

BOTSIM 3.1 - IP Editing Guide

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08 December 2020

1.0 Overview

The Rojobot 3.1 IP Block is created using the PicoBlaze soft core KCPSM6 provided by Xilinx. The IP block is broken up into two parts. The top level parts can be edited in the Vivado IP Packager. The rojobot firmware has to be edited externally and recompiled before it can be loaded into the IP Packager.

The top level IP interface:

Rojobot31_0.v - IP Interface File

Bot31_top.v - Top level Rojobot module

Bot31_if.v - 8-Bit interface module between KCPSM6 and external ports

The Picoblaze Core:

Bot31_pgm.psm - The unassembled Rojobot firmware

KCPSM6.v - The picoblaze soft core

Rom_form.v - The provided ROM template used for assembly

Bot31_pgm.v - The assembled Rojobot firmware

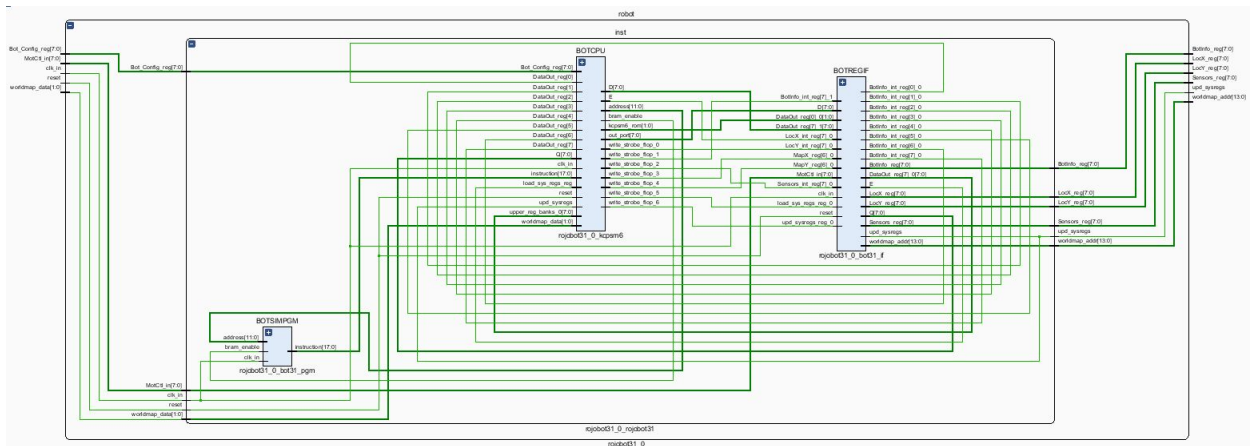
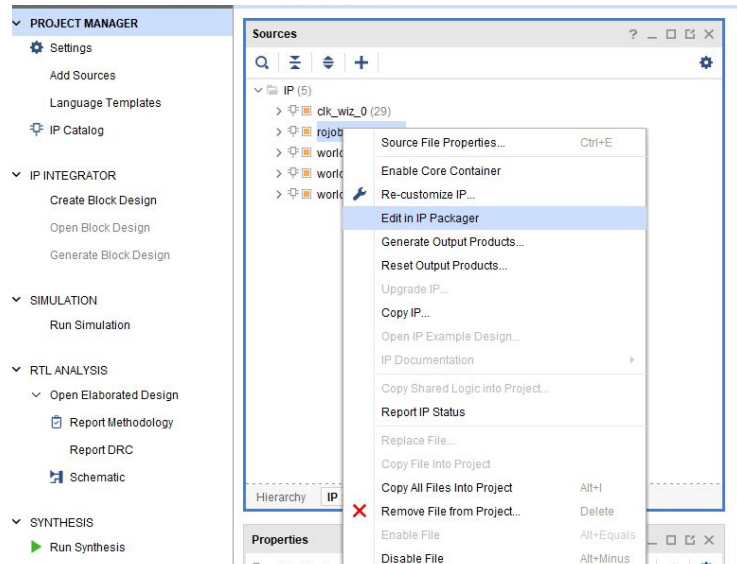


Figure 0 - Rojobot RTL Schematic

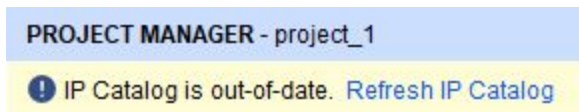
2.0 Vivado IP Packager

The first step is to open the IP source in the vivado IP Packager. This will create a new project and unlock the design files for editing. The three top level files can be edited at this point. Some useful changes include adding additional ports using bot31_if.v, intercepting rojobot outputs, and adjusting the synchronization between the rojobot and the external project.



Once you have finished editing the IP sources you can follow the below steps to rebuild the IP block:

1. Save all of the edited files.
2. Close the IP Packager project.
3. Refresh the IP Catalog



4. At the bottom there should now be an IP Status report
5. Click the “upgrade selected” button at the bottom of the report.

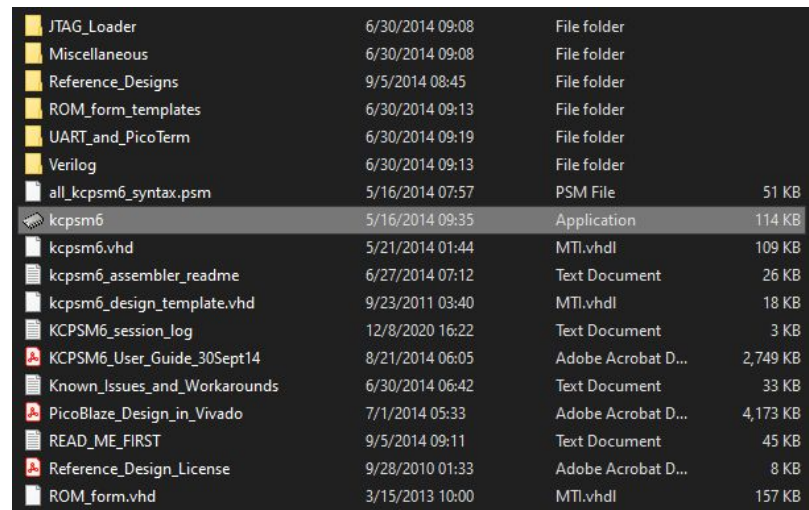
Source File	IP Status	Recommendation	Change Log	IP Name	Current Version	Recommended Version	License	Current Part
rojobot31_0	IP definition rojobot31_v1_0 (1.0) changed on disk	Upgrade IP		rojobot31_v1_0	1.0 (Rev. 2)	1.0 (Rev. 2)	Included	xc7a100tcsg324-1
clk_wiz_0	Up-to-date	No changes required	More info	Clocking Wizard	6.0 (Rev. 4)	6.0 (Rev. 4)	Included	xc7a100tcsg324-1
world_map	Up-to-date	No changes required	More info	Block Memory Generator	8.4 (Rev. 4)	8.4 (Rev. 4)	Included	xc7a100tcsg324-1
world_map_loop	Up-to-date	No changes required	More info	Block Memory Generator	8.4 (Rev. 4)	8.4 (Rev. 4)	Included	xc7a100tcsg324-1
world_map_lr	Up-to-date	No changes required	More info	Block Memory Generator	8.4 (Rev. 4)	8.4 (Rev. 4)	Included	xc7a100tcsg324-1

6. Click the rerun link and make sure all of your IP shows up-to-date in the report.
7. You can now run synthesis. It should re-synthesize the IP source first.

3.0 Assembling the Rojobot Firmware

The rojobot firmware uses the KCPSM6 assembler. Information about it and the design files can be found on Xilinx's website. You should get a zip file containing the KCPSM6 application and various guides and tools to help you with the process.

<https://www.xilinx.com/products/intellectual-property/picoblaze.html>



JTAG_Loader	6/30/2014 09:08	File folder	
Miscellaneous	6/30/2014 09:08	File folder	
Reference_Designs	9/5/2014 08:45	File folder	
ROM_form_templates	6/30/2014 09:13	File folder	
UART_and_PicoTerm	6/30/2014 09:19	File folder	
Verilog	6/30/2014 09:13	File folder	
all_kcpsm6_syntax.psm	5/16/2014 07:57	PSM File	51 KB
kcpsm6	5/16/2014 09:35	Application	114 KB
kcpsm6.vhd	5/21/2014 01:44	MTL.vhdl	109 KB
kcpsm6_assembler_readme	6/27/2014 07:12	Text Document	26 KB
kcpsm6_design_template.vhd	9/23/2011 03:40	MTL.vhdl	18 KB
KCPSM6_session_log	12/8/2020 16:22	Text Document	3 KB
KCPSM6_User_Guide_30Sept14	8/21/2014 06:05	Adobe Acrobat D...	2,749 KB
Known_Issues_and_Workarounds	6/30/2014 06:42	Text Document	33 KB
PicoBlaze_Design_in_Vivado	7/1/2014 05:33	Adobe Acrobat D...	4,173 KB
READ_ME_FIRST	9/5/2014 09:11	Text Document	45 KB
Reference_Design_License	9/28/2010 01:33	Adobe Acrobat D...	8 KB
ROM_form.vhd	3/15/2013 10:00	MTL.vhdl	157 KB

Figure 2 - KCPSM6 Design Files

You will also need to download the BotSim31 zip file containing the Bot31_pgm.psm firmware and ROM_form.v files. You can edit the psm file using your preferred text editor.

Once you have finished editing the firmware you can follow the below steps to reassemble the file:

1. Make sure that both the psm and ROM form file are located in the same folder.
2. Start kcpsm6 and enter the file name, for example:
RojobotPSM\bot31_pgm.psm
3. We don't recommend changing the psm filename unless you also want to deal with filename changes in vivado.
4. The assembler does some basic assembly code checks but should not be heavily relied upon.

5. The assembler will output three files, you will only need the bot31_pgm.v file.
6. Follow the first paragraph in section 2 for opening the IP packager.
7. Locate the bot31_pgm.v file in vivado. You can look at its properties to see its file location.
8. Replace the bot31_pgm.v with your newly assembled version either by using file explorer or if you prefer the “replace file” option in vivado. Note that the replace file points to the new source location.

```
KCPSM6 Assembler v2.70
Ken Chapman - Xilinx Ltd - 16th May 2014

Enter name of PSM file: Rojobot PSM\bot31_pgm.psm

Reading top level PSM file...
C:\Users\rronano\Documents\GitHub\Nexys-A7-Sidescroller-Game\PGM Test\KCPSM6_Release9_30Sept14\Rojobot PSM\bot31_pgm.p

A total of 1028 lines of PSM code have been read

Checking line labels
Checking CONSTANT directives
Checking STRING directives
Checking TABLE directives
Checking instructions

Writing formatted PSM file...
C:\Users\rronano\Documents\GitHub\Nexys-A7-Sidescroller-Game\PGM Test\KCPSM6_Release9_30Sept14\Rojobot PSM\bot31_pgm.f

Expanding text strings
Expanding tables
Resolving addresses and Assembling Instructions
Last occupied address: 316 hex
Nominal program memory size: 1K (1024)    address(9:0)
Occupied memory locations: 540
Assembly completed successfully

Writing L06 file...
C:\Users\rronano\Documents\GitHub\Nexys-A7-Sidescroller-Game\PGM Test\KCPSM6_Release9_30Sept14\Rojobot PSM\bot31_pgm.l

Writing HEX file...
C:\Users\rronano\Documents\GitHub\Nexys-A7-Sidescroller-Game\PGM Test\KCPSM6_Release9_30Sept14\Rojobot PSM\bot31_pgm.h

Writing Verilog file...
C:\Users\rronano\Documents\GitHub\Nexys-A7-Sidescroller-Game\PGM Test\KCPSM6_Release9_30Sept14\Rojobot PSM\bot31_pgm.v

KCPSM6 Options.....
R - Repeat assembly with 'Rojobot PSM\bot31_pgm.psm'
N - Assemble new file.
Q - Quit

-
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Figure 3 - Example RCPSM6 Assembler Output

9. Follow steps 1-7 of the IP packager section to rebuild the IP block.
10. Congratulations, you now have customized the Rojobot firmware.