# DE1SoC: Example 6 Pong

This design uses the **VGA** output and the **Keys**. The application is a Pong game. You control the paddle to stop the ball using **Key2** and **Key1** before it touches the bottom of the screen.

Description

The program includes the pong game and the Vga display driver. The program works both in simulation and on a real FPGA. But simulation requires computing and generating near 1 000 000 pixels-colors (640x480x3) and is too slow for real time. For a more dynamic simulation, a "MiniVga" with a resolution of 64x48 is used.
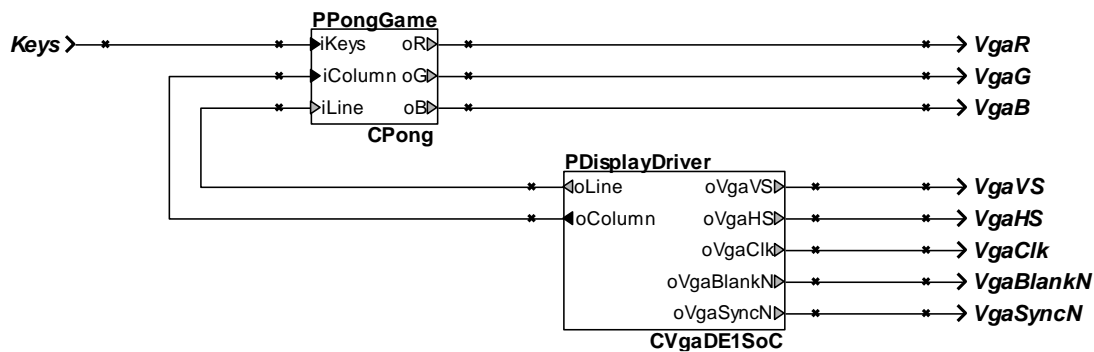
Target setting for using "MiniVga"

After compilation, you need to initialize the LedSwVgaDriver parameters to use the MiniVga.

1) To do so, right-click on the target and select "Edit Properties…".
2) Then make sure the "Target Type" is set to manual.
3) Click OK to close the window
4) Double-click on the targets\LedSwVgaDriver.env to open the environment file editor.
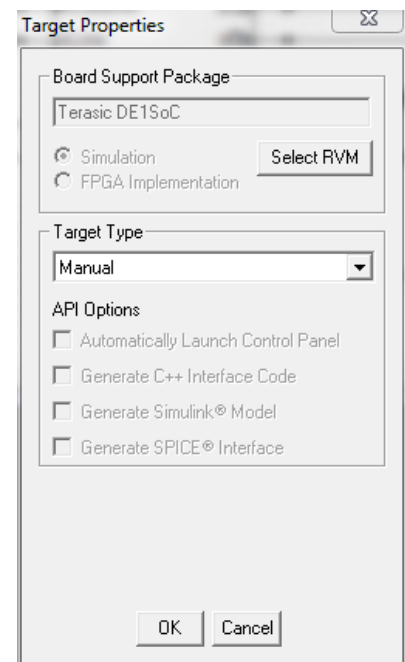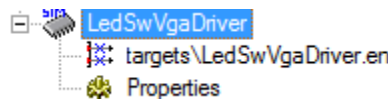
5) Select "Device #2" and make sure there is a 1 at the end of the Parameters.

Parameters

C:\Novakod_Studio\bsp\TerasicDE1SoC\lib\ 1

6) Close the environment file editor.

> **IMPORTANT: If you make changes to the main component IO ports, you need to switch back the "Target Type" to "Auto" and perform a build. In "Auto" mode, the LedSwVgaDriver last parameter is set 0 and therefore you need to repeat the procedure to set the last parameter last value to 1.**

Compiling and running the program in simulation

1) Launch Novakod Studio software and open the project.
2) Open the main program windows and setup the parameters as above for simulation.
3) Select the "LedSwVgaDriver" target.
4) Verify the Target setting as described above.
5) Run: menu Run -> Start
6) Use Key2 or Key1 on the simulated board to move the paddle.
7) Enjoy the game!
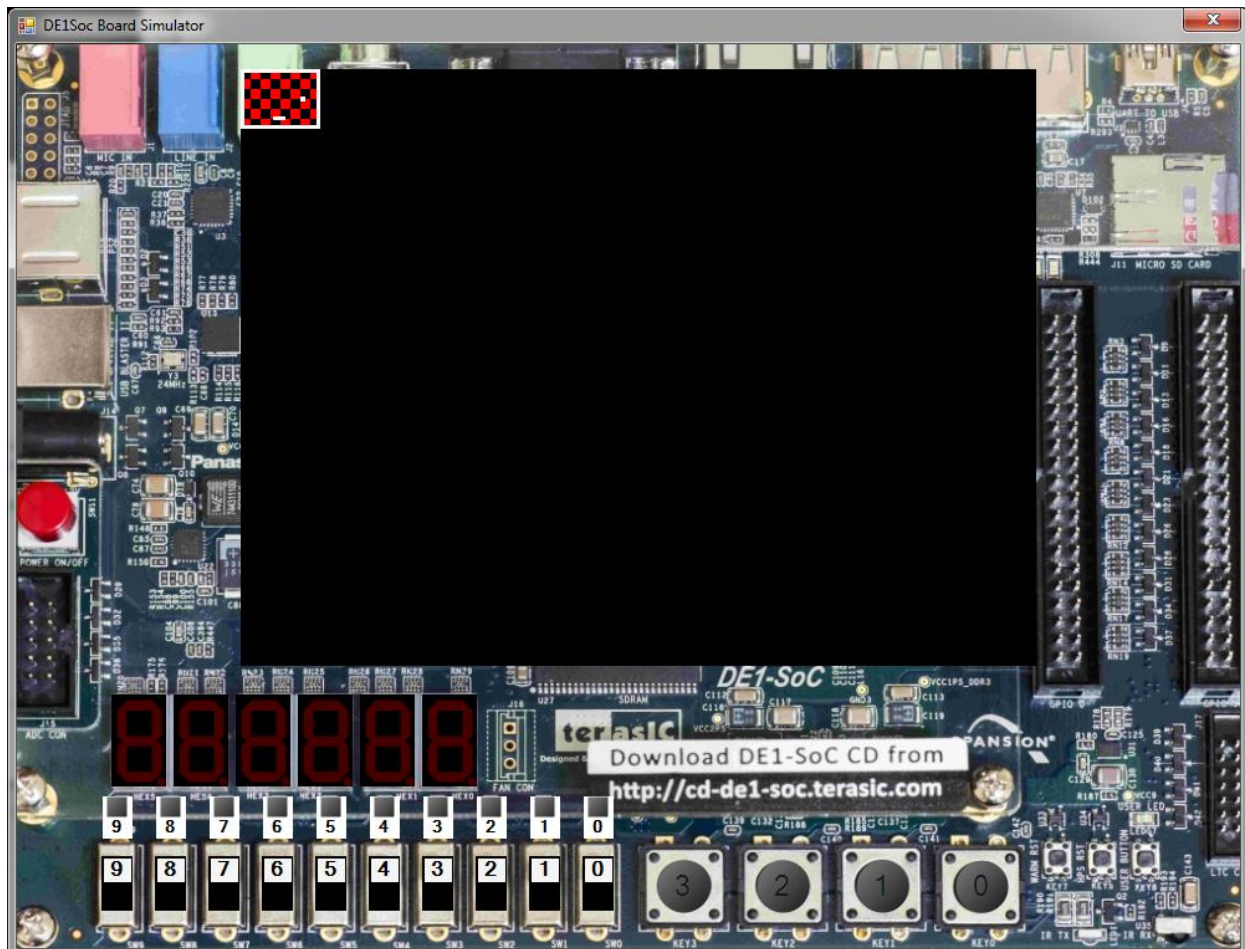
Execution on the FPGA board

Now, you will run the same program on a real FPGA, only by changing the target and the parameters. First you need a FPGA board, the DE1SoC from Terasic, and a Vga display that supports 640x480 resolution, see section "Connecting the VGA port".

1) Assuming the above project is opened; select the "DE1SoC" target.
2) Build the main, and at the end, the board will be programmed and ready to use.
3) Use Key2 or Key1 to move the paddle.
4) Enjoy!

You can also use the program on a full screen by setting the parameters for "FPGA with Normal Vga".

Connecting the VGA port

The display driver requires a VGA port with a resolution of 640x480 at 60Hz. If your LCD display does not support this low resolution or does not have a VGA port, you can use an adapter like:

VGA to HDMI Converter, TURATA 1080P Output VGA Male to HDMI Female, available at amazon:

https://www.amazon.ca/gp/product/B01N18MW2I/ref=oh_aui_detailpage_o01_s00?ie=UTF8&psc=1

This adapter can also sends the audio output from the DE1SoC board to the HDMI cable.