

*****Draft*****
RPI4 with 2GB & Rpi3B+with 1GB
07/23/19
Testing
*****Draft*****

Currently the only package that appears to not work correctly is octave which is used to display the images used in the fpga work. This appears to be problem with the buster changes for the Rpi4.
[GNU Octave - Bugs: PMbug #56570, unable to plot with OpenGL on... \[Savannah\]](#)

The buster release installs 1693 pkgs. The 2019-06-20-raspbian-buster-full.zip was used for the initial install with a sha256sum 7c0dec54e9ad694d6f306f495f793d1a5021020e7c46a6df02b6c84478473e17 2019-06-20-raspbian-buster-full.zip. The current pkgs count is 2197 which is the software required to support FPGA development.

07/07/19

on mypi3-8 downloaded the zip file

7c0dec54e9ad694d6f306f495f793d1a5021020e7c46a6df02b6c84478473e17

sha256sum Downloads/2019-06-20-raspbian-buster-full.zip

7c0dec54e9ad694d6f306f495f793d1a5021020e7c46a6df02b6c84478473e17 Downloads/2019-06-20-raspbian-buster-full.zip

root@mypi3-8:/home/pi/Downloads# gzip -dc 2019-06-20-raspbian-buster-full.zip | dd bs=4M

status='progress' of=/dev/sda

5286559744 bytes (5.3 GB, 4.9 GiB) copied, 295 s, 17.9 MB/s

gzip: 2019-06-20-raspbian-buster-full.zip: invalid compressed data--length error

0+146238 records in

0+146238 records out

5289017344 bytes (5.3 GB, 4.9 GiB) copied, 302.261 s, 17.5 MB/s

initial pkgs 1693

sudo apt-get update

./extra_pkgs.sh 2196 pkgs070719.txt

root@mypi3-11:/etc# diff dphys-swapfile.orig dphys-swapfile

16c16

< CONF_SWAPSIZE=100

> CONF_SWAPSIZE=1000

needed to be rebuilt with gcc version 8.3.0 (Raspbian 8.3.0-6+rpi1)

autofpga arachne-pnr icespice verilator zipcpu yosys nextpnr

uname -a

Linux mypi3-11 4.19.50-v7+ #896 SMP Thu Jun 20 16:11:44 BST 2019 armv7l GNU/Linux

root@mypi3-11:/usr/local/bin# ln -sf /home/devel/catboard_yosys/reset_cat reset_cat

root@mypi3-11:/usr/local/bin# ln -sf /home/devel/catboard_yosys/config_cat config_cat

root@mypi3-11:/usr/local/bin# ln -sf /home/devel/autofpga/sw/autofpga autofpga

The buster repository chg'ed from testing to stable

pi@mypi3-11:~ \$ sudo apt-get update

Hit:1 http://archive.raspberrypi.org/debian buster InRelease

Get:2 http://raspbian.raspberrypi.org/raspbian buster InRelease [15.0 kB]

Reading package lists... Done

E: Repository 'http://raspberrypi.org/raspbian buster InRelease' changed its 'Suite' value from 'testing' to 'stable'

N: This must be accepted explicitly before updates for this repository can be applied. See apt-secure(8) manpage for details.

I was getting an error sudo apt-get update on mypi3-12

On mypi3-12 needed to apt-get update --allow-releaseinfo-change

transfer from mypi3-11 to mypi3-12

sudo rsync -avl --delete catboard_yosys ~/ ;sudo rsync -avl --delete verilator ~/

sudo rsync -avl --delete zipcpu ~/

sudo rsync -avl --delete verilator ~

rsync -avl --delete icestorm ~/

rsync -avl --delete arachne-pnr ~/

rsync -avl --delete testbuilds/nextpnr /home/pi/testbuilds

arachne-pnr

autofpga

icestorm

yosys

zipcpu

verilator

The user pi was replaced with user devel to improve security.

<https://www.raspberrypi.org/documentation/configuration/security.md>

sudo adduser devel

Adding user `devel' ...

Adding new group `devel' (1001) ...

Adding new user `devel' (1001) with group `devel' ...

Creating home directory `/home/devel' ...

Copying files from `/etc/skel' ...

New password:

Retype new password:

passwd: password updated successfully

Changing the user information for devel

Enter the new value, or press ENTER for the default

Full Name []: Ed Vidal Jr.

Room Number []:

Work Phone []:

Home Phone []:

Other []:

Is the information correct? [Y/n] Y

sudo adduser devel sudo

Adding user `devel' to group `sudo' ...

Adding user devel to group sudo

Done.

grep devel /etc/group

sudo:x:27:pi,devel

devel:x:1001:

This file MUST be edited with the 'visudo' command as root.

Move the pi user file to user devel and change the owner to devel

```
root@mypi3-13:/home/pi# mv ultiboinstaller.sh /home/devel/
```

```
root@mypi3-13:/home/pi# chown devel:devel /home/devel/ultiboinstaller.sh
```

```
root@mypi3-13:/home/pi# mv autofpga/ /home/devel/
```

```
root@mypi3-13:/home/pi# chown -R devel:devel /home/devel/autofpga/
```

```
root@mypi3-13:/home/pi# mv arachne-pnr/ /home/devel/
```

```
root@mypi3-13:/home/pi# chown -R devel:devel /home/devel/arachne-pnr/
```

```
root@mypi3-13:/home/pi# mv icestorm/ /home/devel/
```

```
root@mypi3-13:/home/pi# chown -R devel:devel /home/devel/icestorm/
```

```
root@mypi3-13:/home/pi# mv yosys/ /home/devel/
```

```
root@mypi3-13:/home/pi# chown -R devel:devel /home/devel/yosys/
```

```
root@mypi3-13:/home/pi# mv verilator/ /home/devel/
```

```
root@mypi3-13:/home/pi# chown -R devel:devel /home/devel/verilator
```

```
root@mypi3-13:/home/pi# mv zipcpu/ /home/devel/
```

```
root@mypi3-13:/home/pi# chown -R devel:devel /home/devel/zipcpu/
```

```
root@mypi3-13:/home/pi# mv testbuilds/ /home/devel/
```

```
root@mypi3-13:/home/pi# chown -R devel:devel /home/devel/testbuilds/
```

```
root@mypi3-13:/home/pi# mv catboard_yosys/ /home/devel/
```

```
root@mypi3-13:/home/pi# chown -R devel:devel /home/devel/catboard_yosys/
```

```
root@mypi3-13:/usr/local/bin# ln -sf /home/devel/catboard_yosys/reset_cat reset_cat
```

```
root@mypi3-13:/usr/local/bin# ln -sf /home/devel/catboard_yosys/config_cat config_cat
```

```
root@mypi3-13:/usr/local/bin# ln -sf /home/devel/autofpga/sw/autofpga autofpga
```

```
testbuilds/catzip/
```

The script extra_pkgs.sh was used to install the additional 499 pkgs. These pkgs are needed for FPGA software to build and install correctly.

```
#!/bin/bash
```

```
sudo apt-get update
```

```
sudo apt-get install octave vlc kicad hexchat \
```

```
ecryptfs-utils gawk gimp gtwave iverilog clang \
```

```
samba samba-common-bin smbclient cifs-utils \
```

```
libftdi-dev libmpc-dev libmpfr-dev verilator bc mercurial \
```

```
libbison-dev libgmp-dev libelf-dev ncurses-dev ctags \
```

```
default-jdk libreadline-dev xdot graphviz minicom xpdf lrzsz \
```

```
libusb-1.0.0 exuberant-ctags parted ffmpeg qt5-default \
```

```
mesa-utils libboost-all-dev freeglut3 freeglut3-dev \
```

```
python3-dev libgtk2.0-dev libcairo2-dev libpango1.0-dev \
```

```
libgdk-pixbuf2.0-dev libatk1.0-dev libghc-x11-dev binutils-arm-none-eabi \
```

```
gcc-arm-none-eabi diffuser gitk tcl-dev telnet tftp hexedit cmake flex bison \
```

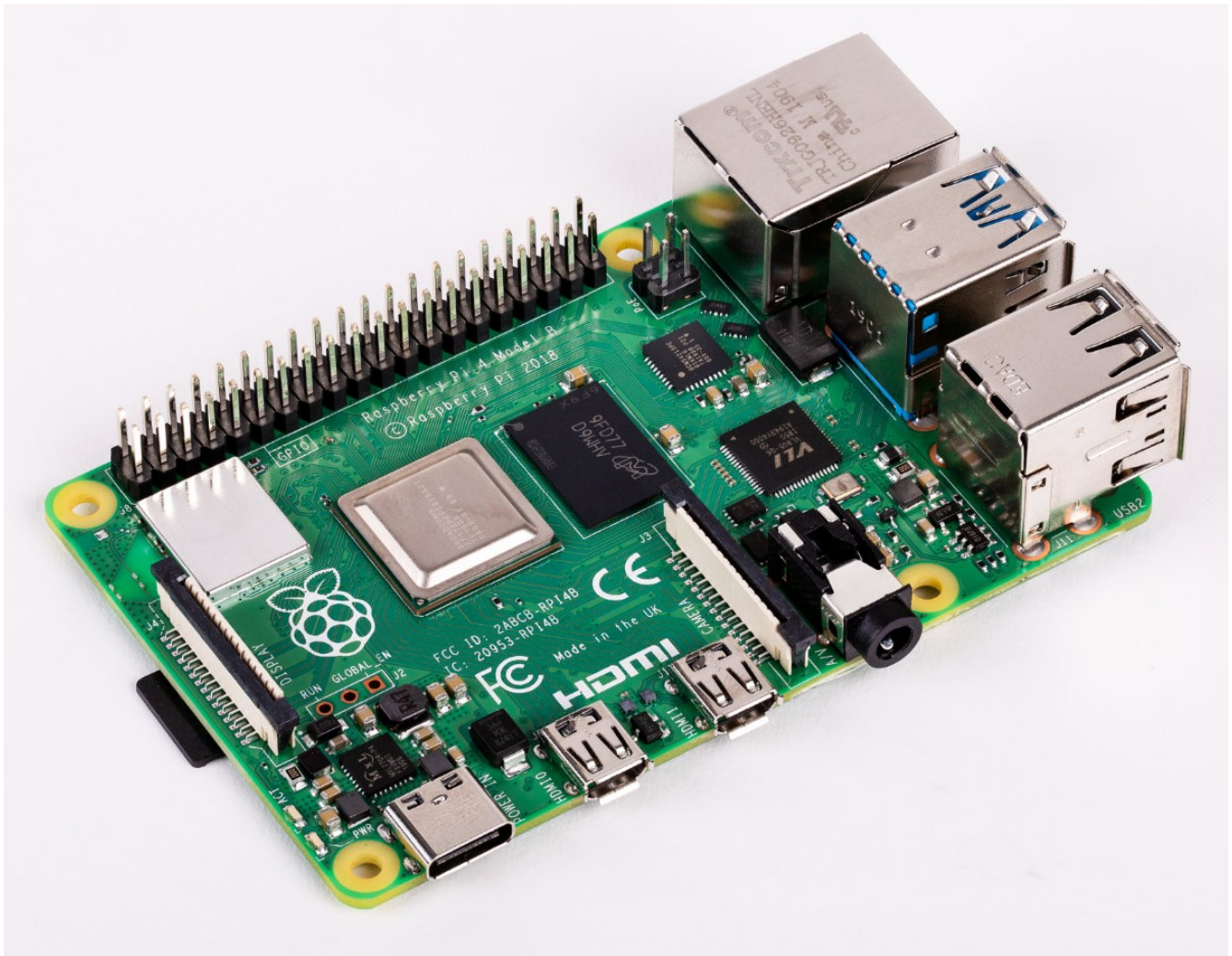
```
gtkmm-3.0 gperf build-essential qt5-default
```

```
extra_pkgs.sh (END)
```

The script to install Lazarus & FPC “ultiboinstaller.sh” on the Rpi4 work very well and appears to run slightly faster than on Rpi3B+. See devel@mypi3-13:~/Ultibo_Projects/jpeg2000/doc \$ ls lazarus_ jpeg2000.odt or devel@mypi3-13:~/Ultibo_Projects/jpeg2000/doc \$ ls lazarus_ jpeg2000.pdf pgs 11-13 where the Lazarus GUI is used to build the jpeg2000 project. https://github.com/develone/Ultibo_Projects/blob/master/jpeg2000/doc/lazarus_ jpeg2000.pdf

Raspberry Pi 4 specs

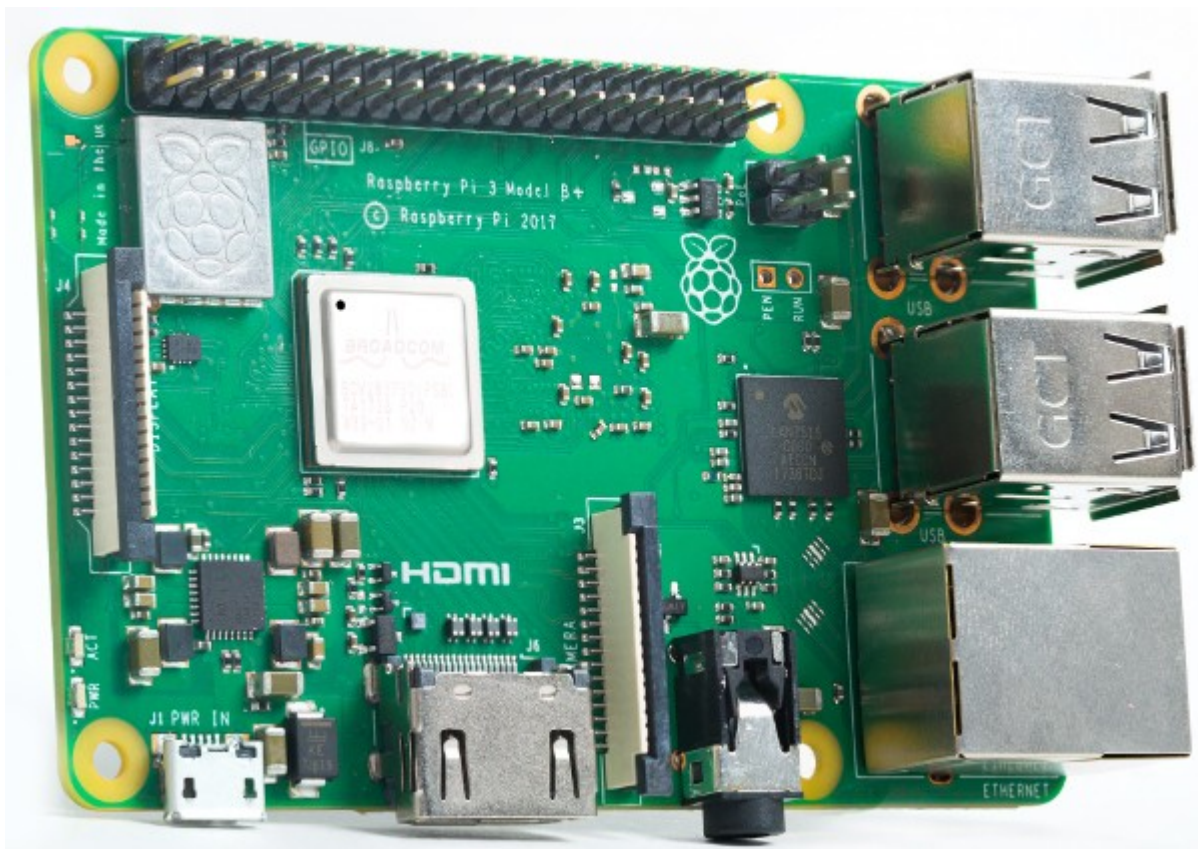
- SoC:** Broadcom BCM2711B0 quad-core A72 (ARMv8-A) 64-bit @ 1.5GHz
- GPU:** Broadcom VideoCore VI
- Networking:** 2.4 GHz and 5 GHz 802.11b/g/n/ac wireless LAN
- RAM:** 1GB, 2GB, or 4GB LPDDR4 SDRAM
- Bluetooth:** Bluetooth 5.0, Bluetooth Low Energy (BLE)
- GPIO:** 40-pin GPIO header, populated
- Storage:** microSD
- Ports:** 2 × micro-HDMI 2.0, 3.5 mm analogue audio-video jack, 2 × USB 2.0, 2 × USB 3.0, Gigabit Ethernet, Camera Serial Interface (CSI), Display Serial Interface (DSI)
- Dimensions:** 88 mm × 58 mm × 19.5 mm, 46 g



Raspberry pi 3B+

The Raspberry Pi model 3 B+ Specs

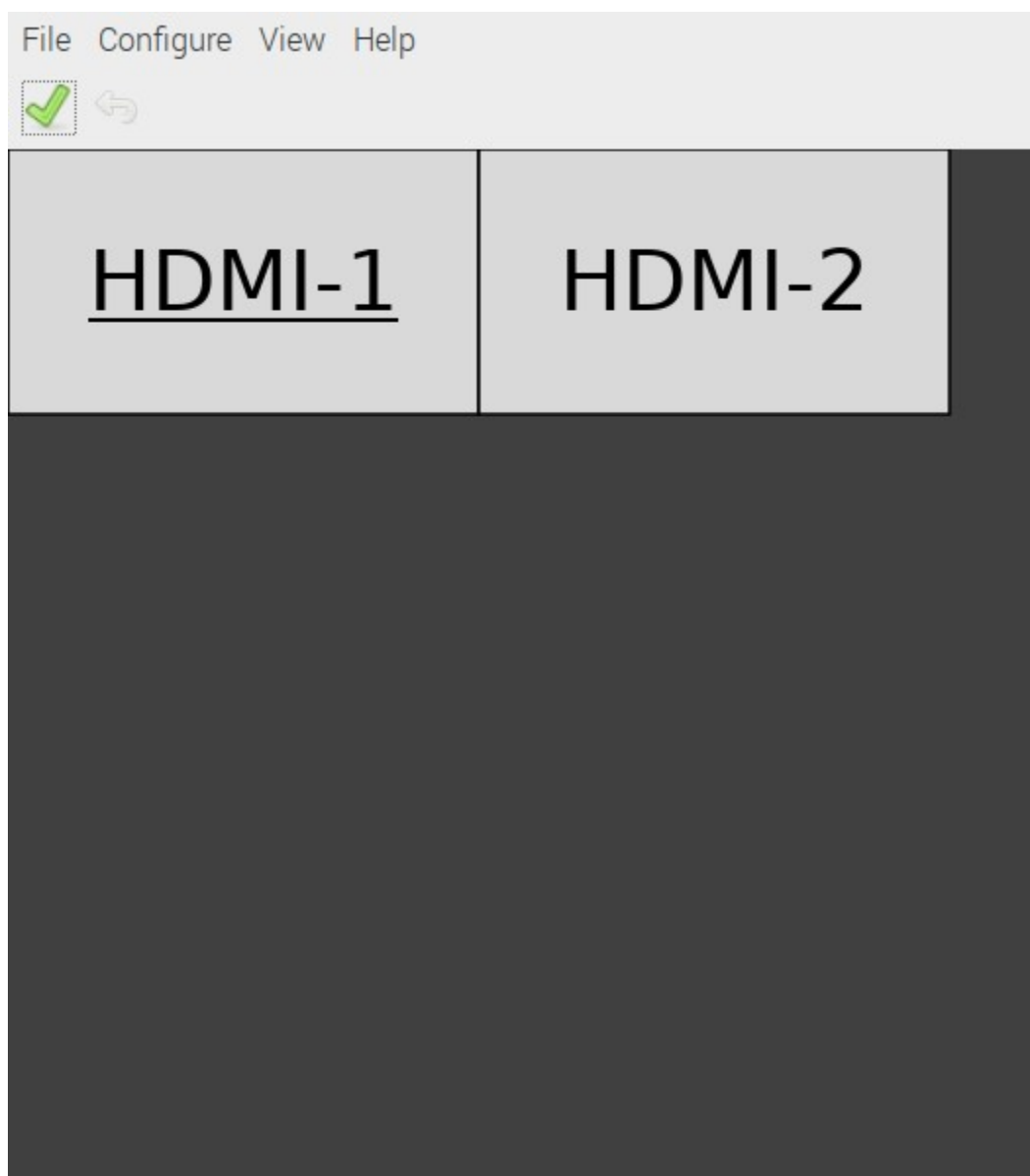
- 1.**SOC:** Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64-bit SoC
- 2.**CPU:** 1.4GHz 64-bit quad-core ARM Cortex-A53 CPU
- 3.**RAM:** 1GB LPDDR2 SDRAM
- 4.**WIFI:** Dual-band 802.11ac wireless LAN (2.4GHz and 5GHz) and Bluetooth 4.2
- 5.**Ethernet:** Gigabit Ethernet over USB 2.0 (max 300 Mbps). Power-over-Ethernet support (with separate PoE HAT). Improved PXE network and USB mass-storage booting.
- 6.**Thermal management:** Yes
- 7.**Video:** Yes – VideoCore IV 3D. Full-size HDMI
- 8.**Audio:** Yes
- 9.**USB 2.0:** 4 ports
- 10.**GPIO:** 40-pin
- 11.**Power:** 5V/2.5A DC power input
- 12.**Operating system support:** Linux and Unix



Adding a fan. Tesing a fan blowing up from Raspberry Pi 4.
`sudo vcgencmd measure_temp`
`temp=52.0'C`



Dual monitors
From Raspberry/Preference/Screen Configuration



Login



DeskTop



The catboard software provides a simulation of the FPGA
devel@mypi3-13:~/testbuilds/catzip/sim/verilated \$./arm-main_tb -d
Listening on port 8363
Listening on port 8364
Opening Bus-master with
 Debug Access port = 8363
 Serial Console = 8364
 VCD File = trace.vcd
> T
CMD: Only sent 0 bytes of 3!
Accepted CMD connection
POLL = 1
RCVD: 12 bytes
< A00200001W8
> A00200001K00000000
POLL = 1
RCVD: 0 bytes
< [CLOSED]
Accepted CMD connection
POLL = 1
RCVD: 11 bytes
< A00200001R
> A00200001R12400008
POLL = 1
RCVD: 11 bytes
< A00200001R
> A00200001R12400008
POLL = 1
RCVD: 0 bytes
< [CLOSED]
Accepted CMD connection
POLL = 1
RCVD: 19 bytes
< A01000005W55aaaa55
> A01000005
> K000000000
POLL = 1
RCVD: 0 bytes
< [CLOSED]
Accepted CMD connection
POLL = 1
RCVD: 11 bytes
< A00200001R
> A00200001R72400008
POLL = 1
RCVD: 11 bytes
< A00200005R
> A00200005R01e10000
POLL = 1

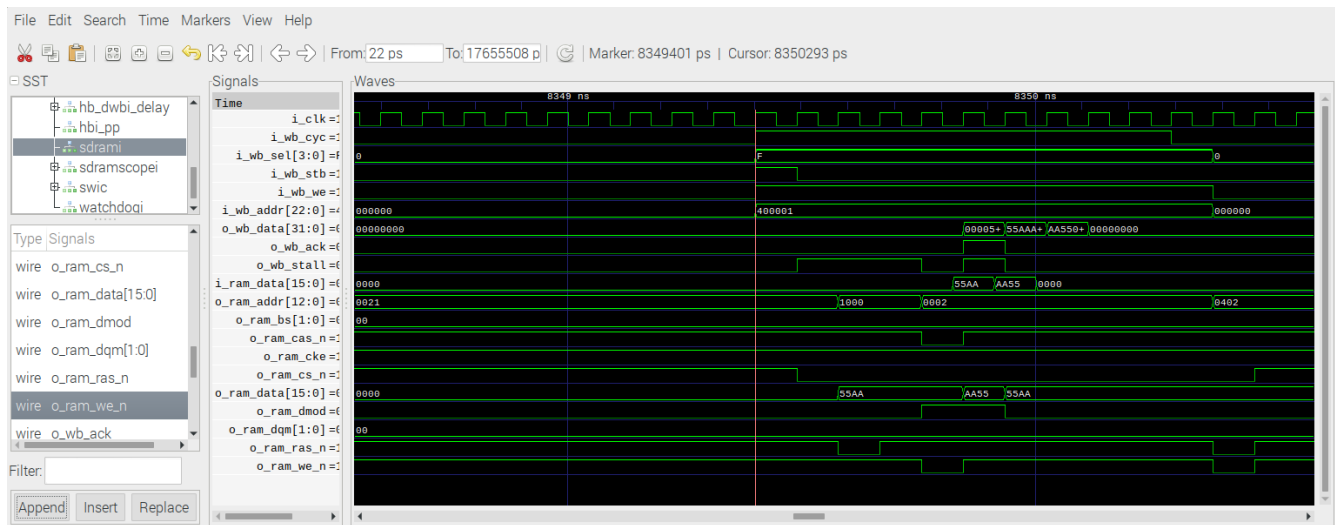
RCVD: 11 bytes
< A00200005R
> A00200005R01e10000
POLL = 1
RCVD: 11 bytes
< A00200005R
> A00200005R01e10000
POLL = 1
RCVD: 11 bytes
< A00200005R
> A00200005R39e10000
POLL = 1
RCVD: 11 bytes
< A00200005R
> A00200005R6ce10000
POLL = 1
RCVD: 11 bytes
< A00200005R
> A00200005R6c6055aa
POLL = 1
RCVD: 11 bytes
< A00200005R
> A00200005R6ce055aa
POLL = 1
RCVD: 11 bytes
< A00200005R
> A00200005R688255aa
POLL = 1
RCVD: 11 bytes
< A00200005R
> A00200005R6ee2aa55
POLL = 1
RCVD: 11 bytes
< A00200005R
> A00200005R68e255aa
POLL = 1
RCVD: 11 bytes
< A00200005R
> A00200005R68e255aa
POLL = 1
RCVD: 11 bytes
< A00200005R
> A00200005R68e255aa
POLL = 1
RCVD: 11 bytes
< A00200005R
> A00200005R68e255aa
POLL = 1
RCVD: 11 bytes

```

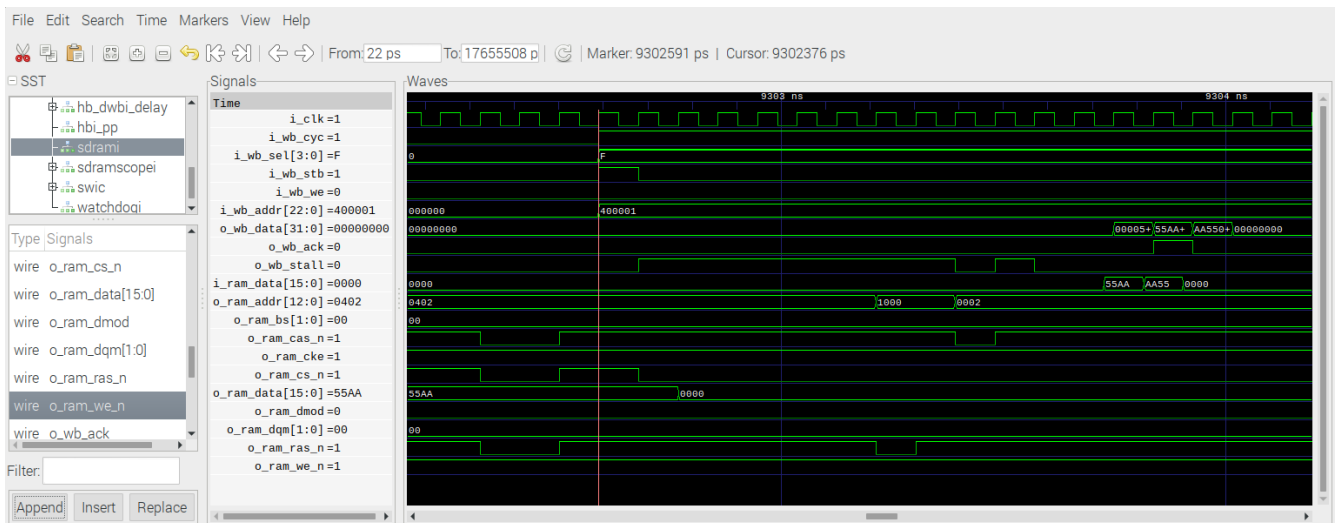
< A00200005R
> A00200005R48e255aa
POLL = 1
RCVD: 11 bytes
< A00200005R
> A00200005R40220000
POLL = 1
RCVD: 11 bytes
< A00200005R
> A00200005R01e255aa
POLL = 1
RCVD: 0 bytes
< [CLOSED]
Accepted CMD connection
POLL = 1
RCVD: 11 bytes
< A01000005R
> A01000005R55aaaa55
POLL = 1
RCVD: 0 bytes
< [CLOSED]
^C

```

write



read



Simulation shell when executed without -d option does not create a VCD file.

```
File Edit Tabs Help
devel@mypi3-13:~/testbuilds/catzip/sim/verilated $ ./arm-main_tb
Listening on port 8363
Listening on port 8364
> T
CMD: Only sent 0 bytes of 3!
Accepted CMD connection
POLL = 1
RCVD: 11 bytes
< A00800011R
> A00800011R20190713
POLL = 1
RCVD: 0 bytes
< [CLOSED]
> Z
CMD: Only sent 0 bytes of 3!
```

Rpi4 query of the FPGA or simulator.


```
File Edit Tabs Help
devel@mypi3-13:~ $ cd testbuilds/catzip/sw/host/
devel@mypi3-13:~/testbuilds/catzip/sw/host $ ./arm-wbregs version
00800010 ( VERSION) : [....] 20190713
devel@mypi3-13:~/testbuilds/catzip/sw/host $
```

Load the program in the FPGA

File Edit Tabs Help

```
devel@mypi3-13:~ $ cd testbuilds/catzip/sw/host/
devel@mypi3-13:~/testbuilds/catzip/sw/host $ ./arm-wbregs version
00800010 ( VERSION) : [...] 20190713
devel@mypi3-13:~/testbuilds/catzip/sw/host $ ./arm-zipload -v ../board/cputest
Halting the CPU
Memory regions:
    Block RAM: 00a00000 - 00a02000
    SDRAM      : 01000000 - 02000000
Loading: ../board/cputest
Section 0: 01000000 - 01003e94
Writing to MEM: 01000000-01003e94
Clearing the CPUs registers
Setting PC to 01000000
The CPU should be fully loaded, you may now
start it (from reset/reboot) with:
> wbregs cpu 0x0f

CPU Status is: 0000060f
devel@mypi3-13:~/testbuilds/catzip/sw/host $
```

With *./arm-wbregs cpu 0x0f*

```
File Edit Tabs Help
RCVD: 11 bytes
< A02000001R
> A02000001R00000060f
POLL = 1
RCVD: 0 bytes
< [CLOSED]
> Z
CMD: Only sent 0 bytes of 3!
> Z
CMD: Only sent 0 bytes of 3!
> Z
CMD: Only sent 0 bytes of 3!
Accepted CMD connection
POLL = 1
RCVD: 12 bytes
< A02000001Wf
> A02000001K00000000
POLL = 1
RCVD: 0 bytes
< [CLOSED]

Running CPU self-test
-----
SIM Instructions          Is this a simulator?
CIS Instructions          Supported
Break test #1            Pass
Break test #2            Pass
Break test #3            Pass
Early Branch test        Pass
Trap test/AND             Pass
Trap test/CLR            Pass
Overflow test            Pass
Carry test               Pass
Loop test                Pass
Shift test               Pass
Pipeline test            Pass
Mem-Pipeline test        Pass
Conditional Execution test Pass
No-waiting pipeline test  Pass
Conditional Branching test Pass
Ill Instruction test, NULL PC Pass
Ill Instruction test, two Pass
Comparison test, ==       Pass
Comparison test, !=       Pass
CC Register test         Pass
Multi-Arg test           Pass
Multiply test            Pass
```

devel@mypi3-13:~/testbuilds/catzip/sw/host \$./arm-zipload -v ../board/hello

Halting the CPU

Memory regions:

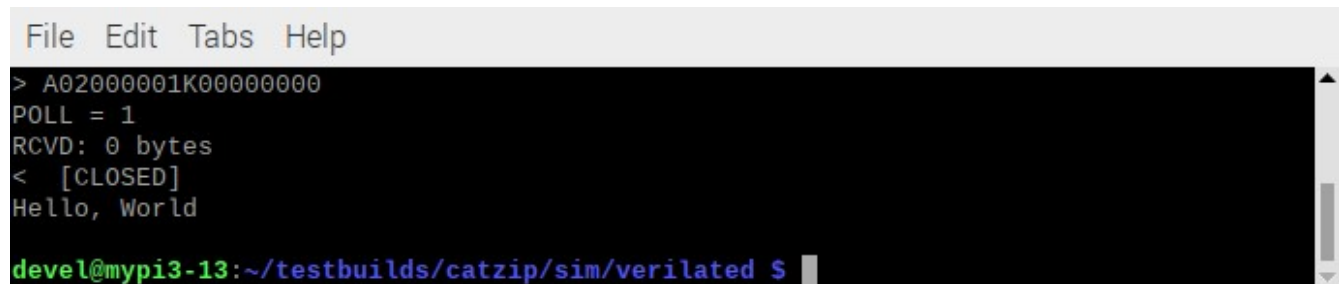
Block RAM: 00a00000 - 00a02000

SDRAM : 01000000 - 02000000

Loading: ../board/hello
Section 0: 01000000 - 010048ec
Writing to MEM: 01000000-010048ec
Clearing the CPUs registers
Setting PC to 01000000
The CPU should be fully loaded, you may now
start it (from reset/reboot) with:
> wbrege cpu 0x0f

CPU Status is: 0000060f

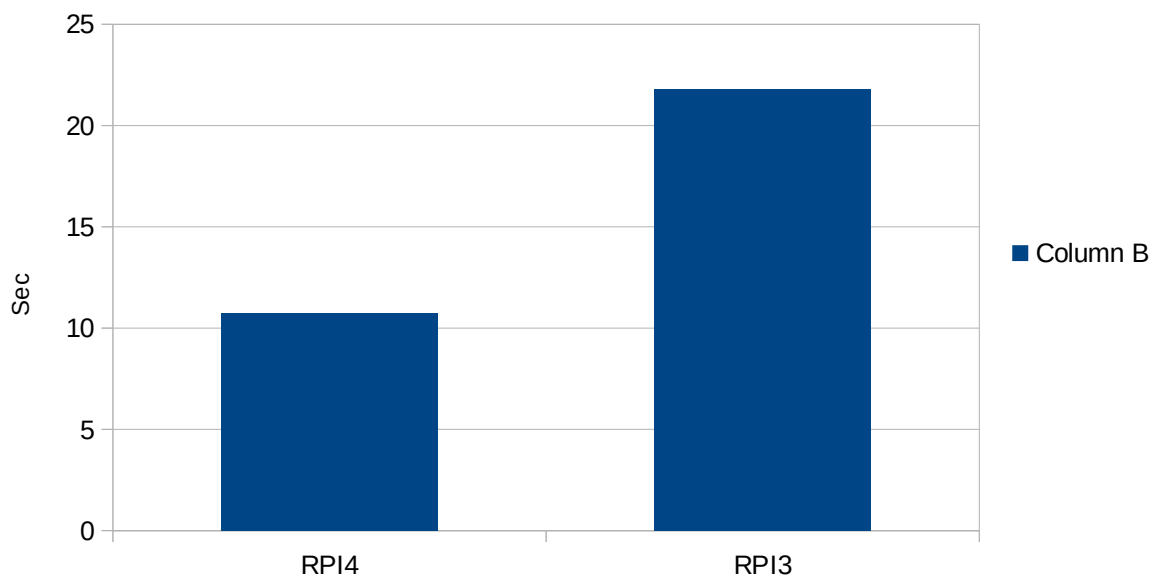
With *./arm-wbrege cpu 0x0f*

A screenshot of a terminal window with a light gray title bar containing 'File Edit Tabs Help'. The terminal has a black background with white text. The output shows a sequence of events: a hex address 'A02000001K00000000', 'POLL = 1', 'RCVD: 0 bytes', '< [CLOSED]', and 'Hello, World'. The prompt 'devel@mypi3-13:~/testbuilds/catzip/sim/verilated \$' is visible at the bottom in green and blue text.

```
File Edit Tabs Help
> A02000001K00000000
POLL = 1
RCVD: 0 bytes
< [CLOSED]
Hello, World
devel@mypi3-13:~/testbuilds/catzip/sim/verilated $
```

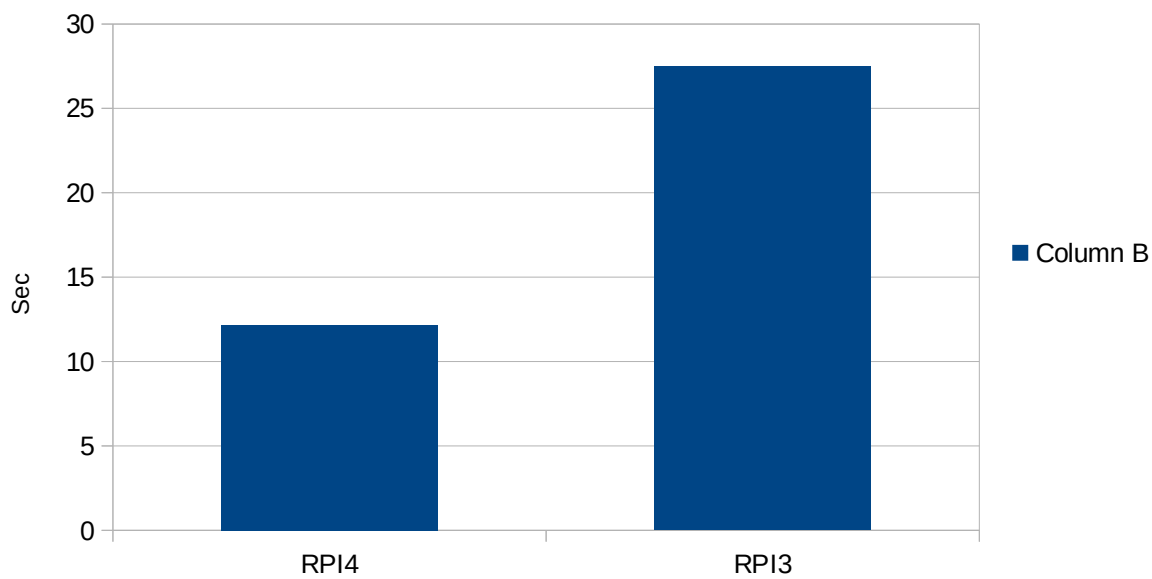
Simulation cputest

simulation cputest



Simulation Hello

simulation hellotest



Thread SVD

Thread SVD

