

\*\*\*\*\*Draft\*\*\*\*\*

**Testing Upgrades to icespice, yosys, zipcpu and nextpnr  
zipcpu, autofpga & verilator  
icozip catzip-dev branch  
mypi3-20  
10/12/21**

\*\*\*\*\*Draft\*\*\*\*\*

## **Build steps:**

```
git clone git@github.com:develone/icozip.git -b catzip-dev catzip-dev
```

```
cd catzip-dev/
```

```
devel@mypi3-20:~/testbuilds/catzip-dev $ mousepad rtl/catzip/cpu/zipcpu.v  
line 737
```

**Note: These next 4 steps might be needed to be repeated one or more times.  
This creates a catzip.bin. If the runjpeg does not end  
in ./arm-netpport window with the following.**

```
. w=256 h=256  
. 1401000 2  
. flag 2 0x204fe08  
. 1401004 1  
. 140100c 200fe08
```

```
cd ~/testbuilds/catzip/rtl/catzip/
```

```
rm -f catzip.asc catzip.json catzip.bin
```

```
make bin
```

```
./myenv-a.sh
```

**Testing upgrade to zipcpu that fixes LOCK instruction generation in  
GCC**

**rtl/catzip/cpu/zipcpu.v line 737**

```
.OPT_LOCK(OPT_LOCK),
```

## **FPGA Tools:**

```
autofpga
```

```
commit 5b57538081d60a04cd32aeba2436816062cb0141 (HEAD -> master, upstream/master,  
upstream/dev)
```

```
Author: ZipCPU <dgisselq@ieee.org>
```

```
Date: Fri Aug 14 07:55:55 2020 -0400
```

Fixes MacOS build err--std::string vs char \* in gbl\_msg.err()

## zipcpu

```
devel@mypi3-20:~/zipcpu $ git log
commit 548a0efbe5729279f2ae9779a2af4229e8241e52 (HEAD -> master, upstream/master,
upstream/dev)
Author: ZipCPU <dgisselq@ieee.org>
Date: Wed Oct 6 11:54:56 2021 -0400
```

Fixed LOCK instruction generation in GCC

## devel@mypi3-20:~/autofpga \$ yosys -V

Yosys 0.9+4081 (git sha1 83a21814, gcc 8.3.0-6+rpi1 -fPIC -Os)

## devel@mypi3-20:~/autofpga \$ nextpnr-ice40 -V

nextpnr-ice40 -- Next Generation Place and Route (Version 67bd349e)

Verilator 4.100 2020-09-07 rev v4.100-10-g39eea781

## Simulation:

```
devel@mypi3-20:~/testbuilds/catzip-dev/sim/verilated $ clear; ./arm-main_tb
```

Listening on port 8363

Listening on port 8364

> T

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@mypi3-20:~/testbuilds/catzip-dev/sim/verilated \$ clear; ./arm-main\_tb**

Listening on port 8363  
Listening on port 8364  
> T  
Accepted CMD connection  
< A04000001Wf  
> A04000001K00000000  
< [CLOSED]  
Hello, World

**devel@mypi3-20:~/testbuilds/catzip-dev/sw/host \$ ./arm-zipload -v  
../board/cputest**

Halting the CPU  
Memory regions:  
    Block RAM: 01400000 - 01402000  
    SDRAM     : 02000000 - 03000000  
Loading: ../board/cputest  
Section 0: 02000000 - 020039f0  
Writing to MEM: 02000000-020039f0  
Clearing the CPUs registers  
Setting PC to 02000000  
The CPU should be fully loaded, you may now  
start it (from reset/reboot) with:  
> wbrege cpu 0x0f

CPU Status is: 0000060f

**devel@mypi3-20:~/testbuilds/catzip-dev/sw/host \$ ./arm-wbrege cpu 0x0f**  
04000000 ( CPU)-> 0000000f

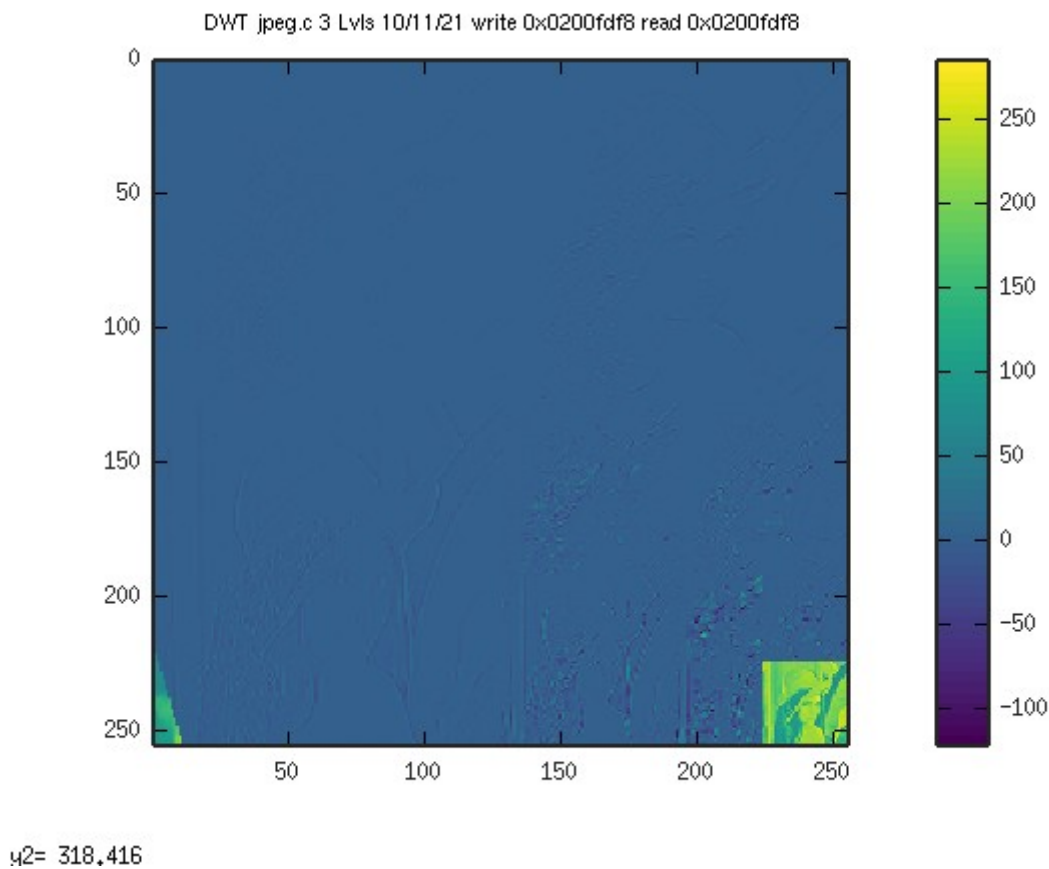
**devel@mypi3-20:~/testbuilds/catzip-dev/sw/host \$ ./arm-zipload -v ../board/hello**

Halting the CPU  
Memory regions:  
    Block RAM: 01400000 - 01402000  
    SDRAM     : 02000000 - 03000000  
Loading: ../board/hello  
Section 0: 02000000 - 020047c8  
Writing to MEM: 02000000-020047c8  
Clearing the CPUs registers  
Setting PC to 02000000  
The CPU should be fully loaded, you may now  
start it (from reset/reboot) with:  
> wbrege cpu 0x0f

CPU Status is: 0000060f

```
devel@mypi3-20:~/testbuilds/catzip-dev/sw/host $ ./arm-wbregs cpu 0x0f
```

## jpeg simulation



## Testing Verilog bins:

```
devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/rtl/uart $ sudo config_cat helloworld.bin
```

```
devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/rtl/uart $ sudo config_cat rtl/basic/dimmer.bin
```

```
devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/rtl/uart $ sudo config_cat rtl/basic/blinky.bin
```

```
devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/rtl/uart $ sudo config_cat  
rtl/switch_leds/switch_leds.bin
```

```
devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/rtl/uart $ sudo config_cat  
rtl/leddigits/leddigits.bin
```

```
devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/sw/host $ sudo ./arm-netpport
```

Listening on port 8363

Listening on port 8364

**devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/rtl/pptest \$ sudo config\_cat  
hellopp.bin**

```
File Edit Tabs Help
Listening on port 8363
Listening on port 8364
. ello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
. Hello, World!
```

**devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/rtl/pptest \$ sudo config\_cat  
speechpp.bin**

```
devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/sw/host $ sudo config_cat ../../rtl/catzip/catzip.bin
```

```
devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/sw/host $ clear; sudo ./arm-netpport
```

Listening on port 8363

Listening on port 8364

```
devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/sw/host $ ./arm-wbregs version
```

```
File Edit Tabs Help
Listening on port 8363
Listening on port 8364
. Hello, World!
. Hello, World!
. =====
. |
. | Four score and seven years ago our fathers brought forth on this
. | continent, a new nation, conceived in Liberty, and dedicated to
. | the proposition that all men are created equal.
. |
. | Now we are engaged in a great civil war, testing whether that
. | nation, or any nation so conceived and so dedicated, can long
. | endure. We are met on a great battle-field of that war. We have
. | come to dedicate a portion of that field, as a final resting
. | place for those who here gave their lives that that nation might
. | live. It is altogether fitting and proper that we should do this.
. |
. | But, in a larger sense, we can not dedicate-we can not consecrate-
. | we can not hallow-this ground. The brave men, living and dead,
. | who struggled here, have consecrated it, far above our poor power
. | to add or detract. The world will little note, nor long remember
. | what we say here, but it can never forget what they did here. It
. | is for us the living, rather, to be dedicated here to the
. | unfinished work which they who fought here have thus far so nobly
. | advanced. It is rather for us to be here dedicated to the great
. | task remaining before us-that from these honored dead we take
. | increased devotion to that cause for which they gave the last
. | full measure of devotion-that we here highly resolve that these
. | dead shall not have died in vain-that this nation, under God,
. | shall have a new birth of freedom-and that government of the
. | people, by the people, for the people, shall not perish from the
. | earth.
. |
. | =====
. |
```

01000014 ( VERSION) : [!..] 20211012

**Testing sdram Write & Read:**

```
devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/sw/host $ ./arm-wrsdram r.bin
The size of the buffer is 0x010000 or 65536 words
```

```
devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/sw/host $ ./arm-rdsdram sdram.bin
```

Write-COMplete

The size of the buffer is 0x010000 or 65536 words

```
devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/sw/host $ diff r.bin sdram.bin
```

Command port is now connected

```
< A04000001Wf
```

```
> A04000001K00000000
```

Command port disconnect

```
. w=2-5 h=2-5
```

```
. 1401000 2
```

```
. flag 2 0x204fdf8
```

```
. 1401004 1
```

```
. 140100c 200fdf8
```

```
. ptrs.alt 0x2054498 0x200fdf8
```

```
. 1:p/?1
```

```
. 0x200fdf8 0xe2
```

```
. 0x200fdfc 0xe2
```

```
. 0x200fe00 0xe1
```

```
. 0x200fe04 0xe1
```

```
.
```

```
. 0x202fdf8 0xcf
```

```
. 0x202fdfc 0xcf
```

```
. 0x202fe00 0xcf
```

```
. 0x202fe04 0xcf
```

```
.
```

```
. 0x204fde8 0x96
```

```
. 0x204fdec 0xa1
```

```
. 0x204fdf0 0xab
```

```
. 0x204fdf4 0xb4
```

```
. 2-5 0x200fdf8 0x2054498 0x 1401004
```

```
. 2-5
```

The runjpeg.sh sets several values in blkram used to wait on user.

```
devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/sw/host $ ./runjpeg.sh
```

```
01401000 (    )-> 00000002
```

```
01401004 (    )-> 00000001
```

```
01401008 (    )-> 00000001
```

```
0140100c (    )-> 00000000
```

```
01401010 (    )-> 00000001
```

```
01401018 (    )-> 00000001
```

Halting the CPU

Memory regions:

Block RAM: 01400000 - 01402000  
SDRAM : 02000000 - 03000000  
Loading: ../board/jpeg  
Section 0: 02000000 - 0204fe7c  
Writing to MEM: 02000000-0204fe7c

Clearing the CPUs registers  
Setting PC to 02000000  
The CPU should be fully loaded, you may now  
start it (from reset/reboot) with:  
> wregs cpu 0x0f

CPU Status is: 0000060f  
04000000 ( CPU)-> 0000000f

This step writes the file r.bin to the sdram. The values can be g.bin or b.bin.

devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/sw/host \$ ./arm-wrsdram r.bin  
The size of the buffer is 0x010000 or 65536 words

#### READ-COMplete

This steps lets the user where the input and output will be written and read.

devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/sw/host \$ ./arm-wbregs 0x0140100c  
0140100c ( ) : [...] 0200fdf8

This step clears the wait loop.

devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/sw/host \$ ./arm-wbregs 0x01401008 0x0  
01401008 ( )-> 00000000

This step clears the wait1 loop.

devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/sw/host \$ ./arm-wbregs 0x01401010 0x0  
01401010 ( )-> 00000000

This step reads the sdram and stores the data in dwt.bin used by octave to show the lifting step results.

devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/sw/host \$ rm -f dwt.bin; ./arm-rdsdram dwt.bin

#### Write-COMplete

The size of the buffer is 0x010000 or 65536 words

devel@mypi3-19:~/testbuilds/mypi3-20/catzip-dev/sw/host \$ octave

libEGL warning: DRI3: failed to query the version

libEGL warning: DRI2: failed to authenticate

GNU Octave, version 4.4.1

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FITNESS FOR A PARTICULAR PURPOSE. For details, type 'warranty'.



Octave was configured for "arm-unknown-linux-gnueabi".

Additional information about Octave is available at <https://www.octave.org>.

Please contribute if you find this software useful.

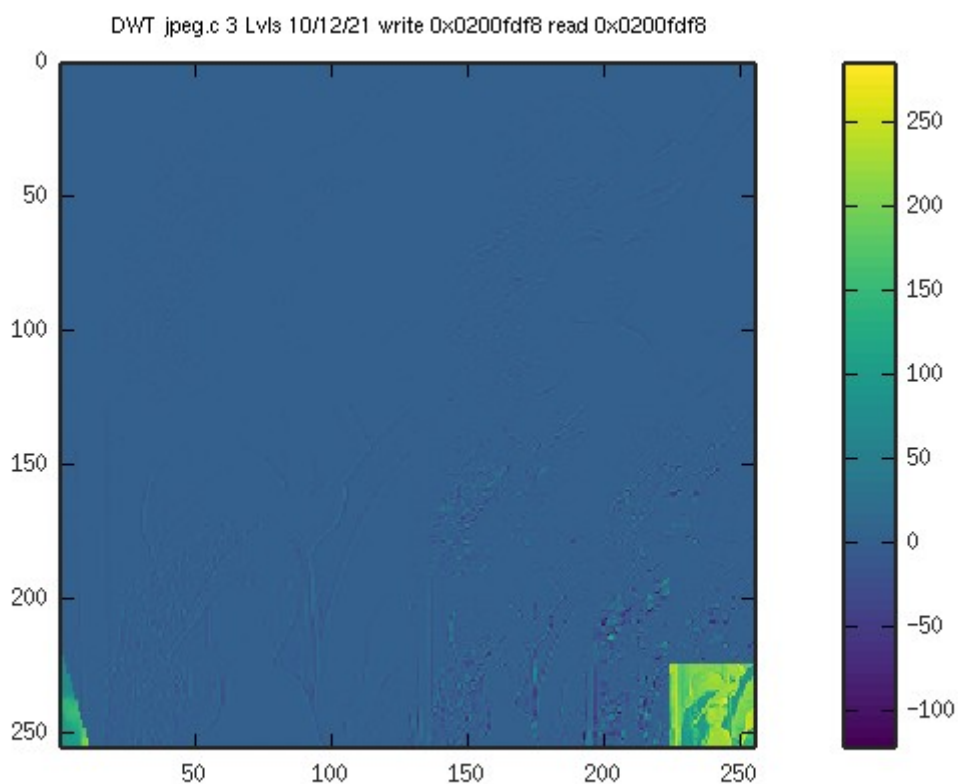
For more information, visit <https://www.octave.org/get-involved.html>

Read <https://www.octave.org/bugs.html> to learn how to submit bug reports.

For information about changes from previous versions, type 'news'.

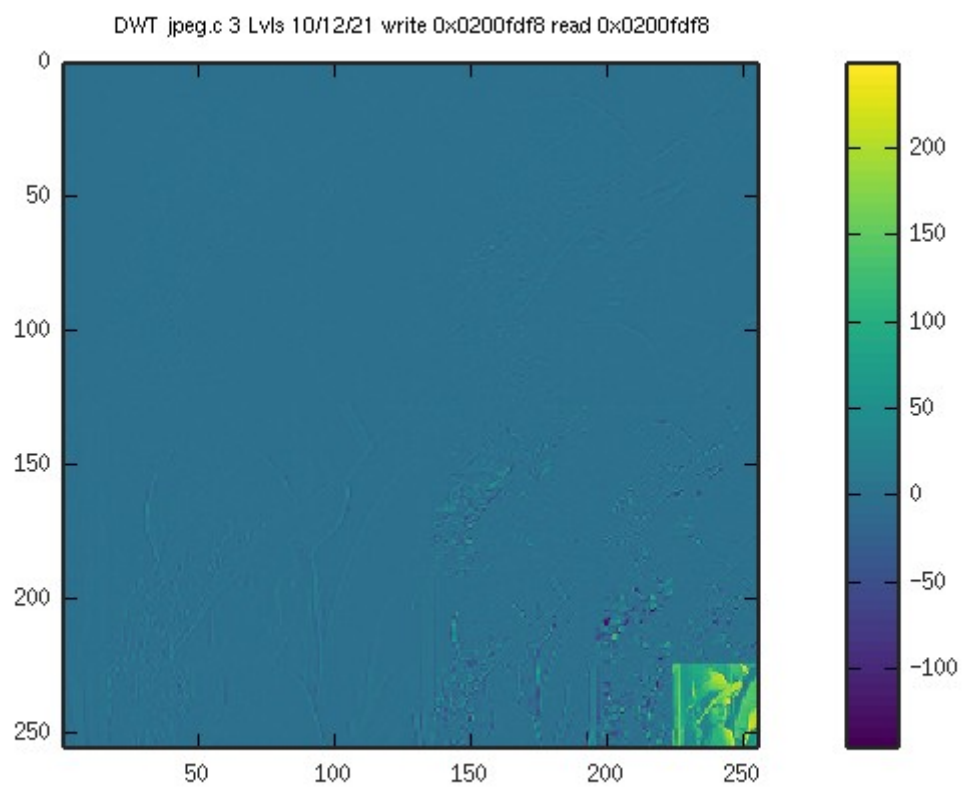
```
octave:1>rgb
```

```
dwt-r
```



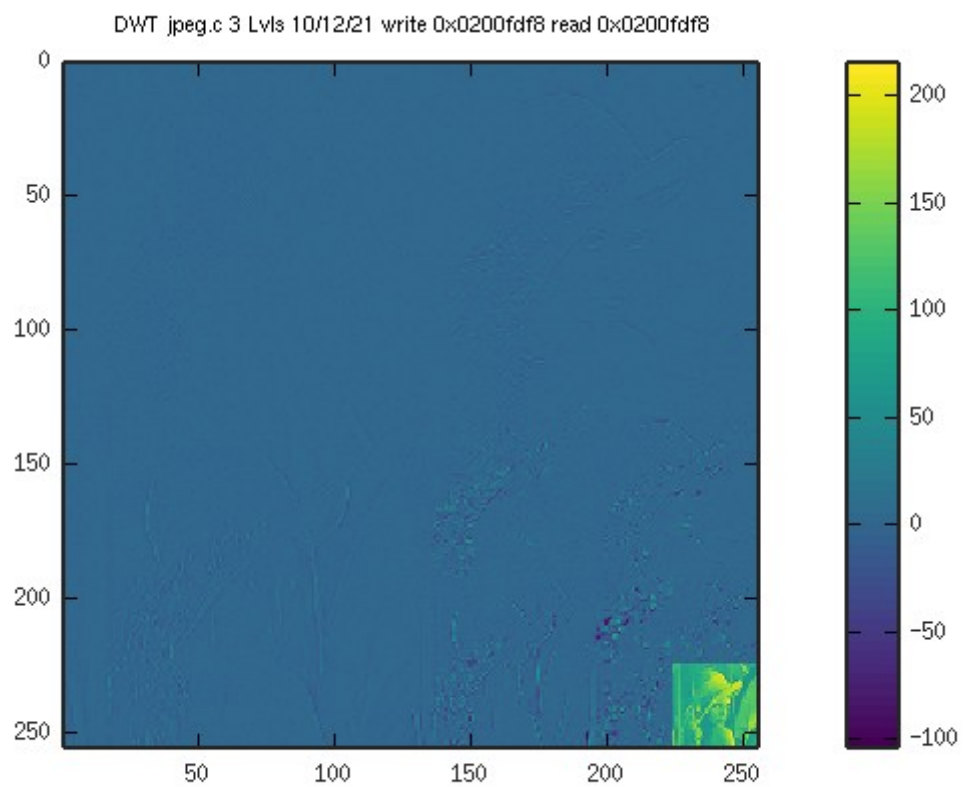
```
u2= 13.1087
```

```
dwt-g
```



$\psi_2 = -199.205$

dwt-b



$\psi_2 = -146.934$