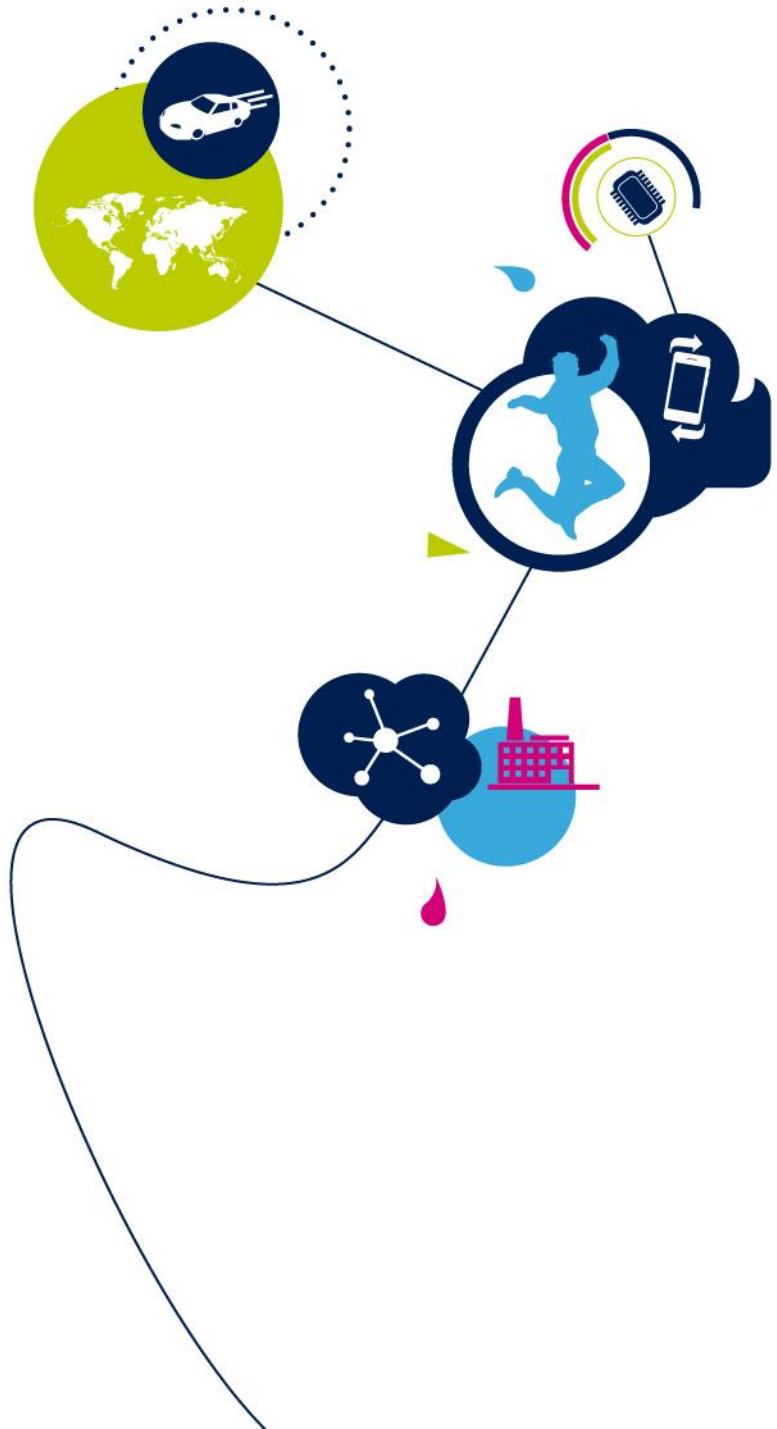
Introduction to TouchGFX

Speaker: Jesper Hedegaard – Technical Manager, STM32 Graphics



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Goals

- During this webinar, you will:
  - Get a fundamental understanding of TouchGFX
  - Learn how to get started with a TouchGFX UI project using an STM32 kit
  - Get info on where you can get support, find knowledge articles, watch demos, and more
  - Learn what the future will bring for TouchGFX users

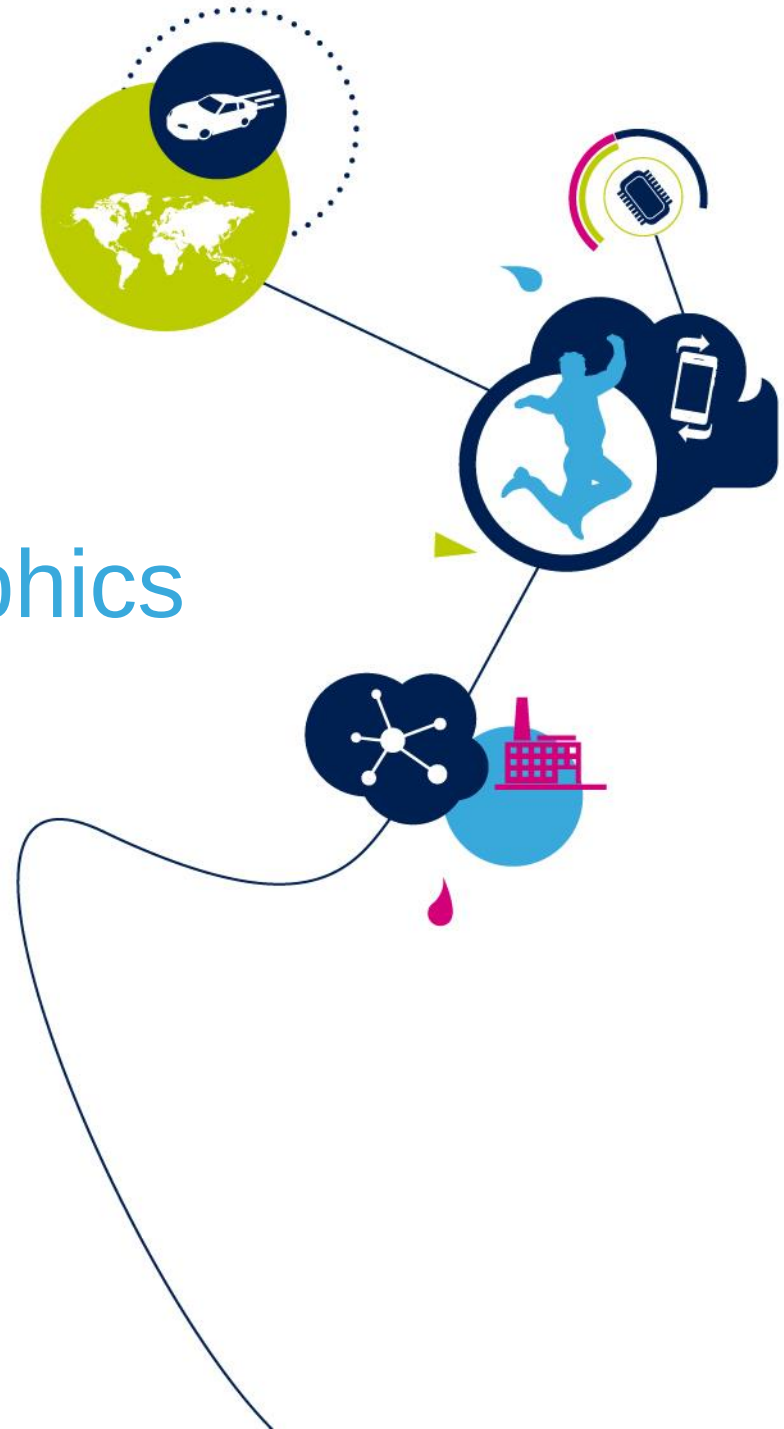
Agenda

- Status of TouchGFX
- Challenges in using embedded graphics
- Introduction to TouchGFX
- TouchGFX development demonstration using an STM32 kit
- Support, knowledge base, community, etc.
- TouchGFX 4.11 – upcoming features

Status of TouchGFX

- TouchGFX is now an STMicroelectronics product
- Free for all STM32 Users
- Large graphics ecosystem
- STM32CubeMX interoperability with STM32F4 and STM32F7 microcontrollers
- Latest version: TouchGFX 4.10

Challenges in using embedded graphics



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Challenges in using embedded graphics

User Expectations

"Smartphones have become the paramount reference when we judge user interfaces and touch displays, which makes users of embedded interfaces more demanding"

Users expect:

- High-end graphics
- Touch gestures
- Instant response
- Modern design
- Intuitive interaction
- Strong brand identity

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Challenges in using embedded graphics

Modern GUI features

TouchGFX enables:

- Alpha-blending
- Anti-aliased fonts and kerning
- Multiple language support
- Touch gestures
- Animation
- Screen transitions
- Texture mapping
- Video playback
- High-resolution displays
- High frame rate

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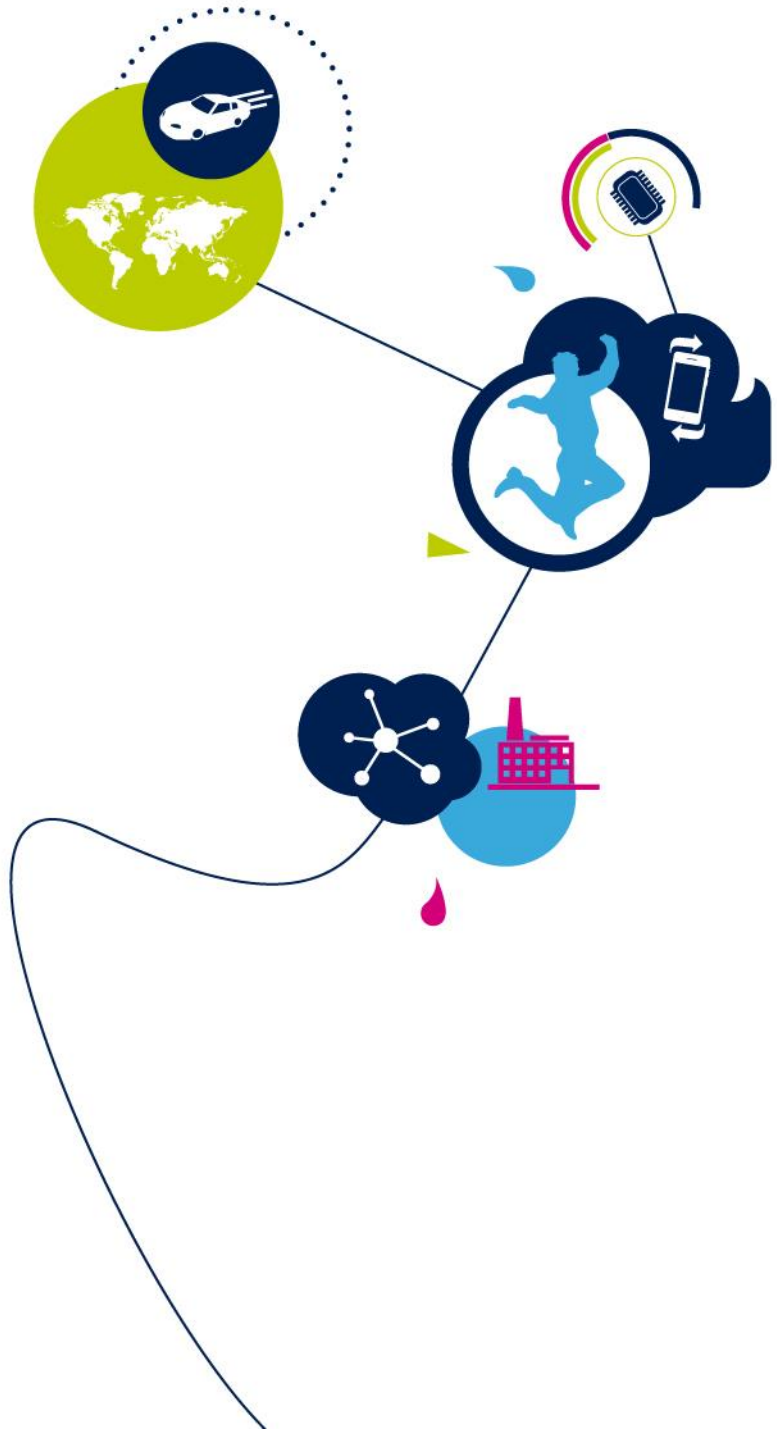
Introduction to TouchGFX

- Main concepts of TouchGFX
- Hardware setup
- Software structure
- Development process

Main concepts of TouchGFX



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Main concepts of TouchGFX

TouchGFX – Unbeatable GUI Performance on STM32

TouchGFX

TouchGFXDesigner
graphic development PC tool

TouchGFX

TouchGFX Engine
Embedded graphic library

Maximum performance

The TouchGFX technology enables you to achieve the highest level of smartphone-quality GUI performance on STM32 devices

Create anything

The structure and flexibility of TouchGFX gives the developer control to easily create unique UI designs

Easy to use

TouchGFX combines a WYSIWYG designer, auto code generation and a PC-simulator with the efficiency and flexibility of the C++ language

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TouchGFX

Main concepts of TouchGFX

TouchGFX software engine optimized for STM32 hardware resources and acceleration

Optimized for minimum MCU load and memory footprint

Compile and runtime analysis

Utilization of STM32 hardware acceleration

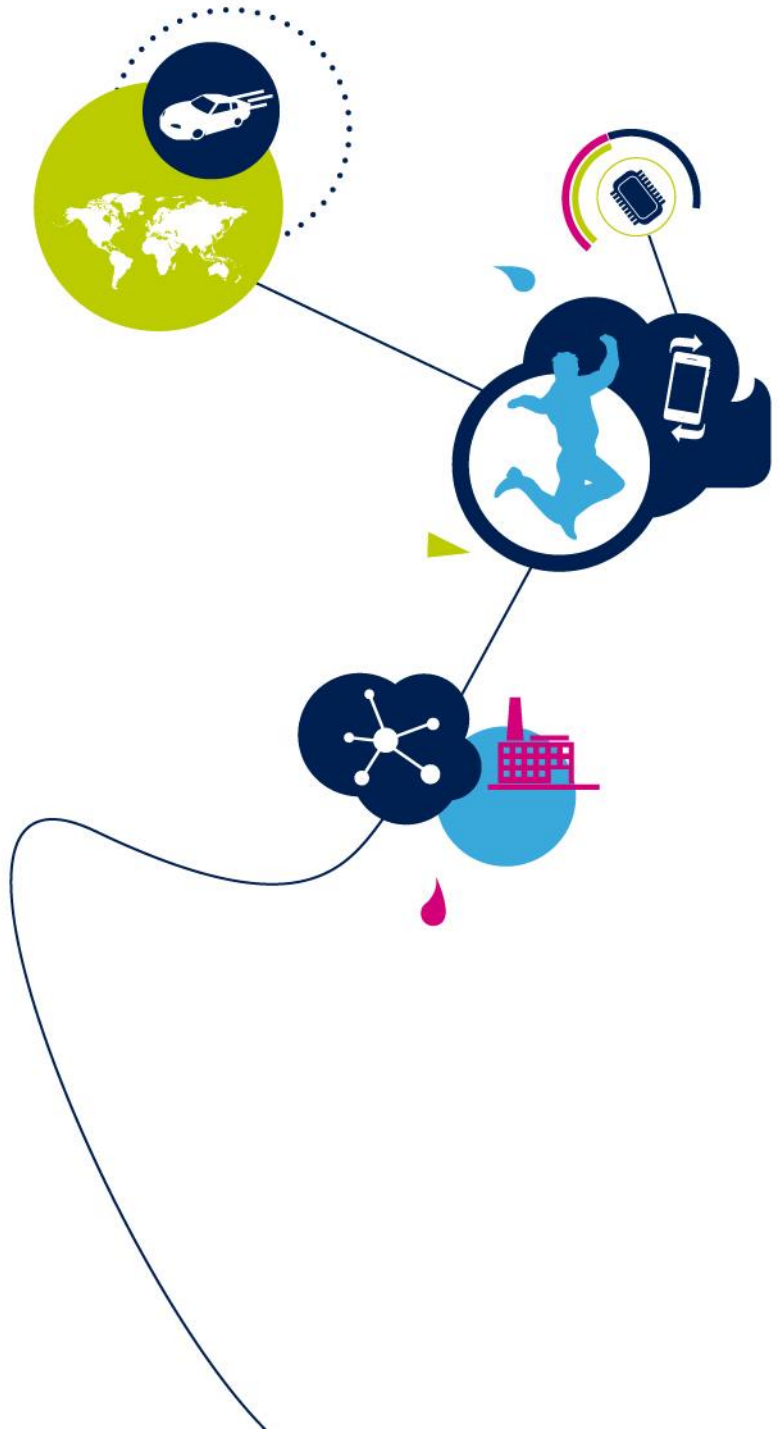
Advanced rendering algorithms

Optimized visible surface determination algorithm and customized invalidation techniques minimize the number of drawn pixels

Advanced graphical objects

Draw lines, circles, custom shapes, and graphics, or apply scaling and 3D rotation to images at runtime with highly optimized and memory-efficient widgets

Hardware setup



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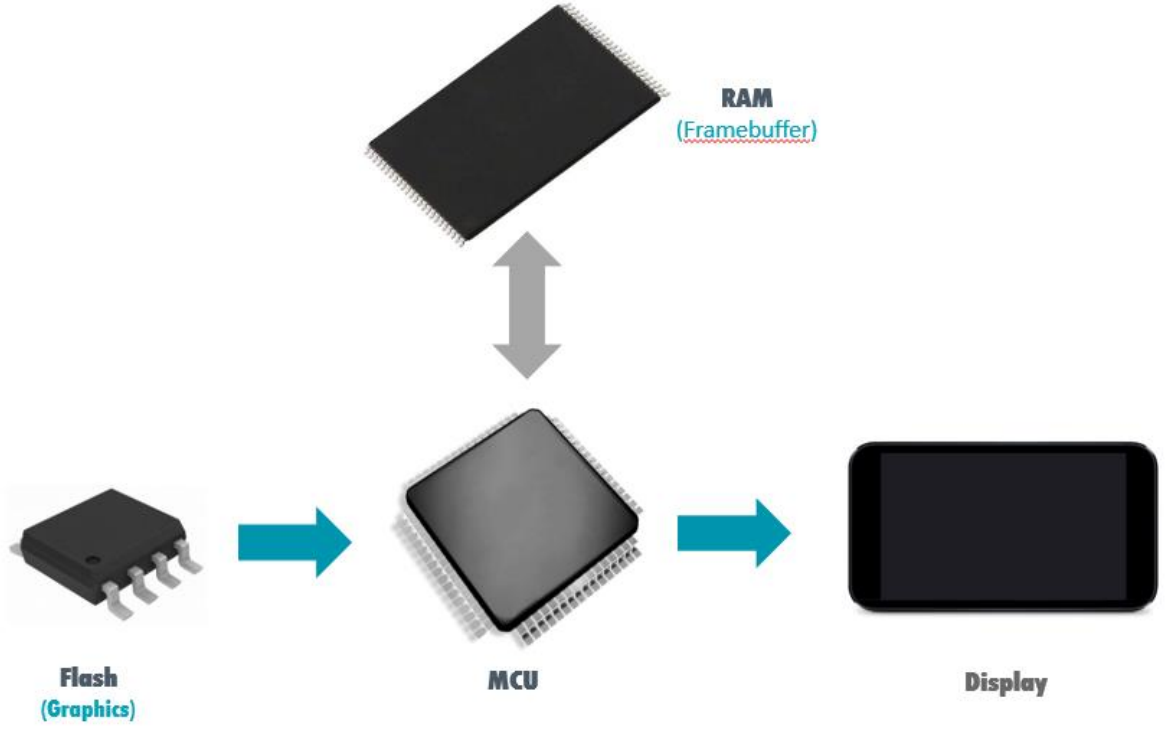
Hardware setup

Hardware Setup

Typical hardware setup involves:

- STM32 microcontroller
- External Flash memory (optional)
- External RAM (optional)
- Display (MIPI-DSI, TFT, Intel 8080, …)

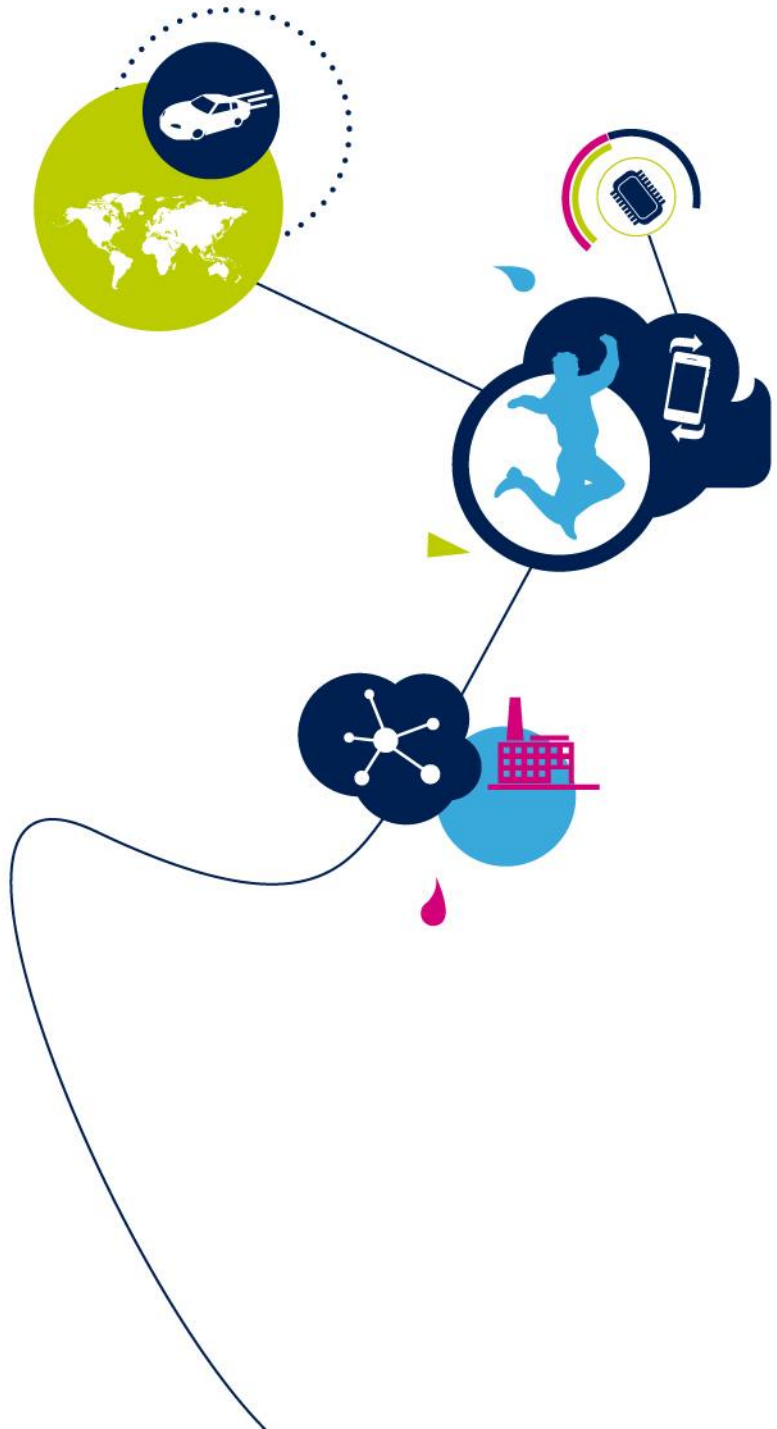


Hardware setup

Required Memory Resources

- Internal RAM for library: 11 to 35 Kbytes
  - 10-20 KB for Framework data structures and GUI task stack
  - 1-15 KB for Widgets used by the Screens
- Internal/External RAM for Framebuffers:
  - Memory usage depends on display resolution, color depth and the number of framebuffers (1,2 or 3)
  - Example: 480 x 272 px, 16-bit color, 2 framebuffers: 480 x 272 x 2 bytes x 2 = 520 Kbytes
- Int./Ext. Flash memory for library: 80 to ? Kbytes
  - 80 to 100 Kbytes (framework)
  - 1 to ? Kbytes (screen definitions, GUI logic)
- Internal/External Flash memory for image data:
  - Depends on the total size of the graphical elements, typically 1 to 20 Mbytes

Software structure



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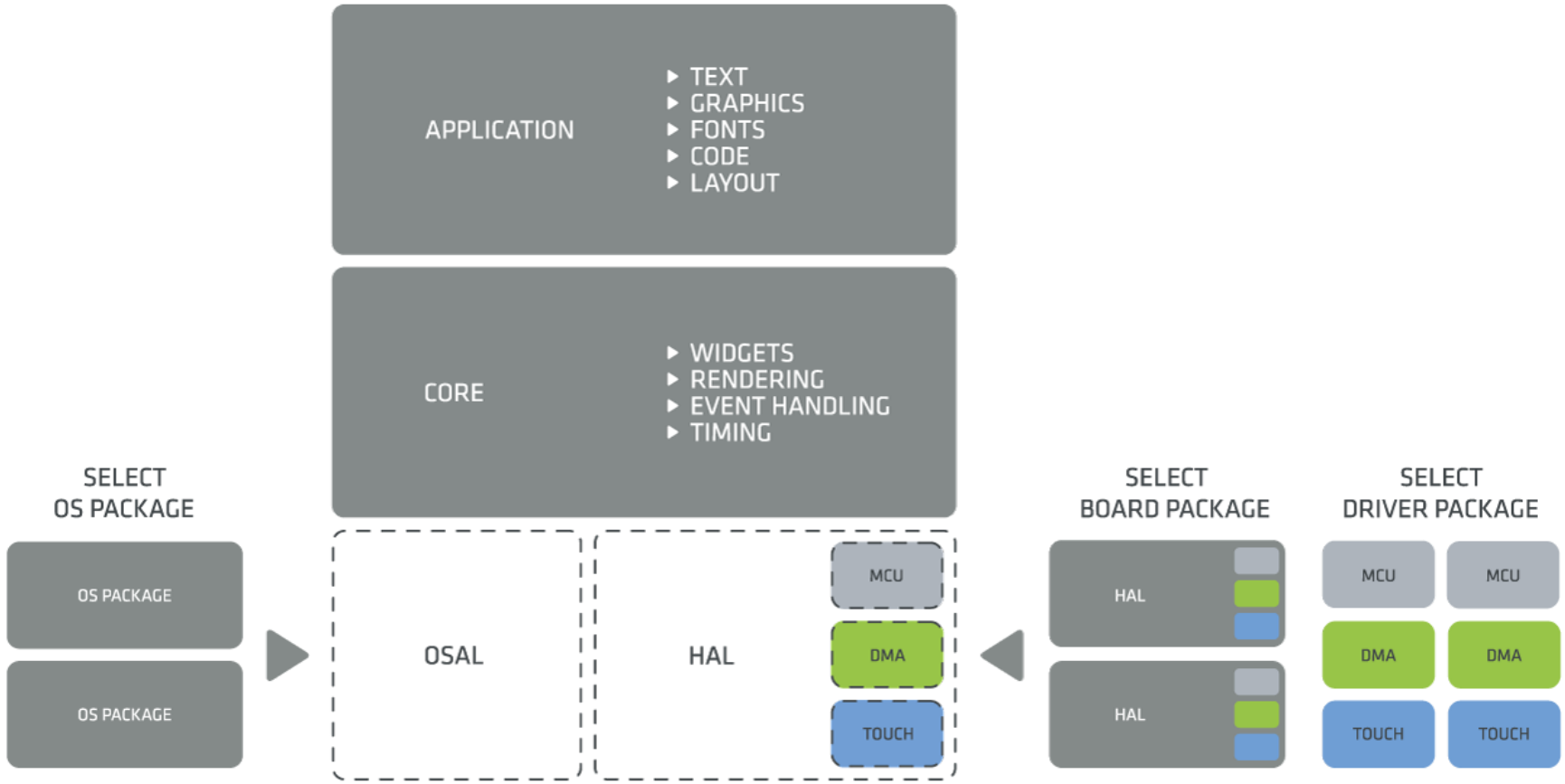
Software layers

Low-level application templates available for all STM32 display kits



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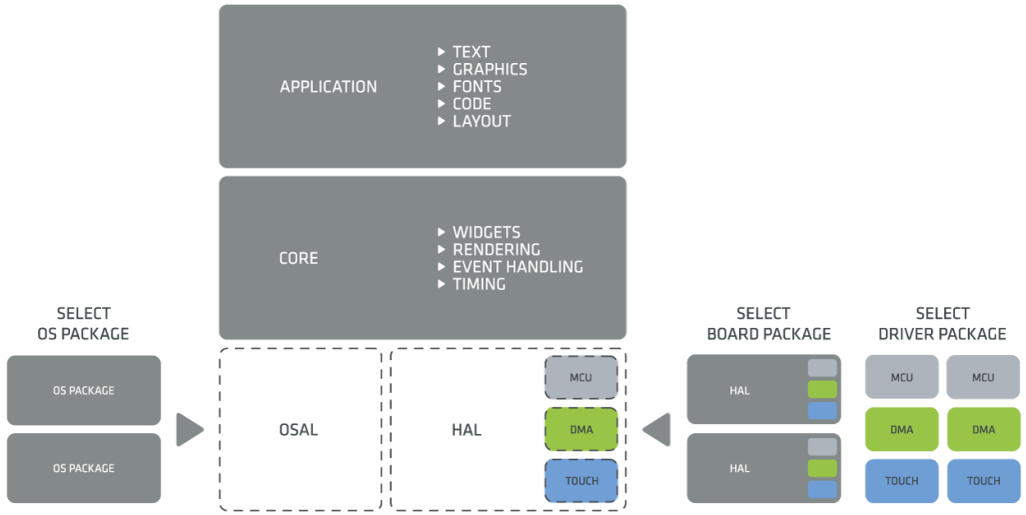
TouchGFX

TouchGFX

Low-level application templates

Available for all STM32 display kits



How to create these components?

- STM32CubeMX creates OS/Board package layer, an empty application and links with the Core
- TouchGFX Application Template (AT) implements the OS/Board package layer
- TouchGFX UI Template implements the application layer
- TouchGFXDesigner combines AT and UI templates and creates an empty application + links with the Core
- You can implement your own custom OS/Board package layer and use as an AT in TouchGFXDesigner

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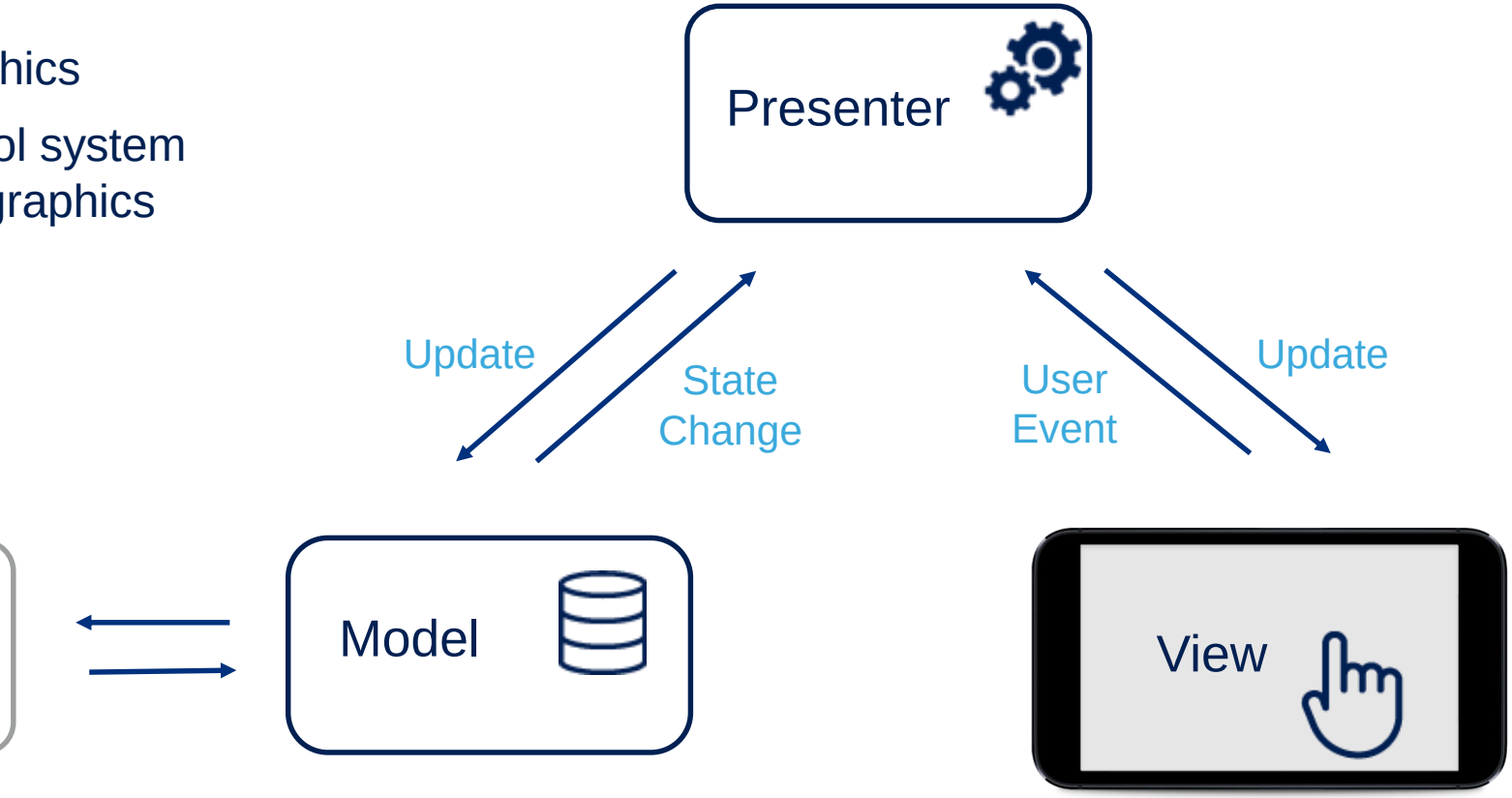
TouchGFX

TouchGFX

Model-View-Presenter

Software architecture

- Logic separated from graphics
- Communication with control system separated from logic and graphics
- Reuse of code
- Easy to test independently



TouchGFXDesigner

Support throughout the entire GUI development

From Idea to Prototype

A simple drag n' drop approach combined with ready-to-use high-quality sample graphics enables you to create stunning prototypes in minutes with no need for advanced design and programming skills or TouchGFX knowledge.

From Prototype to product

TouchGFXDesigner supports you throughout your entire UI project by simplifying the process of creating the visual design and layout of your screens and custom controls. Your TouchGFX application code is automatically updated with the changes done in TouchGFXDesigner.

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TouchGFXDesigner

Accelerate your GUI creation

- **Structure**
  TouchGFXDesigner lets you create multiple screens while providing a clear view of screen content.
- **Widgets**
  Wide selection of widgets like Swipe container, Scrollable list etc.
- **Interactions**
  Add dynamic interactions to create a user-friendly application.
- **Custom container**
  Create custom reusable controls for your application
- **Text handling**
  Multiple alphabets and scripts, such as Latin, Cyrillic, Arabic, Chinese, and Japanese.

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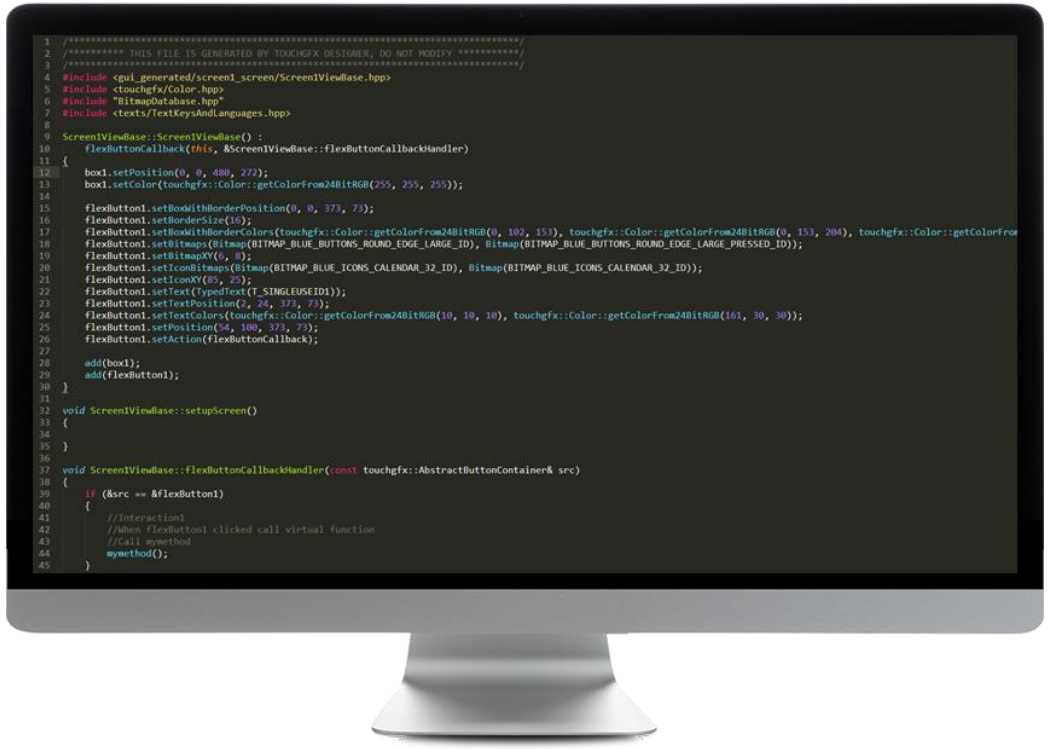
TouchGFX

TouchGFX Benefits

Realization of any GUI design made easy

- TouchGFXDesigner generates and maintains performant C++ code
- Split between TouchGFXDesigner-generated code and the developers' own code
- Developers can use preferred IDE
- Multiple compiler support: IAR, KEIL, and GCC
- Project files are automatically updated in TouchGFXDesigner



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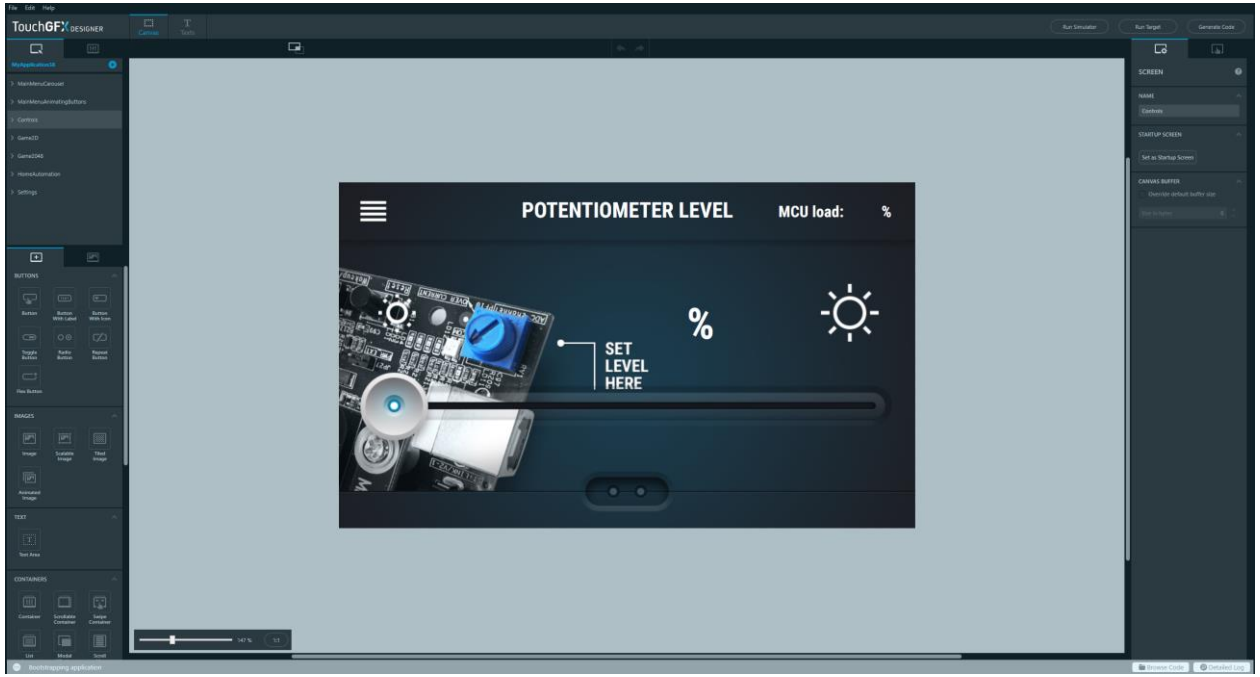
TouchGFX

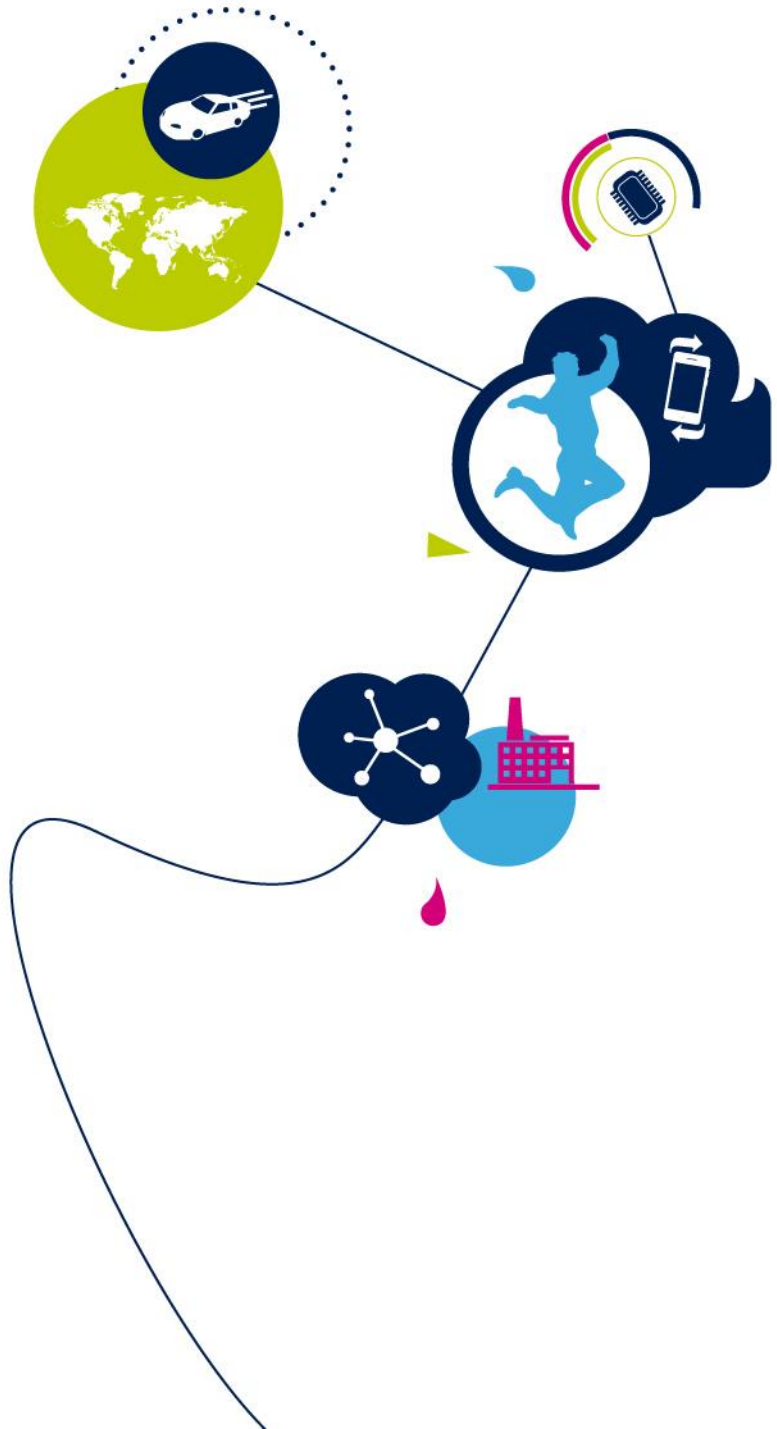
Software structure

TouchGFXDesigner demonstration

- General introduction
- AT and UI
- Create an example application
- Create your own application
  - Adding widgets
  - Using interactions
  - Adding screens and component tree view
  - Containers
  - Custom container
- User-defined code
- Compiling and flashing



TouchGFX Help Center



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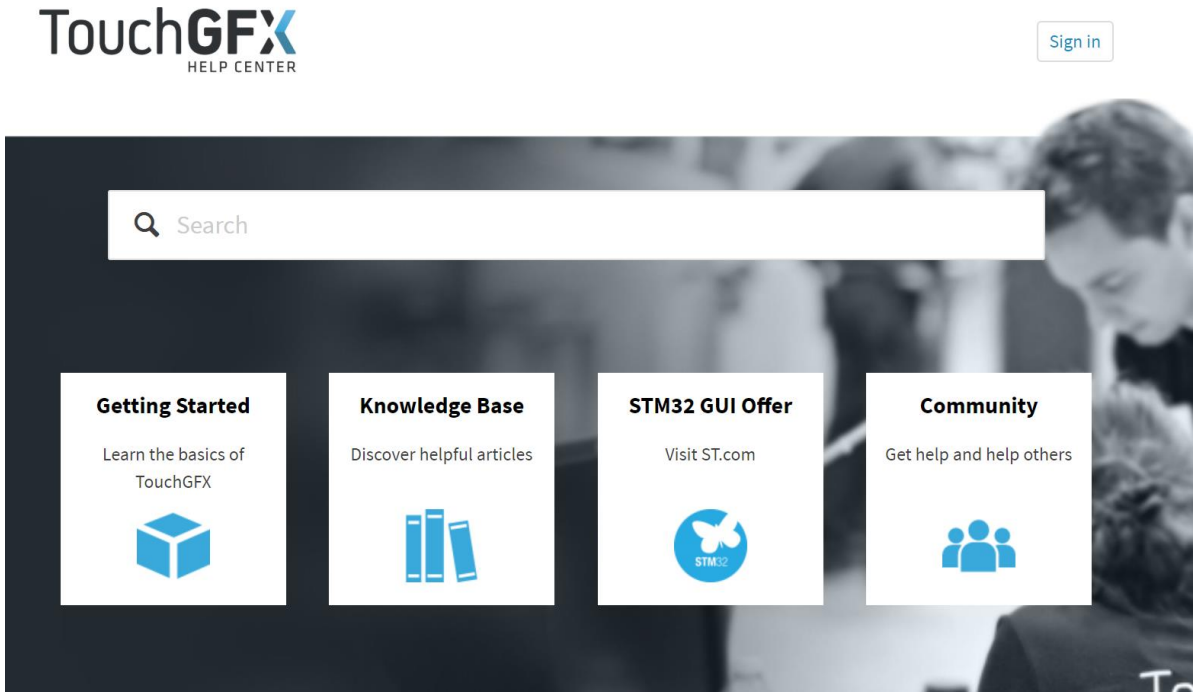
TouchGFX Help Center & Community

- touchgfx.com
- support.touchgfx.com
- Communit.st.com – TouchGFX
- STM32 Graphical User interface



TouchGFX 4.11 – Upcoming features

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TouchGFX Roadmap

- Integration with STM32CubeMX
- TouchGFX framework features
- TouchGFXDesigner widgets and features

TouchGFX 4.11

- Support for 8 bpp
  - RGBA2222, ARGB2222, and ABGR2222 Framebuffer formats
- Display rotation (landscape/portrait)
- PC simulator skin in TouchGFXDesigner
- Widgets: Analog/digital clock, texture mapper, animated texture mapper, shapes, and more