

*****Draft*****

**QEMU Ultibo Bare Metal
JPEG2000
with
Remote Shell
07/28/21**

*****Draft*****

Note:

<https://ultibo.org/forum/viewtopic.php?f=13&t=1303&p=11632#p11632>

By Ultibo Wed Jul 21, 2021 9:01 pm

I suspect the version of QEMU that you have on the RPI3B+ is later than the one on the RPi4, try doing qemu-system-arm -version on each one.

We recently discovered that the Ultibo SD card driver was not compatible with the latest versions of QEMU, a fix for this is included in the release from today (Ultibo core 2.1.079) so if you update your RTL to the latest either using the RTL Builder or by rerunning the ultiboinstaller script then it should work now.

**<https://en.m.wikipedia.org/wiki/QEMU>. On the pi400-1 I ran
./ultiboinstaller.sh on pi400-1.**

QEMU is a [hosted virtual machine monitor](#): it emulates the machine's [processor](#) through dynamic [binary translation](#) and provides a set of different hardware and device models for the machine, enabling it to run a variety of [guest operating systems](#). It also can be used with [Kernel-based Virtual Machine](#) (KVM) to run virtual machines at near-native speed (by taking advantage of hardware extensions such as [Intel VT-x](#)). QEMU can also do emulation for user-level processes, allowing applications compiled for one architecture to run on another.[\[3\]](#)

**Note : Additional software is needed to run QEMU “sudo apt-get install qemu-system-arm”.
The following programs are added.**

**/usr/bin/qemu-img /usr/bin/qemu-nbd /usr/bin/qemu-system-aarch64
/usr/bin/qemu-io /usr/bin/qemu-pr-helper /usr/bin/qemu-system-arm**

The command line for starting Lazarus IDE (Ultibo Edition) “~/ultibo/core/lazarus.sh”

**The script compiles several C source files into libopenjp2.a
~/Ultibo_Projects/jpeg2000/src/compile_ultibo.sh**

**#!/bin/bash
rm -f *.o**

rm -f libopenjp2.a

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c bio.c -o bio.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c cio.c -o cio.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c dwt.c -o dwt.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c event.c -o event.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c function_list.c -o function_list.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c image.c -o image.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c invert.c -o invert.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c j2k.c -o j2k.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c jp2.c -o jp2.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c mct.c -o mct.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c mqc.c -o mqc.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c opj_clock.c -o opj_clock.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c opj_malloc.c -o opj_malloc.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c pi.c -o pi.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c t1.c -o t1.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c rd-wr-ops.c -o rd-wr-ops.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c t2.c -o t2.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c tcd.c -o tcd.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c tgt.c -o tgt.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c thread.c -o thread.o

arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpv3-d16 -mfloat-abi=hard -c openjpeg.c -o openjpeg.o

```
arm-none-eabi-gcc -O3 -mabi=aapcs -marm -march=armv7-a -mfpu=vfpv3-d16
-mfloat-abi=hard -c sparse_array.c -o sparse_array.o
arm-none-eabi-ar rcs libopenjp2.a *.o
arm-none-eabi-ar t libopenjp2.a > libopenjp2_obj.txt
echo "The word count here should be 22"
echo "the word count in /home/pi/jpeg-2000-test/bare-metal/openjp"
echo "when ./libbuild.sh is executed should be 22"
wc libopenjp2_obj.txt
```

```
devel@mypi3-20:~/Ultibo_Projects/jpeg2000/src $ ./compile_ultibo.sh
The word count here should be 22
the word count in /home/pi/jpeg-2000-test/bare-metal/openjp
when ./libbuild.sh is executed should be 22
22 22 182 libopenjp2_obj.txt
```

```
-rw-r--r-- 1 devel devel 419068 Jul 28 10:29 libopenjp2.a
```

```
devel@mypi3-20:~/Ultibo_Projects/jpeg2000/src $ less libopenjp2_obj.txt
```

```
bio.o
cio.o
dwt.o
event.o
function_list.o
image.o
invert.o
j2k.o
jp2.o
mct.o
mqc.o
openjpeg.o
opj_clock.o
opj_malloc.o
pi.o
rd-wr-ops.o
sparse_array.o
t1.o
t2.o
tcd.o
tgt.o
thread.o
```

The script libbuild.sh uses dwtlift.c & libopenjp2.a above to create libdwtlift.a

-rw-r--r-- 1 devel devel 441028 Jul 28 10:27 libdwtlift.a

devel@mypi3-20:~/Ultibo_Projects/jpeg2000/QEMU \$./libbuild.sh

dwtlift.c: In function 'decompress':

**dwtlift.c:658:3: warning: implicit declaration of function 'octave_write_byte';
did you mean 'opj_write_tile'? [-Wimplicit-function-declaration]**

**octave_write_byte(r_decompress_fn,r_decompress,da_x1*da_y1);
^~~~~~**

opj_write_tile

when ./libbuild.sh is executed should be 23

23 23 192 libdwtlift_obj.txt

**Two Pascal units (uBufferToC.pas & uliftbitmap.pas) are used with
DWT_LIFT_QEMU.lpr to link the**

testfile

**00000000 19 00 00 00 01 00 00 00 00 00 00 00 00 00 00 00
00000010 00 01 00 00 00 01 00 00**

256com

**00000000 19 00 00 00 01 00 00 00 00 00 00 00 00 00 00 00
00000010 00 01 00 00 00 01 00 00**

256decom

**00000000 19 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00000010 00 01 00 00 00 01 00 00**

#!/bin/bash

**qemu-system-arm -machine versatilepb -cpu cortex-a8 -kernel kernel.bin \
-net**

**user,hostfwd=tcp::5080-:80,hostfwd=tcp::5023-:23,hostfwd=udp::5069-:69,hos\$
-drive file=disk.img,if=sd,format=raw**

qemu-img create disk.img 25M

Formatting 'disk.img', fmt=raw size=26214400

sudo fdisk disk.img

[sudo] password for devel:

Welcome to fdisk (util-linux 2.33.1).

Changes will remain in memory only, until you decide to write them.

Be careful before using the write command.

Device does not contain a recognized partition table.

Created a new DOS disklabel with disk identifier 0xcadc8dbe.

Command (m for help): n

Partition type

p primary (0 primary, 0 extended, 4 free)

e extended (container for logical partitions)

Select (default p): p

Partition number (1-4, default 1): 1

First sector (2048-51199, default 2048):

Last sector, +/-sectors or +/-size{K,M,G,T,P} (2048-51199, default 51199):

Created a new partition 1 of type 'Linux' and of size 24 MiB.

Command (m for help): t

Selected partition 1

Hex code (type L to list all codes): L

0 Empty	24 NEC DOS	81 Minix / old Lin	bf Solaris
1 FAT12	27 Hidden NTFS Win	82 Linux swap / So	c1 DRDOS/sec (FAT-
2 XENIX root	39 Plan 9	83 Linux	c4 DRDOS/sec (FAT-
3 XENIX usr	3c PartitionMagic	84 OS/2 hidden or	c6 DRDOS/sec (FAT-
4 FAT16 <32M	40 Venix 80286	85 Linux extended	c7 Syrinx
5 Extended	41 PPC PReP Boot	86 NTFS volume set	da Non-FS data
6 FAT16	42 SFS	87 NTFS volume set	db CP/M / CTOS / .
7 HPFS/NTFS/exFAT	4d QNX4.x	88 Linux plaintext	de Dell Utility
8 AIX	4e QNX4.x 2nd part	8e Linux LVM	df BootIt
9 AIX bootable	4f QNX4.x 3rd part	93 Amoeba	e1 DOS access
a OS/2 Boot Manag	50 OnTrack DM	94 Amoeba BBT	e3 DOS R/O
b W95 FAT32	51 OnTrack DM6 Aux	9f BSD/OS	e4 SpeedStor
c W95 FAT32 (LBA)	52 CP/M	a0 IBM Thinkpad	hi Rufus alignment
e W95 FAT16 (LBA)	53 OnTrack DM6 Aux	a5 FreeBSD	eb BeOS fs
f W95 Ext'd (LBA)	54 OnTrackDM6	a6 OpenBSD	ee GPT
10 OPUS	55 EZ-Drive	a7 NeXTSTEP	ef EFI (FAT-12/16/
11 Hidden FAT12	56 Golden Bow	a8 Darwin UFS	f0 Linux/PA-RISC b
12 Compaq diagnost	5c Priam Edisk	a9 NetBSD	f1 SpeedStor
14 Hidden FAT16 <3	61 SpeedStor	ab Darwin boot	f4 SpeedStor
16 Hidden FAT16	63 GNU HURD or Sys	af HFS / HFS+	f2 DOS
secondary			
17 Hidden HPFS/NTF	64 Novell Netware	b7 BSDI fs	fb VMware VMFS
18 AST SmartSleep	65 Novell Netware	b8 BSDI swap	fc VMware
VMKCORE			
1b Hidden W95 FAT3	70 DiskSecure Mult	bb Boot Wizard hid	fd Linux raid
auto			
1c Hidden W95 FAT3	75 PC/IX	bc Acronis FAT32 L	fe LANstep
1e Hidden W95 FAT1	80 Old Minix	be Solaris boot	ff BBT

Hex code (type L to list all codes): 4
Changed type of partition 'Linux' to 'FAT16 <32M'.

Command (m for help): p
Disk disk.img: 25 MiB, 26214400 bytes, 51200 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0xcadc8dbe

Device	Boot	Start	End	Sectors	Size	Id	Type
disk.img1		2048	51199	49152	24M	4	FAT16 <32M

Command (m for help): w
The partition table has been altered.
Syncing disks.

mkdosfs disk.img
mkfs.fat 4.1 (2017-01-24)

sudo mount disk.img /mnt/img1

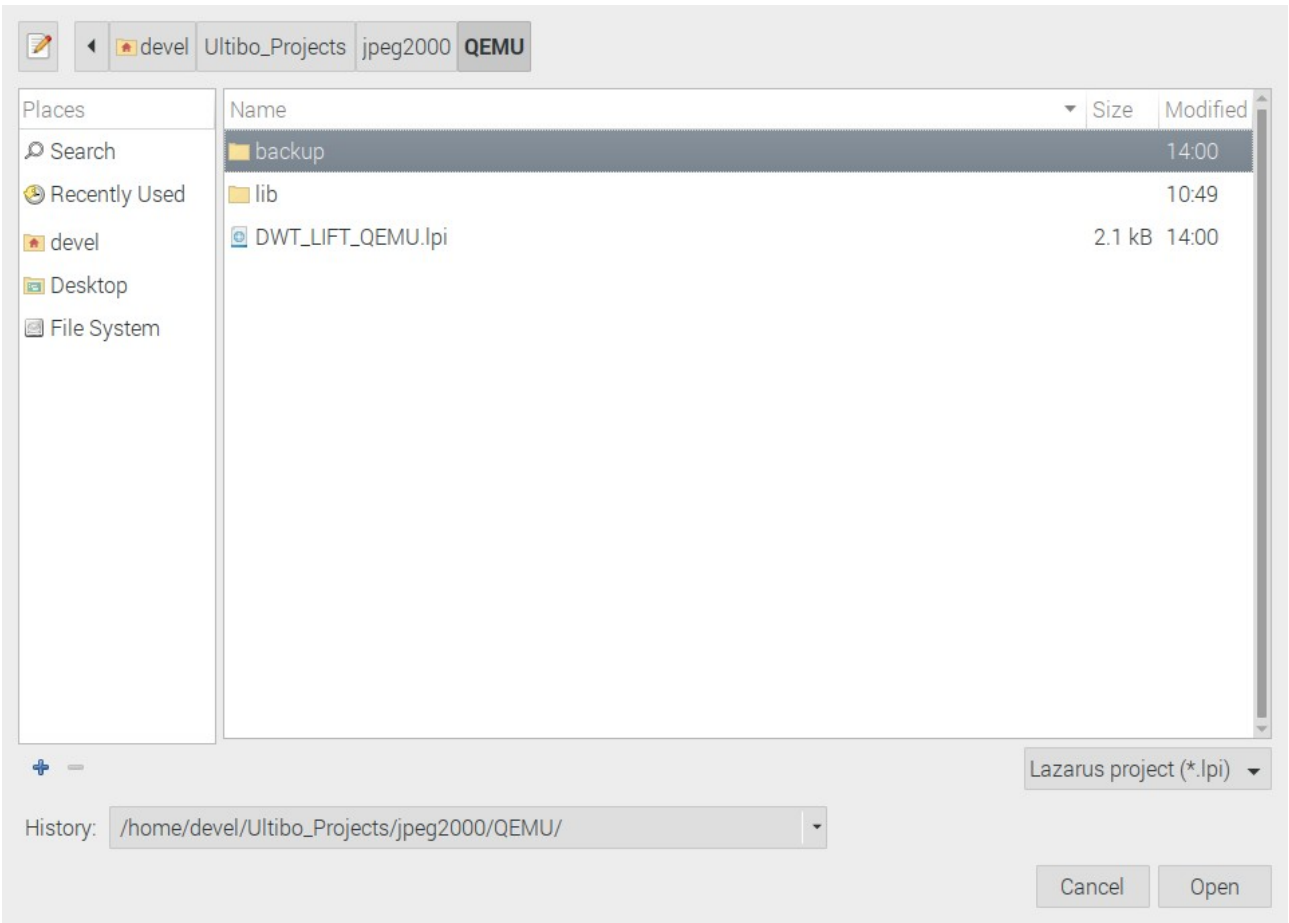
sudo cp -R ~/Ultibo_Projects/Little_Interpreted_Language/img-tests/disk/*
/mnt/img1

devel@mypi3-20:~/Ultibo_Projects/jpeg2000/QEMU \$ sudo cp testfile 256com
256decom lena_rgb_256.bmp MyBitmap.bmp /mnt/img1

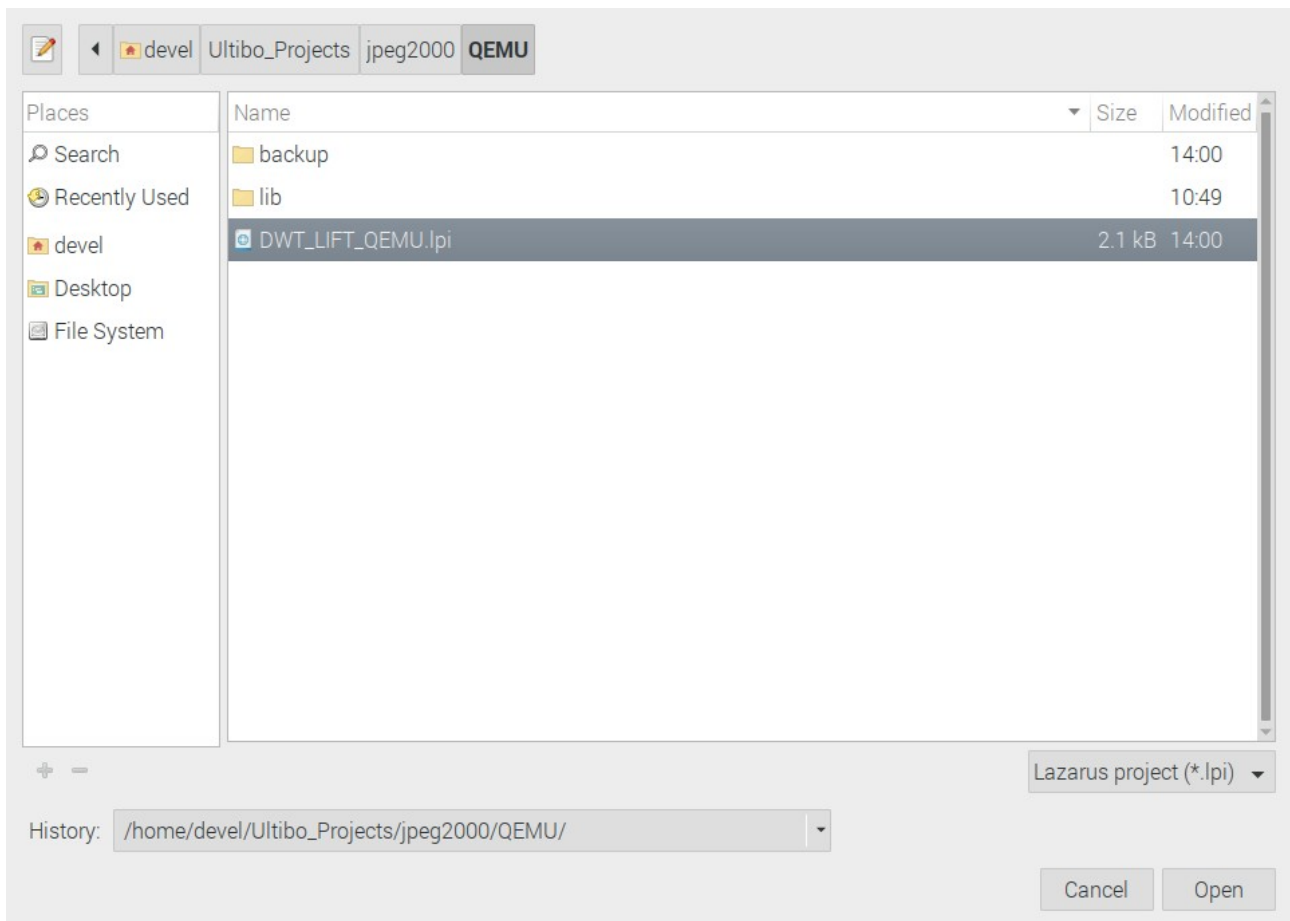
ls -la /mnt/img1
total 420
drwxr-xr-x 3 root root 16384 Dec 31 1969 .
drwxr-xr-x 5 root root 4096 Jul 18 10:10 ..
-rwxr-xr-x 1 root root 24 Jul 28 12:44 256com
-rwxr-xr-x 1 root root 24 Jul 28 12:44 256decom
-rwxr-xr-x 1 root root 53 Jul 28 12:41 'Another File.txt'
-rwxr-xr-x 1 root root 196730 Jul 28 12:44 lena_rgb_256.bmp
-rwxr-xr-x 1 root root 196730 Jul 28 12:44 MyBitmap.bmp
-rwxr-xr-x 1 root root 24 Jul 28 12:44 testfile
-rwxr-xr-x 1 root root 31 Jul 28 12:41 'Test File.txt'
drwxr-xr-x 2 root root 2048 Jul 28 12:41 www

sudo umount /mnt/img1

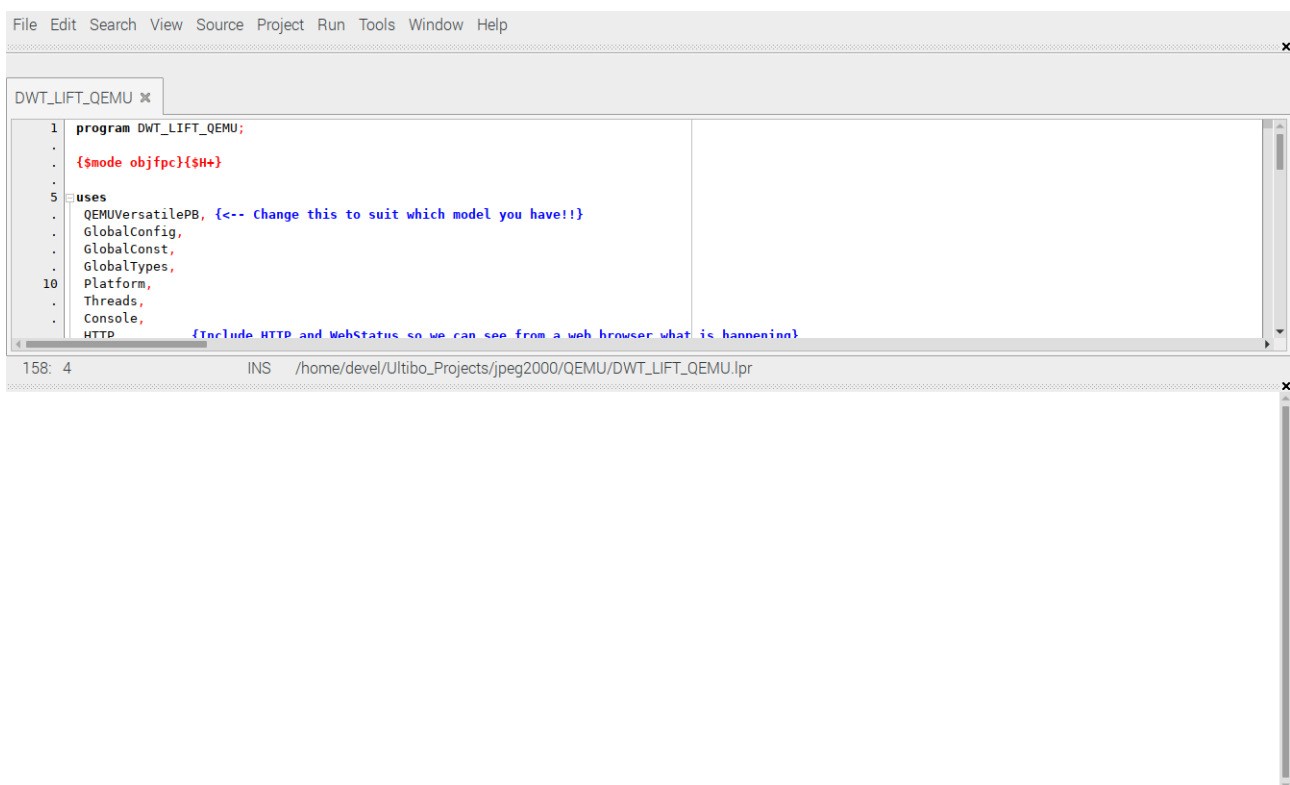
Project/Open Project



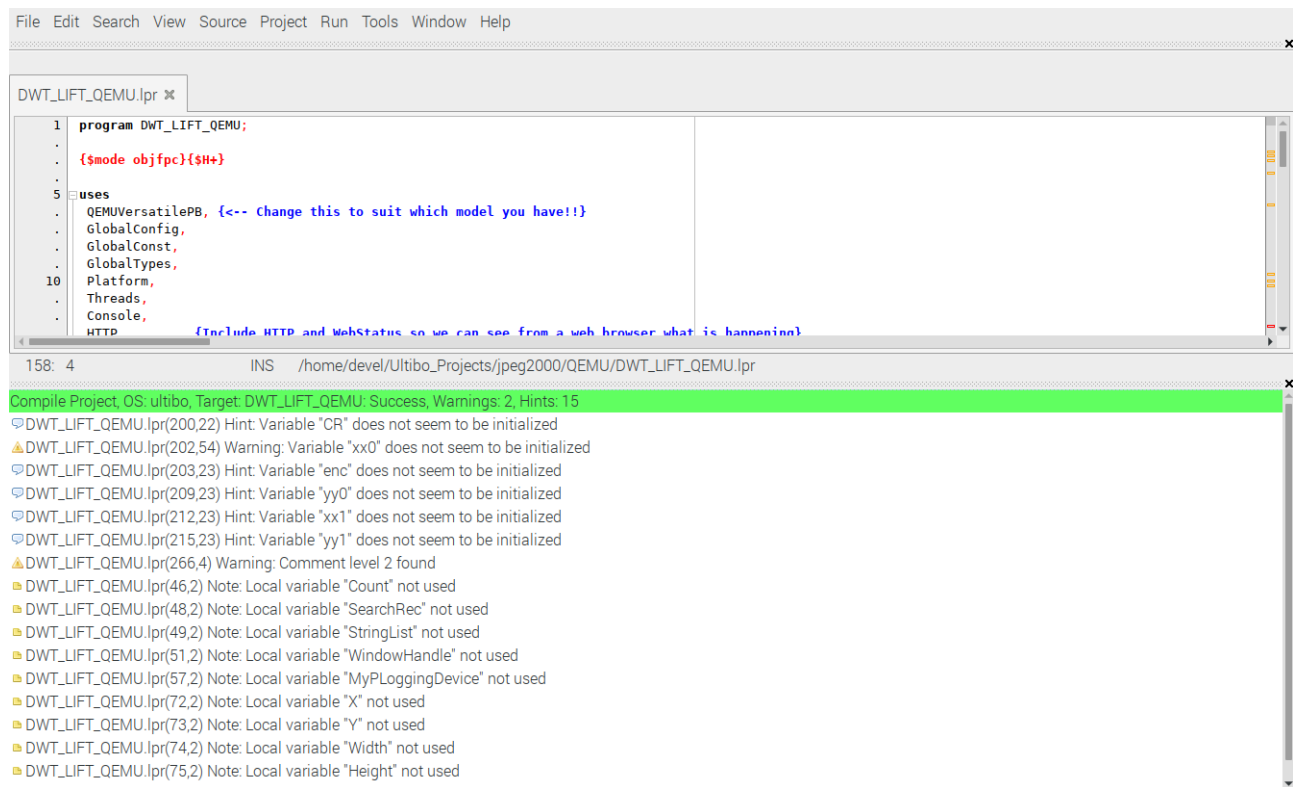
Select DWT_LIFT_QEMU.lpi



Depress Open



Run/Compile The kernel.bin is created when the Green bar appears.



```
File Edit Search View Source Project Run Tools Window Help

DWT_LIFT_QEMU.lpr x

1 program DWT_LIFT_QEMU;
.
. ($mode objfpc){$H+}
.
.
5 uses
. QEMUVersatilePB, {<-- Change this to suit which model you have!!}
. GlobalConfig,
. GlobalConst,
. GlobalTypes,
10 Platform,
. Threads,
. Console,
. HTTP {Include HTTP and WebStatus so we can see from a web browser what is happening}

158: 4 INS /home/devel/Ultibo_Projects/jpeg2000/QEMU/DWT_LIFT_QEMU.lpr

Compile Project, OS: ultibo, Target: DWT_LIFT_QEMU: Success, Warnings: 2, Hints: 15
DWT_LIFT_QEMU.lpr(200,22) Hint: Variable "CR" does not seem to be initialized
DWT_LIFT_QEMU.lpr(202,54) Warning: Variable "xx0" does not seem to be initialized
DWT_LIFT_QEMU.lpr(203,23) Hint: Variable "enc" does not seem to be initialized
DWT_LIFT_QEMU.lpr(209,23) Hint: Variable "yy0" does not seem to be initialized
DWT_LIFT_QEMU.lpr(212,23) Hint: Variable "xx1" does not seem to be initialized
DWT_LIFT_QEMU.lpr(215,23) Hint: Variable "yy1" does not seem to be initialized
DWT_LIFT_QEMU.lpr(266,4) Warning: Comment level 2 found
DWT_LIFT_QEMU.lpr(46,2) Note: Local variable "Count" not used
DWT_LIFT_QEMU.lpr(48,2) Note: Local variable "SearchRec" not used
DWT_LIFT_QEMU.lpr(49,2) Note: Local variable "StringList" not used
DWT_LIFT_QEMU.lpr(51,2) Note: Local variable "WindowHandle" not used
DWT_LIFT_QEMU.lpr(57,2) Note: Local variable "MyLoggingDevice" not used
DWT_LIFT_QEMU.lpr(72,2) Note: Local variable "X" not used
DWT_LIFT_QEMU.lpr(73,2) Note: Local variable "Y" not used
DWT_LIFT_QEMU.lpr(74,2) Note: Local variable "Width" not used
DWT_LIFT_QEMU.lpr(75,2) Note: Local variable "Height" not used
```

#!/bin/bash

**qemu-system-arm -machine versatilepb -cpu cortex-a8 -kernel kernel.bin **
-net

user,hostfwd=tcp::5080-:80,hostfwd=tcp::5023-:23,hostfwd=udp::5069-:69,hostf
**wd=tcp::6050-:5050 -net nic **
-drive file=disk.img,if=sd,format=raw

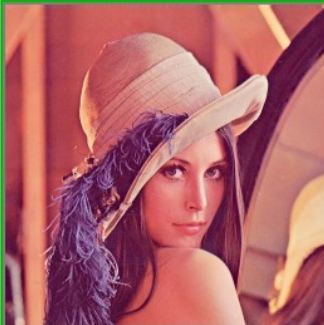
./startqemu.sh

If testfile has the contents of 256com

Ultibo Core (Release: Beetroot Version: 2.1.079 Date: 21 July 2021)

```
xx0 0
xx0 0
yy0 0
xx1 256
yy1 256
Hello Ultibo from C!! Called by Pascal starting compress
ion: 0 seconds 0 useconds 0
in lift config dec 6 enc 1 compression CR 25 bpp 24 flg
0 him 256 wim 256
size 196608 pointer passed 34f56d4 28b4b98 width 256 hei
ght 256
l_nb_tiles 1 l_data_size 196608
0x7c 0x89 0xe2
In test_tile_encoder creating J2k
Compression time: 0 seconds 0 useconds 0 starting openjp
eg
[INFO] tile number 1 / 1
Compression time: 3 seconds 3 useconds 0
20:09:58
```

TFTP Demo.
writing top right handle1
Local Address 10.0.2.15



The file test.j2k will be created

```
File Edit Tabs Help
Ultibo Core (Release: Beetroot Version: 2.1.079 Date: 21 July 2021)
(Type HELP for a list of available commands)
>dir
  Directory of C:\

28-7-21 18:41:54          53  Another File.txt
28-7-21 18:41:54          31  Test File.txt
28-7-21 18:41:54          <DIR>      www
28-7-21 18:44:28          24  testfile
28-7-21 18:44:28          24  256com
28-7-21 18:44:28          24  256decom
28-7-21 18:44:28       196730  lena_rgb_256.bmp
28-7-21 18:44:28       196730  MyBitmap.bmp
28-7-21 20:09:58        7848  test.j2k
      8 file(s) 401464 bytes
      1 dir(s)

C:\>
```

The file test.j2k will be used as the input.

If testfile has the contents of 256decom

```
File Edit Tabs Help
Ultibo Core (Release: Beetroot Version: 2.1.079 Date: 21 July 2021)
(Type HELP for a list of available commands)
>dir
  Directory of C:\

28-7-21 18:41:54          53  Another File.txt
28-7-21 18:41:54          31  Test File.txt
28-7-21 18:41:54          <DIR>      www
28-7-21 18:44:28          24  testfile
28-7-21 20:17:03       65536  red
28-7-21 18:44:28          24  256com
28-7-21 18:44:28          24  256decom
28-7-21 18:44:28       196730  lena_rgb_256.bmp
28-7-21 18:44:28       196730  MyBitmap.bmp
28-7-21 20:09:58        7848  test.j2k
28-7-21 20:17:03       65536  green
28-7-21 20:17:03       65536  blue
28-7-21 20:17:04       196730  test_wr.bmp
      12 file(s) 794802 bytes
      1 dir(s)

C:\>
```

The file test_wr.bmp is the decompressed image.

Ultibo Core (Release: Beetroot Version: 2.1.079 Date: 21 July 2021)

```
conds 0 starting openjpeg
l_stream 0xc00305c8
In infile_format test.j2k reader 0xc003048c
test.j2k l_nb_read 12 0xc003048c 0xff 0x4f 0xff 0x51 0x0
0x2f 0x0 0x0 0x0 0x0 0x1 0x0
[INFO] Start to read j2k main header (-1072487312).
[INFO] Main header has been correctly decoded.
[INFO] Setting decoding area to 0,0,256,256
[INFO] Header of tile 1 / 1 has been read.
Decompression time: 0 seconds 0 useconds 0
start writing: 0 seconds 0 useconds 0 starting openjpeg
file name red data ptr 0xc0000410 size 65536
file name green data ptr 0xc0020410 size 65536
file name blue data ptr 0xc0010410 size 65536
WR imagesize = 0x30000
Wr bpp = 24
Wr xresolution = 2835 yresolution 2835
File writes: 2 seconds 2 useconds 0 starting openjpeg
20:17:04
```

TFTP Demo.
writing top right handle1
Local Address 10.0.2.15

