BOTSIM 3.1 - IP Editing Guide

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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

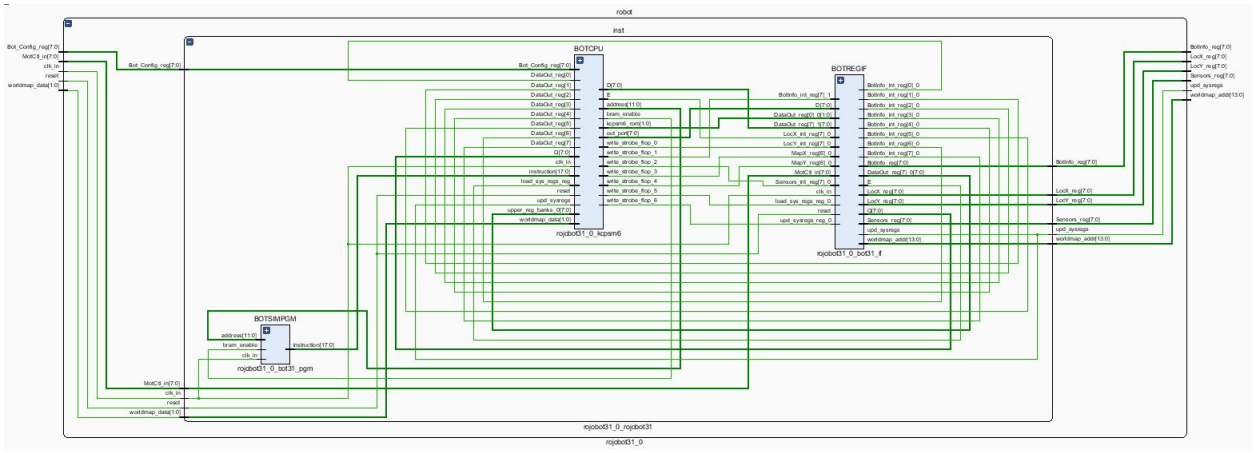
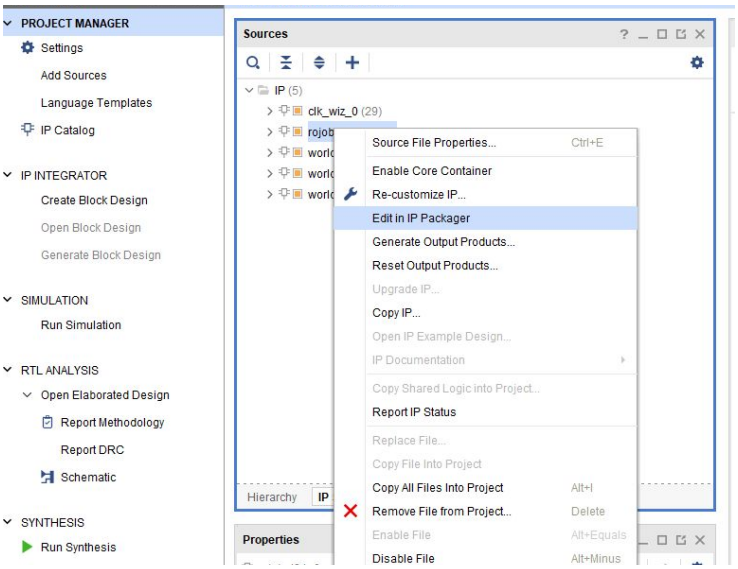


Figure 0 - Rojobot RTL Schematic

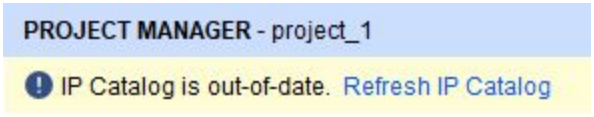
2.0 Vivado IP Packager

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.

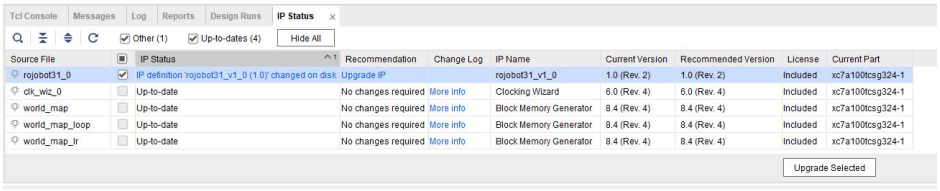


Once you have finished editing the IP sources you can follow the below steps to rebuild the IP block:

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.



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

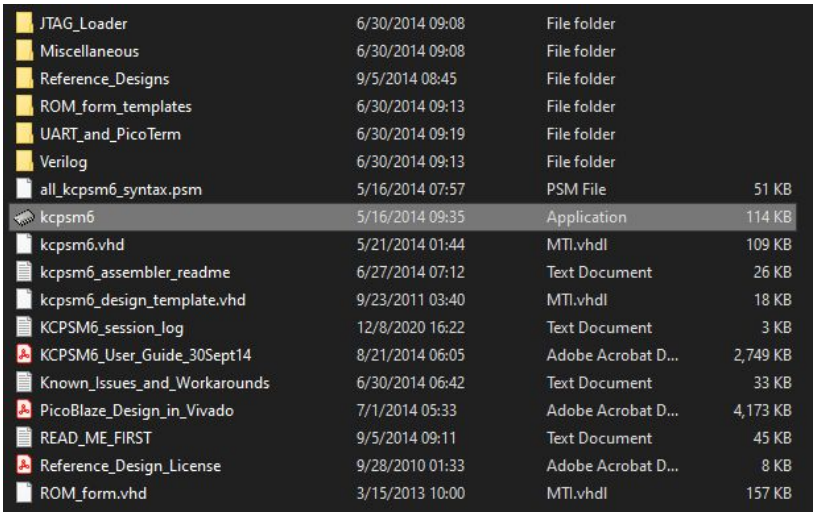


Figure 2 - KCPSM6 Design Files

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

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

 Writing Verilog file...
   C:\Users\rromano\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
-
```

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.