



### Exercise 3 Multitasking

The goal of this exercise is to write a graphical program by use of multiple tasks.  
For this, every group gets an Olimex STM32-LCD prototype board.

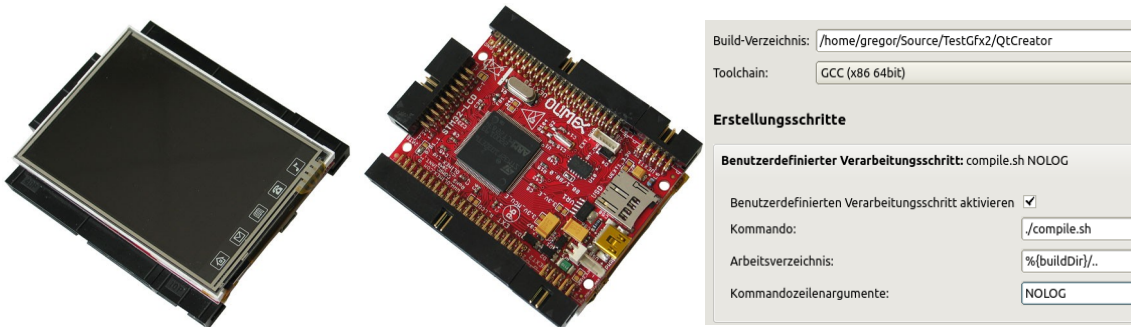


Abbildung 1: Project-Settings

You start by creating a new project with ToolChain v1.0.50 and enabling these lines in your activate\_project.sh:

- activate.100\_board\_olimex\_lcd.sh
- activate.600\_example\_gfx\_printf.sh

Don't forget to deactivate other boards and examples. After a first compile run, you should see a counter on the screen.  
You shall then modify this example and write your code right into example\_gfx\_printf.c/.h.

After loading the project into QtCreator, make sure that your project settings are correct for compilation:

The intended application shall start multiple tasks tBox() of the same function. Each task controls one Rectangle by use of these Variables:

**X, Y** the coordinate of the upper left corner of the rectangle

**W, H** width and height of the rectangle

**C** 24 bit color in which the rectangle is drawn (see ../common/ttc\_gfx\_types.h for predefined colors)

**VX, VY** velocity vector of the rectangle

The screen geometry is 240x320 pixels in size. Choose datatypes of your variables accordingly!

A graphics library is provided by ../common/ttc\_gfx.c. It is activated automatically.

The most important function for this exercise is ttc\_gfx\_rect\_fill() as described in ../common/ttc\_gfx.h.

Important: As most graphics libraries, these functions can only be called from one task!

Therefore, the tBox() tasks have to send their draw-data into a queue. This queue is read by a drawing task tDraw().

tDraw() is the only task how is allowed to call ttc\_gfx\_XXX() functions.

If a box hits the wall, it shall be reflected. The current width and height of the screen can be found inside the global Variable DisplayConfig.

Tip: You can remove a box at its old position by drawing it in background color.

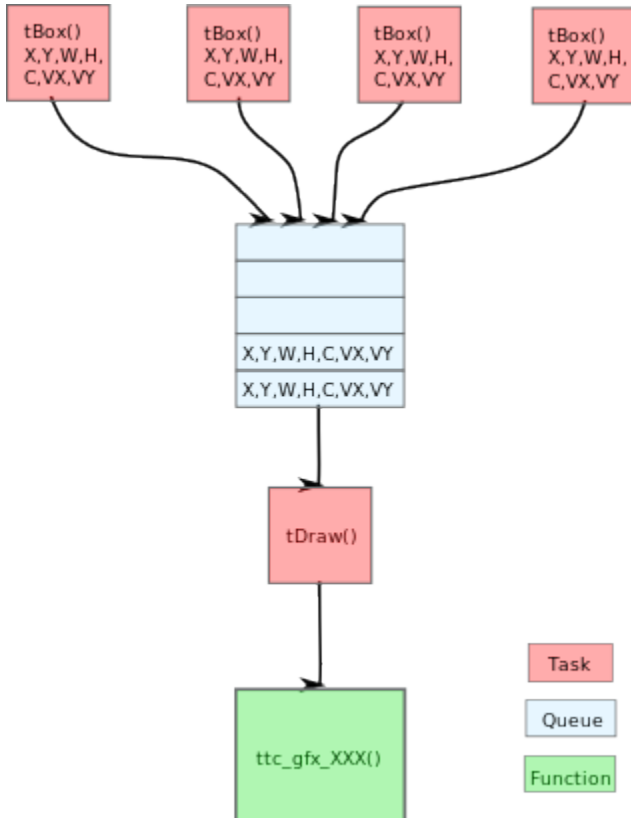


Abbildung 2: Dataflow between Tasks

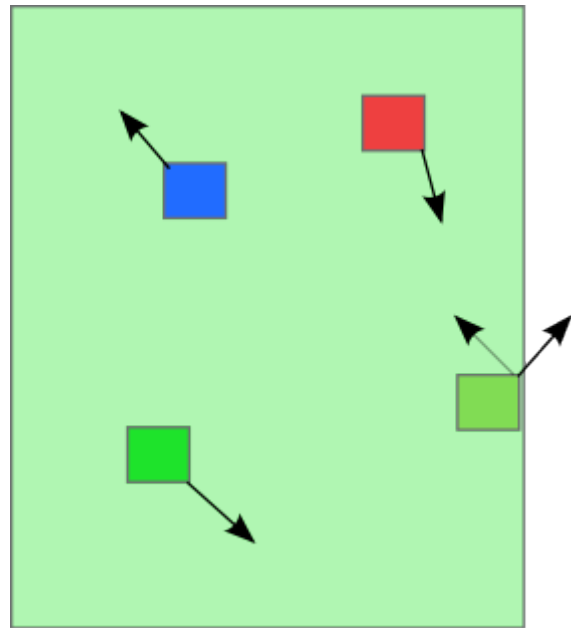


Abbildung 3: Boxes moving on the screen