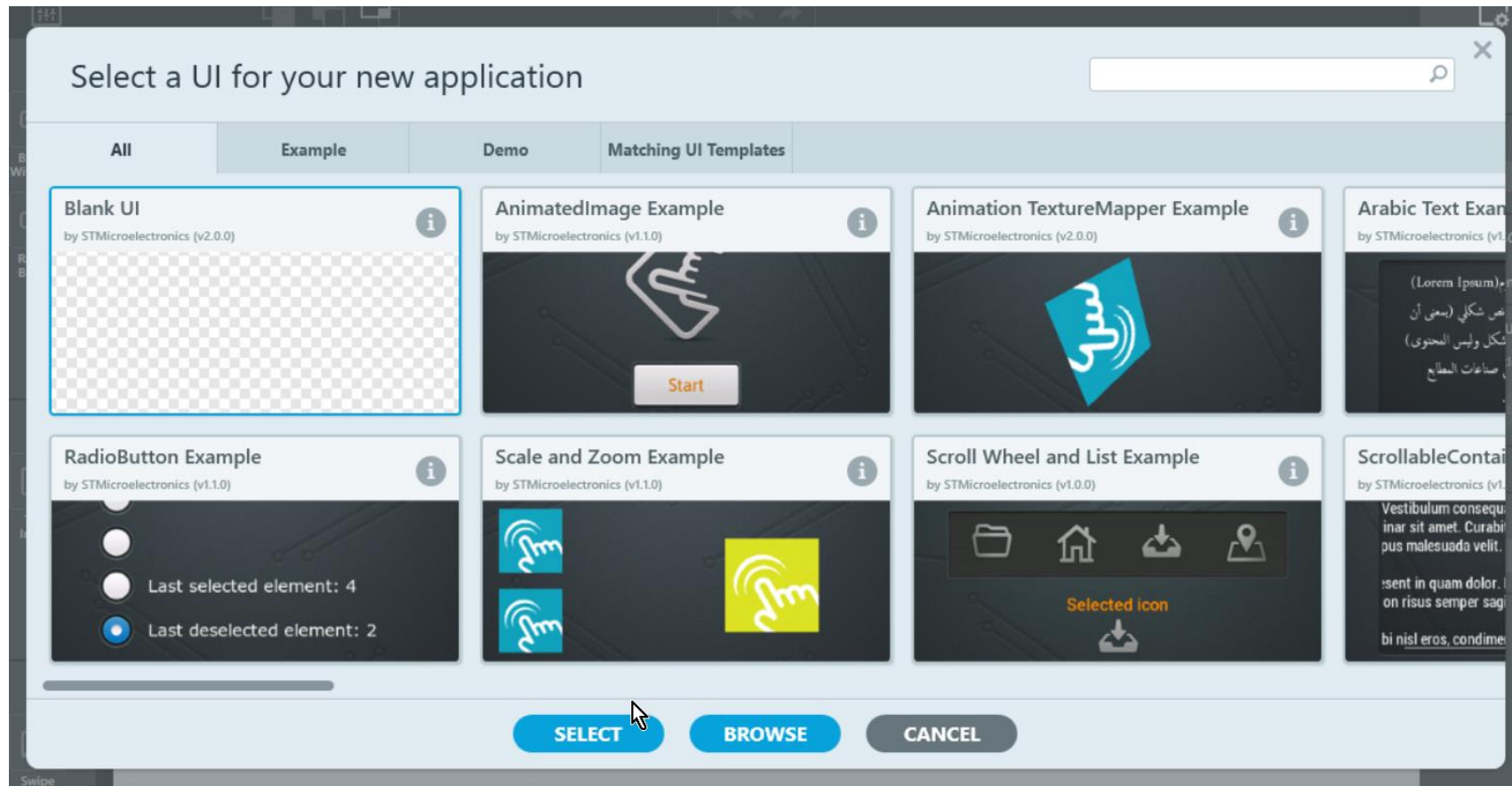
The screenshot displays the STM32CubeMX Project Manager interface. At the top, there is a dark blue header with a light blue button labeled "GENERATE CODE". Below this, a navigation bar shows "Project Manager" and "Tools". The main area shows the file explorer path: "C:\TouchGFXProjects > HandsOnSeminar". A list of files and folders is shown, including "Core", "Drivers", "EWARM", "gcc", "MDK-ARM", "Middlewares", "STM32CubeIDE", "TouchGFX", ".extSettings", ".mxproject", and "STM32H7B3I-DK.ioc". A grey callout box titled "TouchGFX Folder:" is positioned over the "TouchGFX" folder, showing its contents: "App", "target", and "ApplicationTemplate.touchgfx.part". An arrow points from the "TouchGFX" folder in the main list to the callout box.

WF-9: Inspect .part file

```
1
2 {
3   "Application": {
4     "Name": "STM32F746G_DISCO",
5     "TouchGfxPath": "../Middlewares/ST/touchgfx",
6     "AvailableColorDepths": [ 24 ],
7     "AvailableLCDs":
8     {
9       "24": "LCD24bpp"
10    },
11    "AvailableResolutions" : [
12      {
13        "Width": 480,
14        "Height": 272
15      }
16    ],
17    "PostGenerateTargetCommand" : "touchgfx update_project --project-file=../STM32F746G_DISCO.ioc --platform=m7"
18  },
19  "Version": "4.13.0"
20 }
21
```

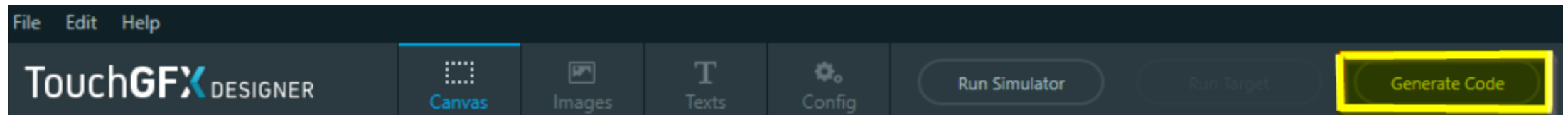
WF-10: Create simple GUI 1/2

Open the .part file with TouchGFXdesigner.

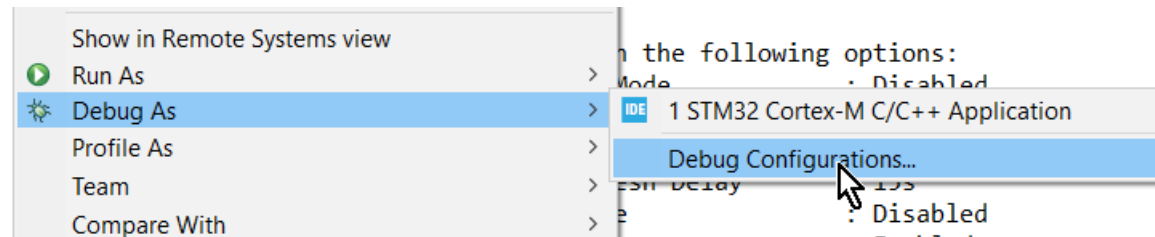
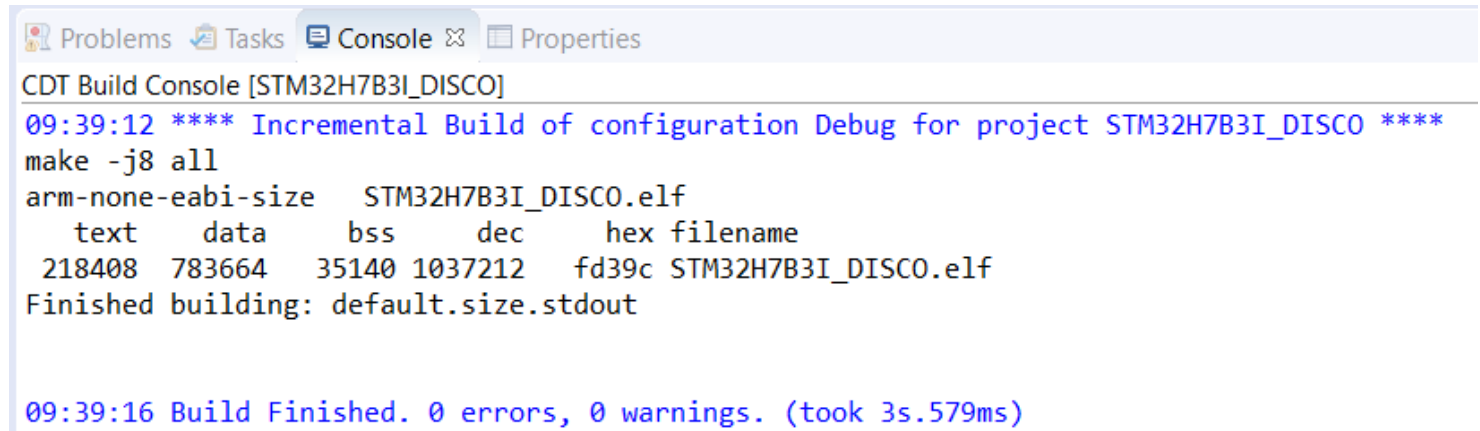
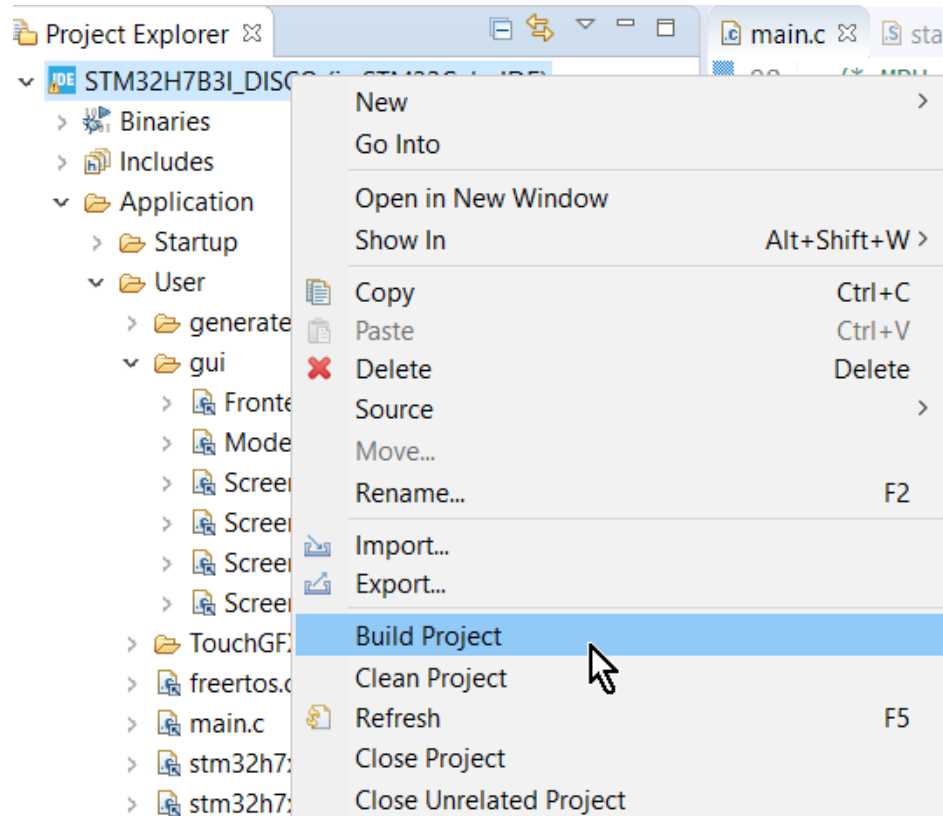


WF-10: Create simple GUI 2/2

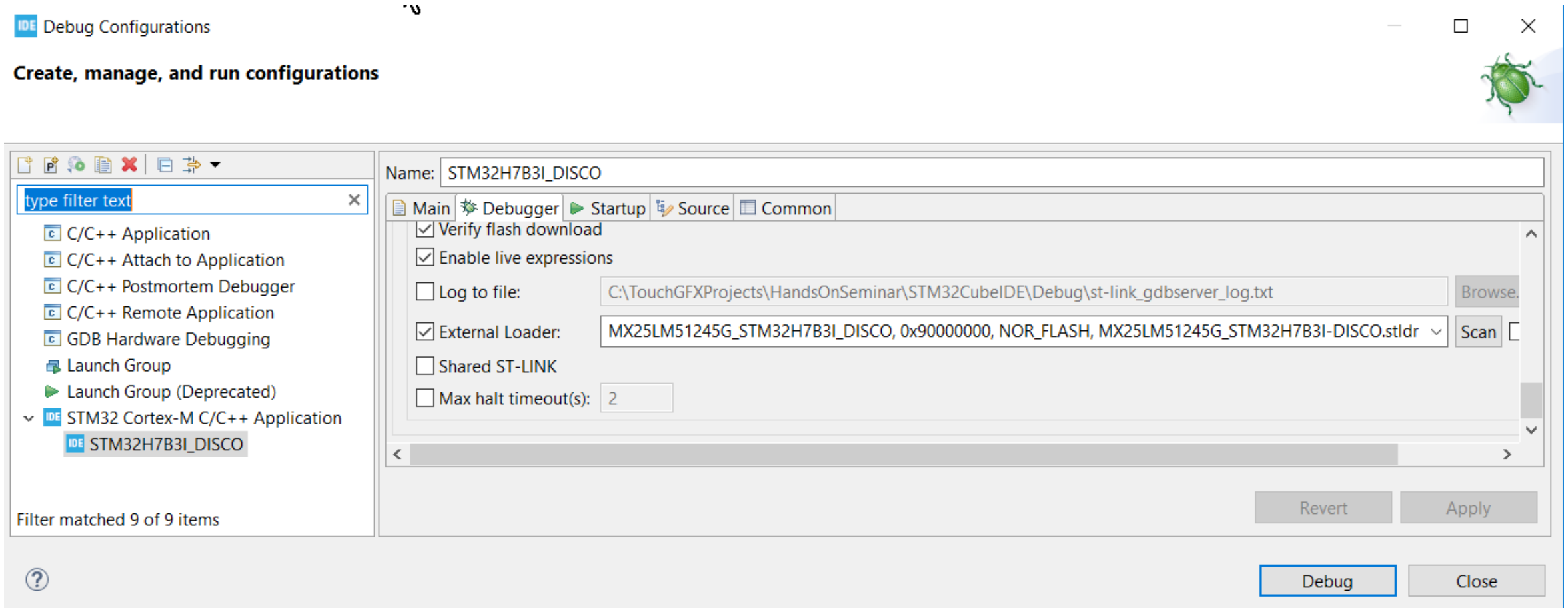
Press “Generate code”.



WF-11: Compile, program and debug 1/2



WF-11: Compile, program and debug 2/2



The screenshot shows the 'Debug Configurations' dialog box in an IDE. The title bar reads 'IDE Debug Configurations' and the subtitle is 'Create, manage, and run configurations'. A green beetle icon is in the top right corner. The dialog is divided into a left sidebar and a main configuration area.

Left Sidebar:

- type filter text
- C/C++ Application
- C/C++ Attach to Application
- C/C++ Postmortem Debugger
- C/C++ Remote Application
- GDB Hardware Debugging
- Launch Group
- Launch Group (Deprecated)
- IDE STM32 Cortex-M C/C++ Application
 - IDE STM32H7B3I_DISCO

Filter matched 9 of 9 items

Main Configuration Area:

Name: STM32H7B3I_DISCO

Tabs: Main | Debugger | Startup | Source | Common

- Verify flash download
- Enable live expressions
- Log to file: C:\TouchGFXProjects\HandsOnSeminar\STM32CubeIDE\Debug\st-link_gdbserver_log.txt [Browse]
- External Loader: MX25LM51245G_STM32H7B3I_DISCO, 0x90000000, NOR_FLASH, MX25LM51245G_STM32H7B3I-DISCO.stldr [Scan]
- Shared ST-LINK
- Max halt timeout(s): 2

Buttons: Revert, Apply, Debug, Close

Summary



Summary of WF- steps

- WF-1: Add TGFX Generator
- WF-2: Enable TGFX Generator
- WF-3: Enable CRC
- WF-4: Verify LTDC settings
- WF-5: Verify NVIC settings
- WF-6: Configure TouchGFX Generator
- WF-7: Configure Project Generation
- WF-8: Generate Code from CubeMX
- WF-9: Inspect .part file
- WF-10: Create simple GUI
- WF-11: Compile, program, debug

Thank you

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