**********Draft**********

Custom Raspbian Image with Lazarus FPC installed

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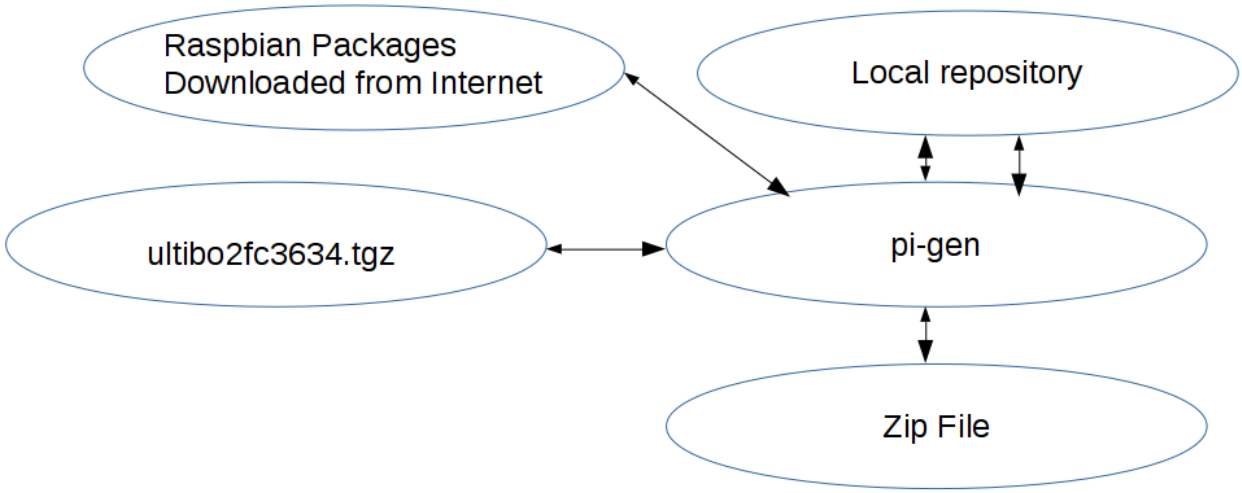
image_2018-03-20-RaspbianUltibo.zip
Created with pi-gen
Testing Lazarus/FPC
Comparing number files needed
for VideoCore Apps
Raspbian & Ultibo
03/21/18

**********Draft**********

Introduction:

The overall goal is to create a bootable micro sd card ready to start developing Ultibo applications using Lazarus IDE (Ultibo Edition).with Free Pascal Compiler FPC. This was made possible with creation of the ***"ultiboinstaller.sh"*** found at https://github.com/ultibohub/Tools/blob/master/Installer/Core/Linux/ultiboinstaller.sh by Gary from Ultibo, ***"pi-gen"*** and the ***"Stretch Raspbain release"*** make this possible. Ultibo releassed an installer script "utiboinstaller.sh" that installs Lazarus and Free Pascal Compiler FPC on the Raspberry Pi. This marks a milestone in the Ultibo Bare Metal development providing an Intregrated Development Enviornment (IDE). The Strech Raspbian release still needs serveral dependencies to install Lazarus IDE (Ultibo Edition).with Free Pascal Compiler FPC. In addition, other tools such as arm-none-eabi tools, telnet, tftp, gitk, diffuse, hexedit are desired.
This is why pi-gen was used to get the system up quickly.

The target system is Linux based since the Linux firmware plus the kernel7.img or kernel.img are what make ultibo run on the RPi hardware.
We currenty have a Lazarus/FPC executeable that runs on Windows System.
This still requires the binutils and arm-none-eabi compiler.



Tool used to create the raspberrypi.org Raspbian images. The Debian packages plus Lazarus IDE (Ultibo Edition) which was created with ***utiboinstaller.sh*** *script and put in* ***ultibo2fc3634.tgz.***
The file stage4/02-extrase/01-run.sh installs the ultibo tree in rootfs /home/pi.

```
#!/bin/bash -e

tar xfz files/ultibo2fc3634.tgz -C ${ROOTFS_DIR}/home/pi/
chown 1000:1000 ${ROOTFS_DIR}/home/pi/ultibo -Rv
cp files/ultibo.desktop ${ROOTFS_DIR}/home/pi/.local/share/applications
chown 1000:1000 ${ROOTFS_DIR}/home/pi/.local/share/applications/ultibo.desktop
cp ${ROOTFS_DIR}/etc/dphys-swapfile ${ROOTFS_DIR}/etc/dphys-swapfile.orig
sed s/100/1000/ < ${ROOTFS_DIR}/etc/dphys-swapfile.orig > ${ROOTFS_DIR}/etc/dphys-
swapfile
```

The file stage4/00-install-packages/02-packages

```
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
diffuse
gitk
tcl-dev
telnet
tftp
hexedit
cmake
flex
bison

The packages above provide the dependencies for Lazarus IDE (Ultibo Edition) and tools needed to connect with Ultibo bare metal systems and transfer kernel7.img or kernel.img.

Creating the boot & rootfs in zip file that can be transferred to the micro sd card:
This requred several steps found in ***Appendix A: Notes during pi-gen testing***

Testing creating multple micro sd cards

date > t1.txt; gzip -dc image_2018-03-20-RaspbianUltibo.zip | dd bs=16M of=/dev/sdb; date >> t1.txt
gzip: image_2018-03-20-RaspbianUltibo.zip: invalid compressed data--length error
gzip: image_2018-03-20-RaspbianUltibo.zip: invalid compressed data--length error
0+147301 records in
0+147301 records out
7730102272 bytes (7.7 GB, 7.2 GiB) copied, 1035.77 s, 7.5 MB/s

Thu Feb 15 17:37:09 MST 2018
Thu Feb 15 17:54:25 MST 2018

date > t2.txt; gzip -dc image_2018-03-20-RaspbianUltibo.zip | dd bs=16M of=/dev/sdc; date >> t2.txt
gzip: image_2018-03-20-RaspbianUltibo.zip: invalid compressed data--length error
0+130267 records in
0+130267 records out
7730102272 bytes (7.7 GB, 7.2 GiB) copied, 1189.3 s, 6.5 MB/s

Thu Feb 15 17:37:17 MST 2018
Thu Feb 15 17:57:06 MST 2018

date > t3.txt; gzip -dc image_2018-03-20-RaspbianUltibo.zip | dd bs=16M of=/dev/sdd; date >> t3.txt
gzip: image_2018-03-20-RaspbianUltibo.zip: invalid compressed data--length error
0+115177 records in
0+115177 records out
7730102272 bytes (7.7 GB, 7.2 GiB) copied, 1103.39 s, 7.0 MB/s

Thu Feb 15 17:37:27 MST 2018
Thu Feb 15 17:55:50 MST 2018
Three micro sd card were created in 18 mins..

Comparing number files needed for VideoCore Apps Raspbian & Ultibo.

Ultibo only requires a few files.
bootcode.bin
start.elf
fixup.dat

kernel.img RPi Zero or kernel7.img (RPi2B or RPi3B)

test.h264 needed for hello_videocube.bin

Several thousand files are needed with an O/S
Below are the numbers of the main directories.

/usr/bin
1 directory, 1411 files
/usr/lib
3632 directories, 33202 files
sudo su
First need to compile the libraries
cd /opt/vc/src/hello_pi/libs/ilclient
make
cd /opt/vc/src/hello_pi/libs/vgfont
make

Next compile and test the apps

cd ../../hello_videocube/
make
./hello_videocube.bin

cd ../hello_tiger/
make
./hello_tiger.bin

The following 4 images were complied on Rpi2B for a Rpi Zero. The first 2 are 2D image of Rotating Tiger and 3rd & 4th are of a Rotating cube.

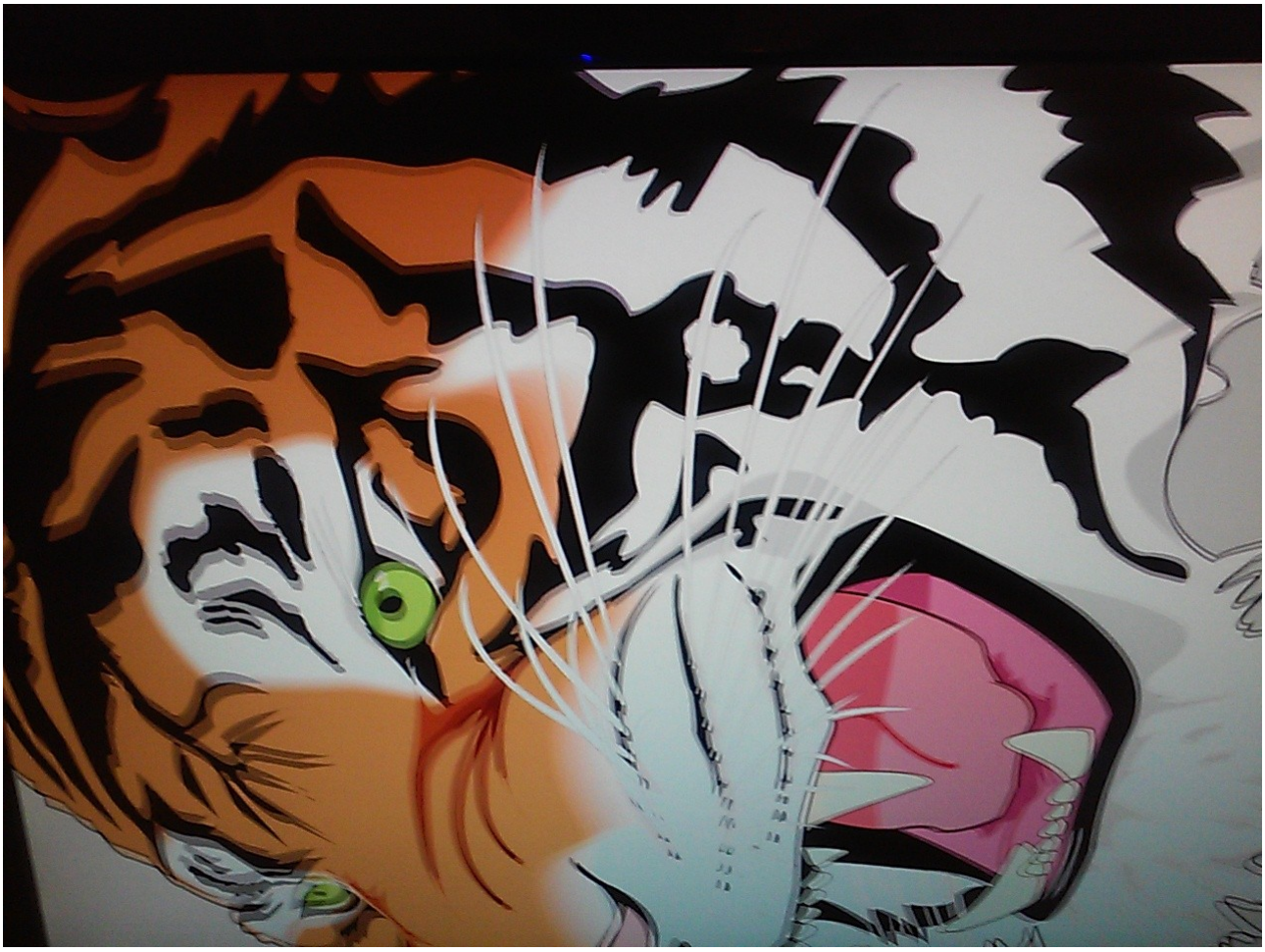


Image 1

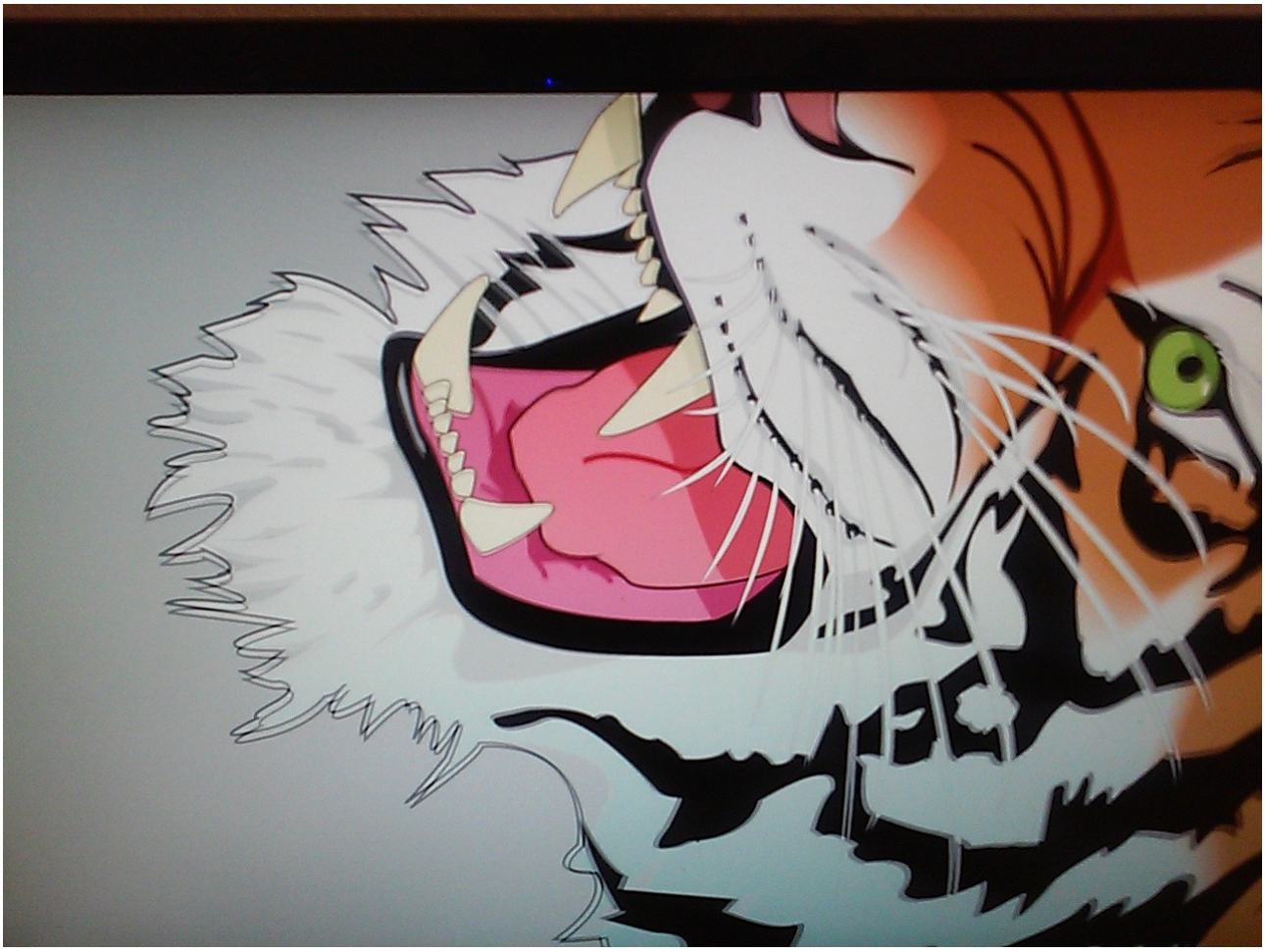


Image 2

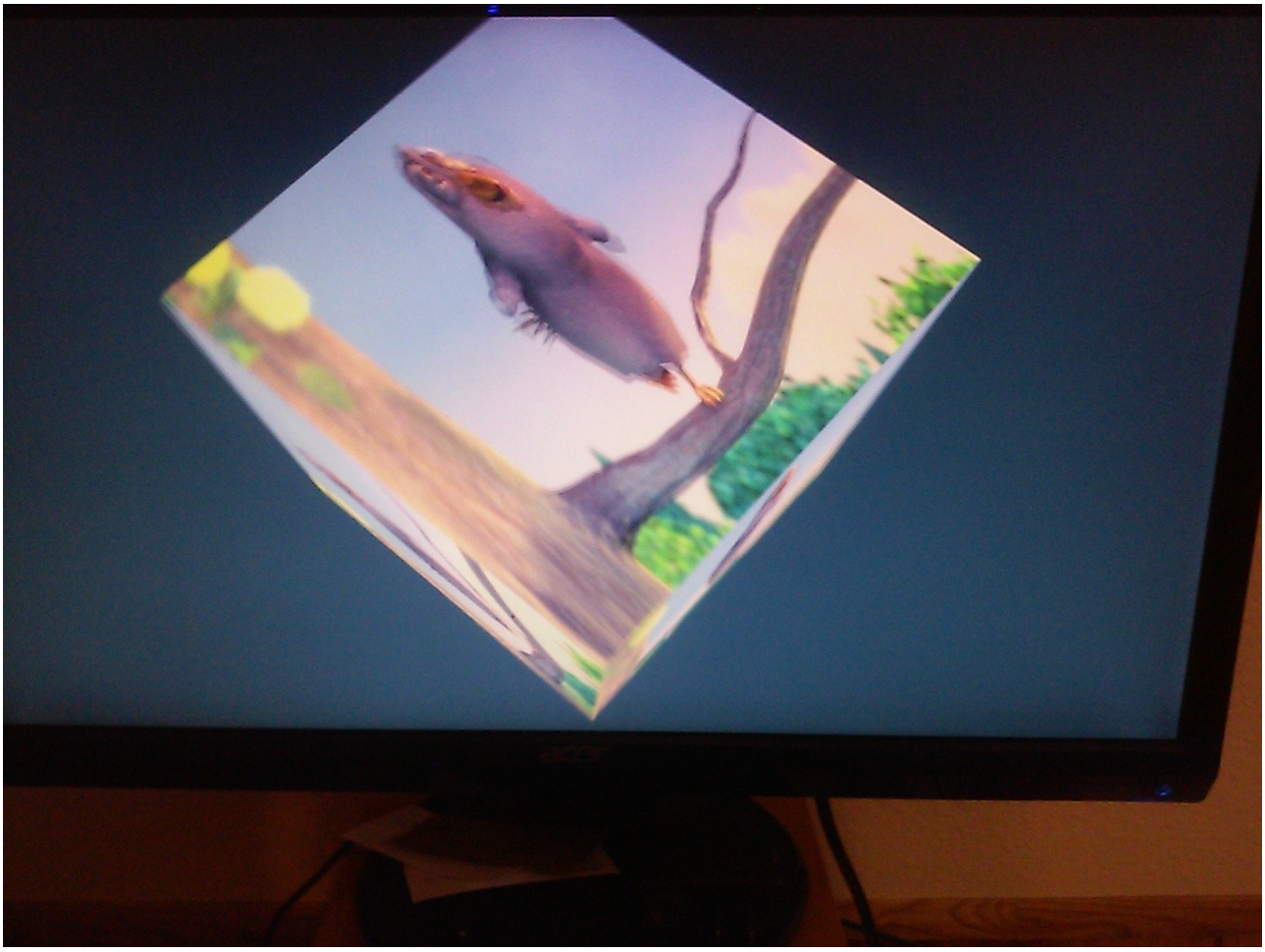


Image 3

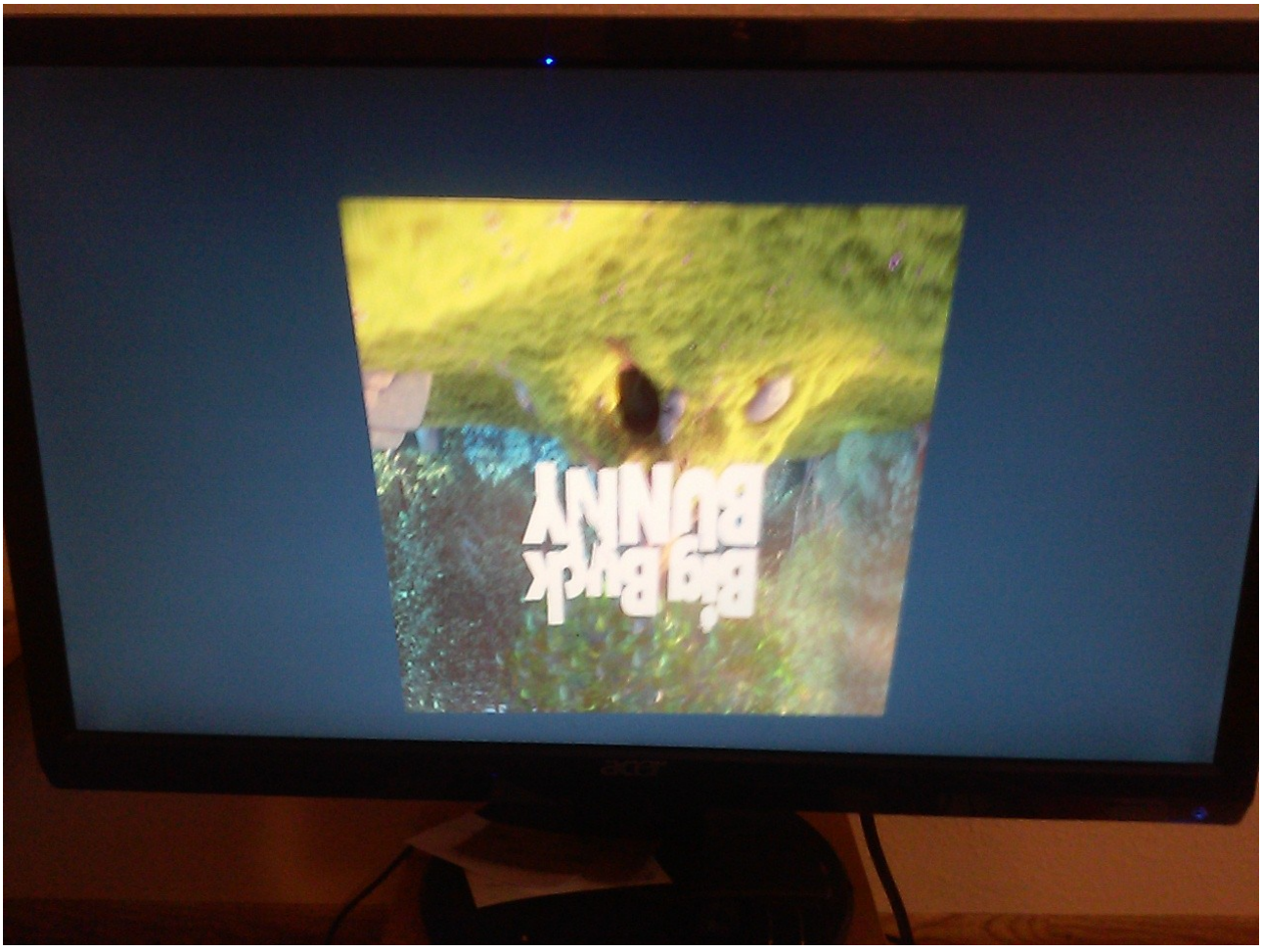


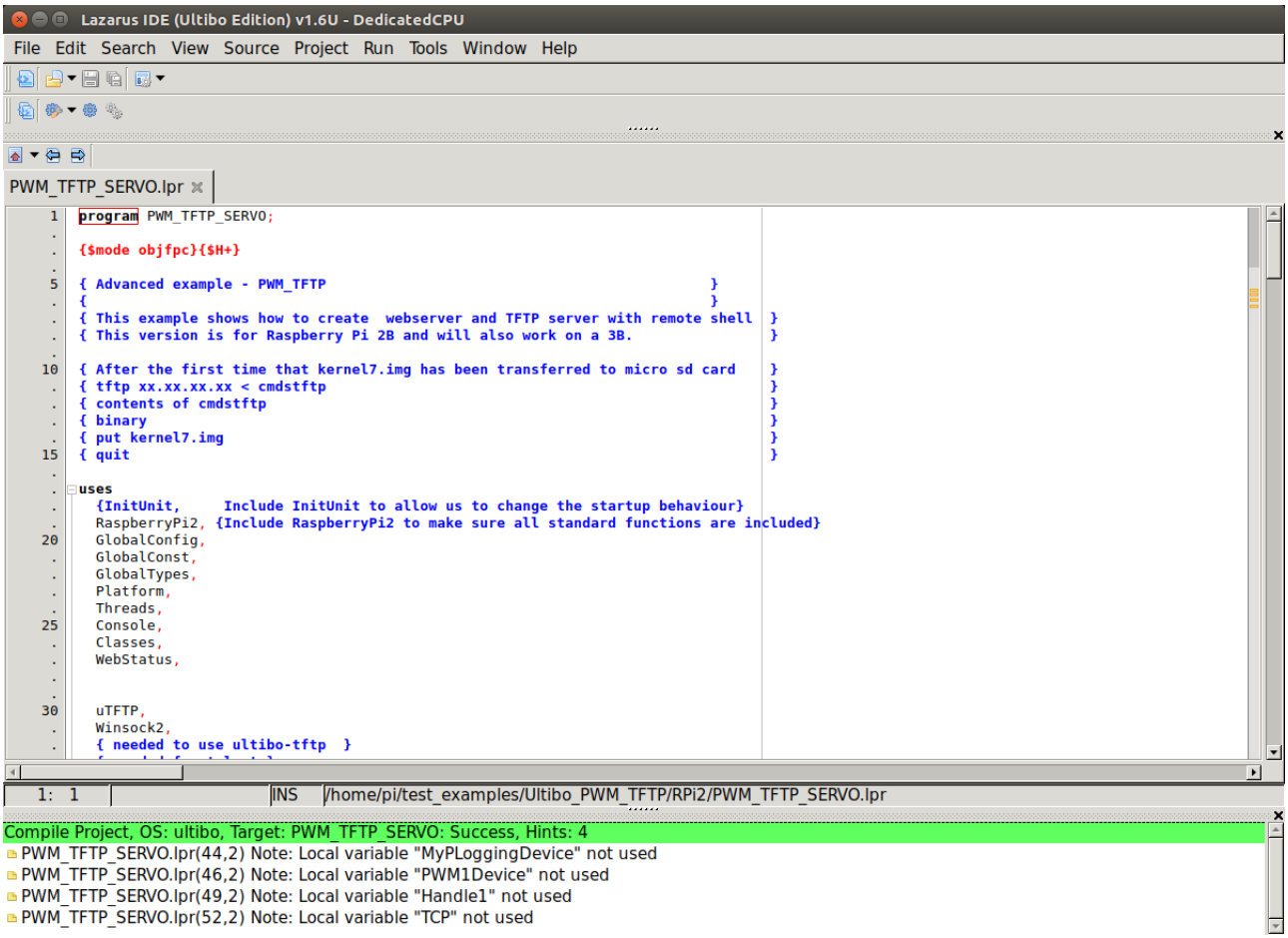
Image 4
Testing:
pi@raspberrypi:~ $ ***mkdir test_examples***
pi@raspberrypi:~ $ ***cd test_examples/***
pi@raspberrypi:~/test_examples $ ***git clone https://github.com/develone/Ultibo_PWM_TFTP.git***

note
pi@raspberrypi:~ $ ***ultibo/core/startlazarus*** was the command used to start the Lazarus IDE (Ultibo Edition).
This was required since a tar file ***-rw-r--r-- 1 vidal vidal 329724698 Feb 7 17:19 ultibo.tgz*** was used to install lazarus
pi@raspberrypi:~ $ time tar xfz ultibo.tgz

real 5m0.582s
user 1m24.990s
sys 0m44.640s
ultibo
2123 directories, 32499 files

From the Raspberry Pi/Programming/Lazarus IDE (Ultibo Edition)

If the PWM_TFTP_SERVO project was the current project Run/Compile

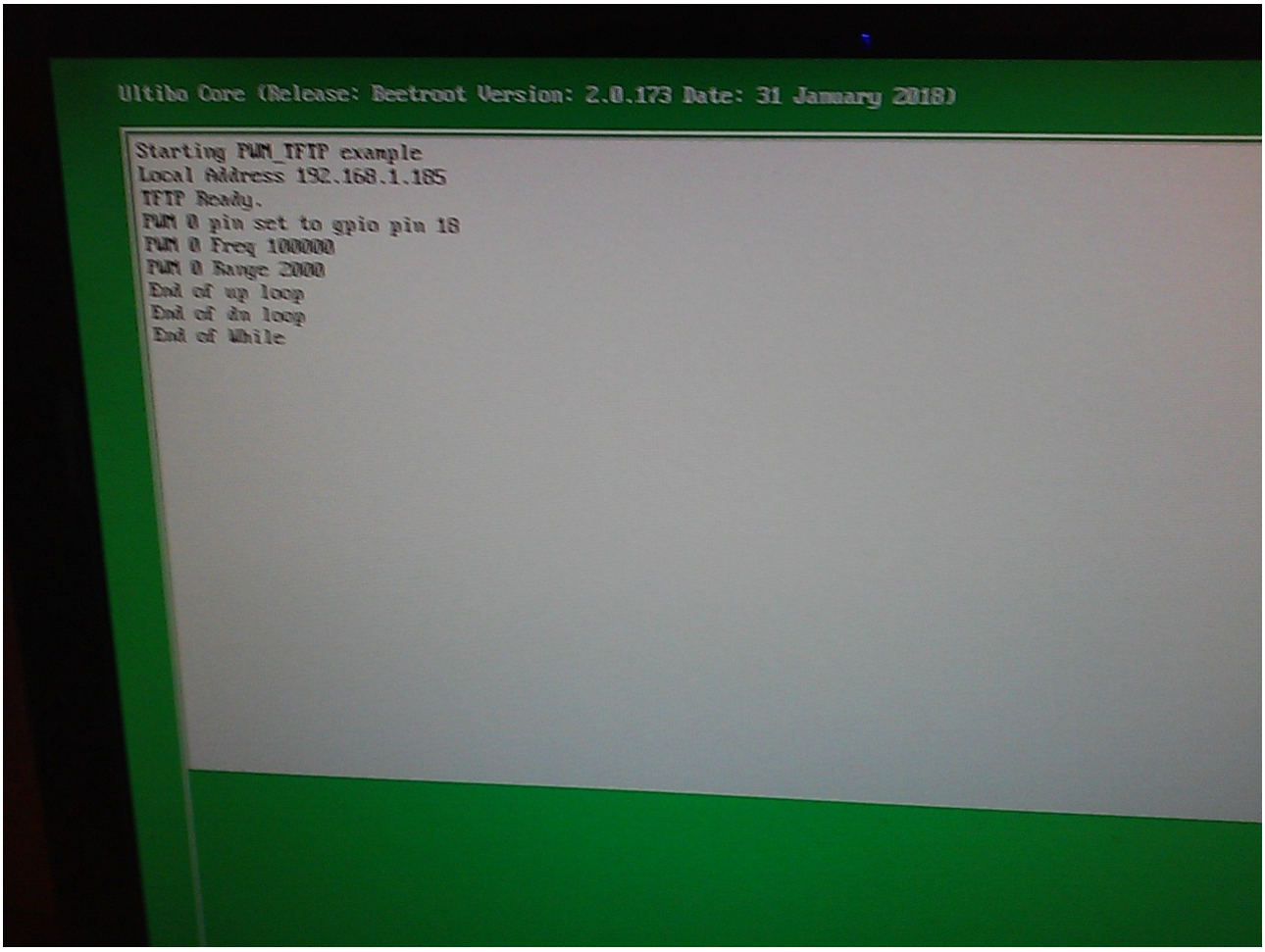


Success Compile
If the compile works without errors a green bar wil appear as seen above.

Transferring the kernel7.img and firmware files displays the following when booting.
-

-

The Core was updated
~~ULTIBO_RELEASE_DATE = '31 January 2018';~~
~~ULTIBO_RELEASE_NAME = 'Beetroot';~~
~~ULTIBO_RELEASE_VERSION = '2.0.173';~~
ULTIBO_RELEASE_DATE = '19 March 2018';
ULTIBO_RELEASE_NAME = 'Beetroot';
ULTIBO_RELEASE_VERSION = '2.0.235';
The recently built target matches the values found in ultibo/core/fpc/source/rtl/ultibo/core/globalconst.pas



pi@raspberrypi:~/test_examples/Ultibo_PWM_TFTP/RPi2 $ cp kernel7.img /media/pi/6FCF-2BFD/

Rpi-Zero
prior to boot installed ultiboinstaller.sh and modified the dphys-swapfile

cd /media/vidal/rootfs/home/pi
cp /home/vidal/raspbian-pi-gen/ultiboinstaller.sh .
cd ../cd etc/
cp dphys-swapfile dphys-swapfile.orig

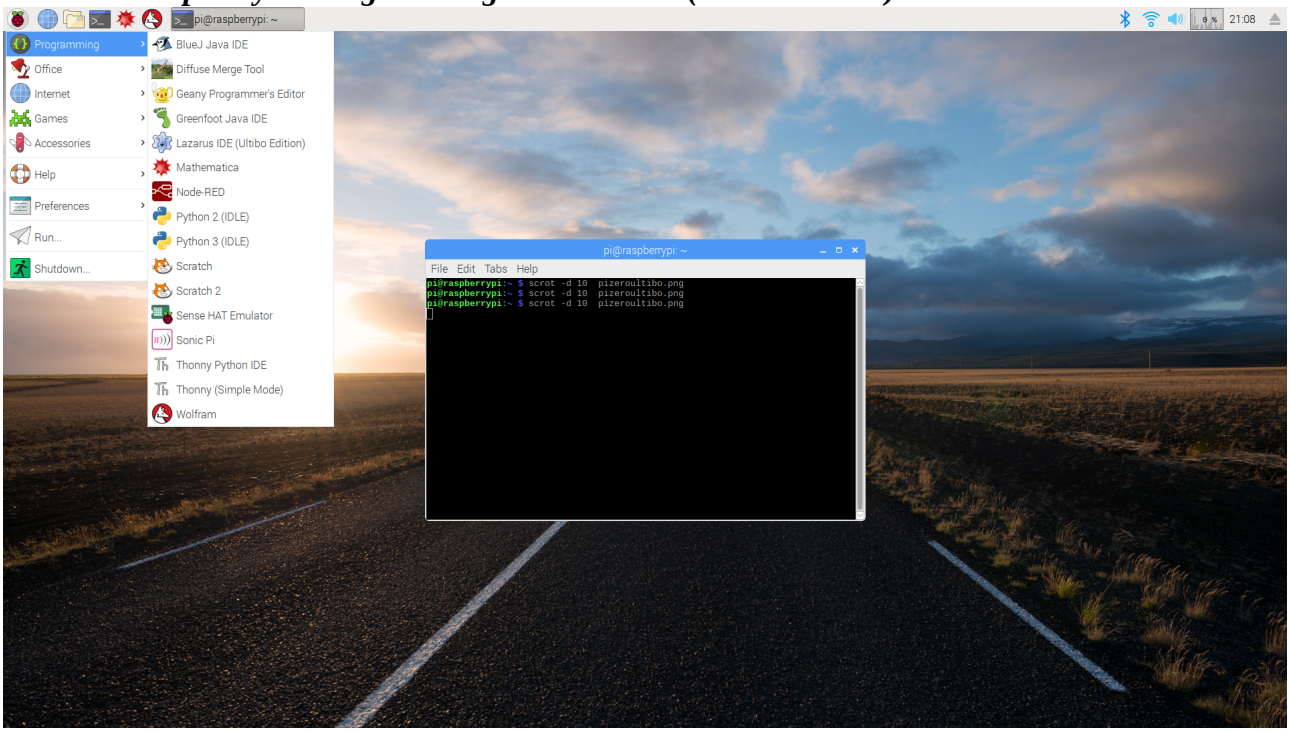
nano dphys-swapfile
diff dphys-swapfile dphys-swapfile.orig
16c16
< CONF_SWAPSIZE=1000

> CONF_SWAPSIZE=100

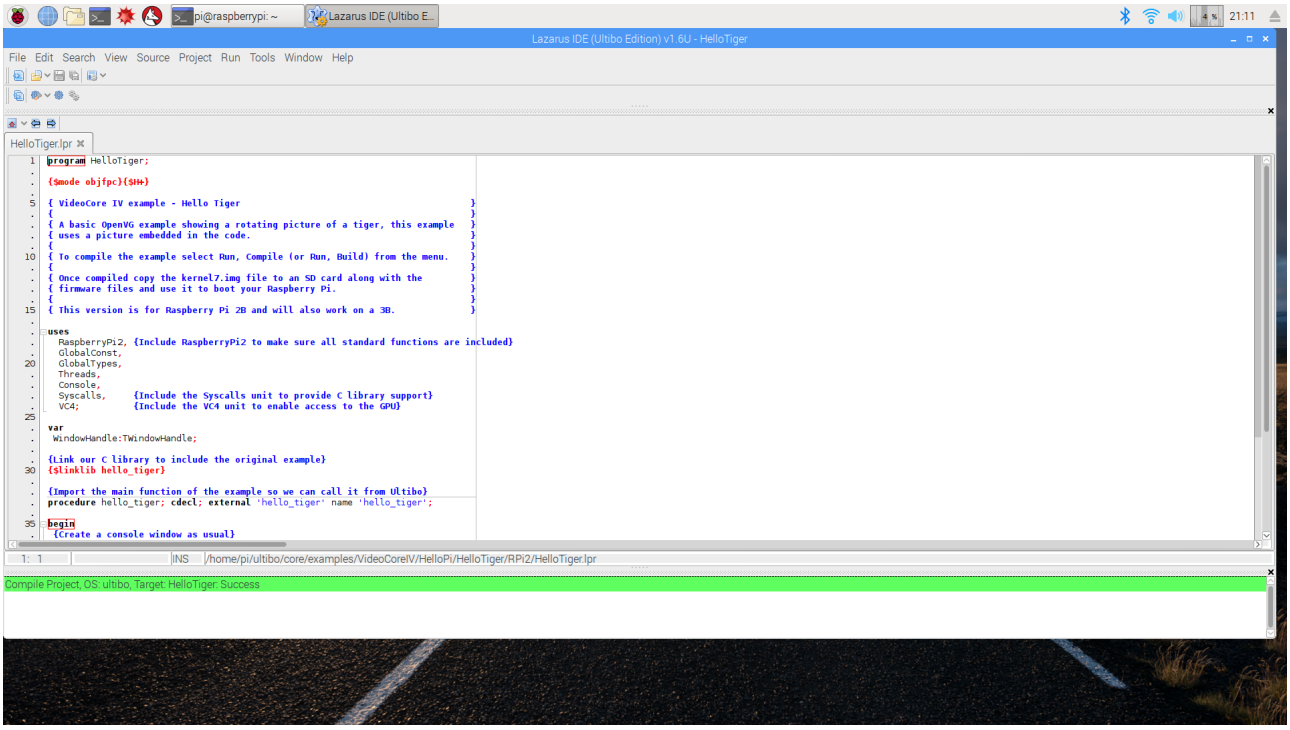
See the first_boot document on booting the Raspbina Ultibo micro-sd-card..

Rpi-Zero Starting Lazarus

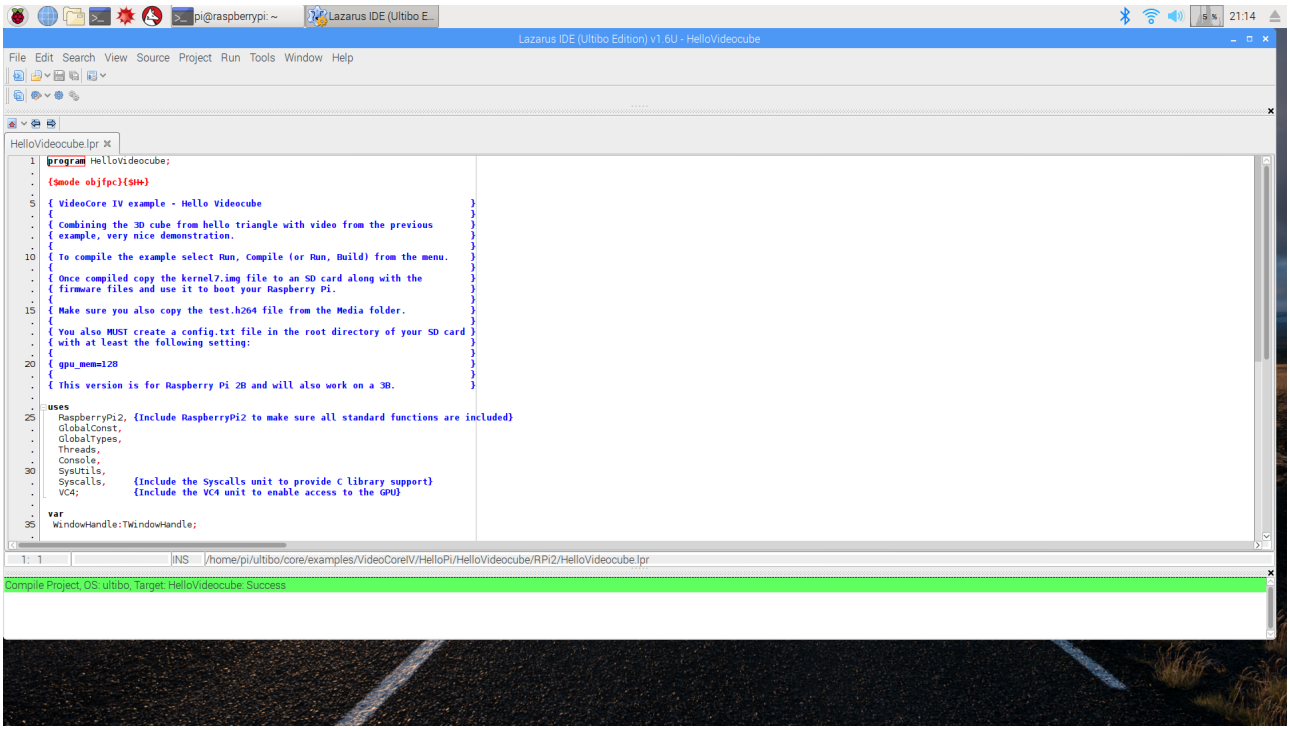
From the Raspberry Pi/Programming/Lazarus IDE (Ultibo Edition)



Starting Lazarus



Compiling HelloTiger on Rpi-Zero
Success Compile
If the compile works without errors a green bar wil appear as seen above.
pi@raspberrypi:~/ultibo/core/examples/VideoCoreIV/HelloPi/HelloTiger/RPi2 $ cp kernel7.img /media/pi/6FCF-2BFD/



Compiling HelloVideocube on Rpi-Zero
Success Compile
If the compile works without errors a green bar wil appear as seen above.

pi@raspberrypi:~/ultibo/core/examples/VideoCoreIV/HelloPi/HelloVideocube/RPi2 $ cp kernel7.img /media/pi/6FCF-2BFD/
pi@raspberrypi:~/ultibo/core/examples/VideoCoreIV/HelloPi/Media $ cp test.h264 /media/pi/6FCF-2BFD/

Both of examples created on the Rpi Zero ran correctly with on a few files running Ultibo.

Note:
Even on the RRI Zero the compile was very quick for the HelloTiger & HelloVideocube projects.

Appendix A: Notes during pi-gen testing

pi-gen Tool used to create the raspberrypi.org Raspbian images.

Forked pi-gen https://github.com/RPi-Distro/pi-gen
commit 066eb03d52868290661e813738a9a66eda263aa9
Author: Ben Pirt <ben@pirt.co.uk>
Date: Wed Jan 3 12:48:31 2018 +0000

    Allow image building to be skipped for stages (#137)

pi-gen
GitHub - RPi-Distro/pi-gen: Tool used to create the raspberrypi.org ...
https://github.com/RPi-Distro/pi-gen

README.md. pi-gen. Tool used to create the raspberrypi.org Raspbian images.
Dependencies. pi-gen runs on Debian based operating systems. Currently it
is only supported on either Debian Stretch or Ubuntu Xenial and is known
to have issues building on earlier releases of these systems. To install
the required

On a Ubuntu 16.04 added pi-gen dependencies.
sudo apt-get install quilt parted realpath qemu-user-static debootstrap zerofree pxz zip dosfstools bsdtar libcap2-bin grep rsync xz-utils

Linux sim2 4.4.0-112-generic #135-Ubuntu SMP Fri Jan 19 11:48:36 UTC 2018 x86_64 x86_64 x86_64 GNU/Linux
AMD FX(tm)-4130 Quad-Core Processor
cpu MHz : 1800.000

Steps create the pi-gen/work/2018-02-07-RaspbianUltibo tree.

1.0)
git clone https://github.com/develone/pi-gen.git
2.0)
cd pi-gen/
3.0)
cp ~/raspbian-pi-gen/config .
Added a file pi-gen/config

#!/bin/bash
export IMG_NAME=RaspbianUltibo
4.0)***Appendix***
cp ~/raspbian-pi-gen/stage4/00-install-packages/02-packages stage4/00-install-packages/
5.0)
~~cp ~/raspbian-pi-gen/ultibo_laz_fpc/ultibo94af3cb.tgz ~/pi-gen/stage4/02-extras/files~~
cp ~/raspbian-pi-gen/ultibo_laz_fpc/ultibo2fc3634.tgz ~/pi-gen/stage4/02-extras/files
Note: The file raspbian-pi-gen/ultibo_laz_fpc/ultibo2fc3634.tgz is not
in the rasbian-pi-gen repository due to the size of the tar file.
331297115 Feb 14 13:32 ultibo2fc3634.tgz
md5sum
~~***e3b54b45689a14e67440f4ea428efc5a ultibo94af3cb.tgz***~~
a2b796d36aee271655e80ea088214ea2 ultibo2fc3634.tgz
Adding the script in stage4/02-extras that un tar the ultibo tree which provides
lazarus. Uses the file ultibo2fc3634.tgz
Adding the short cut to start Lazarus
6.0.)
cp ~/raspbian-pi-gen/ultibo.desktop stage4/02-extras/files/
7.0)
cp ~/raspbian-pi-gen/stage4/02-extras/01-run.sh ~/pi-gen/stage4/02-extras/
new for ver 03/20/18 the file /etc/dphys-swapfile
< CONF_SWAPSIZE=100

> CONF_SWAPSIZE=1000
8.0)
date > t1.txt; ./build.sh ; date >> t1.txt
~~Wed Feb 21 08:14:23 MST 2018~~
~~Wed Feb 21 11:30:34 MST 2018~~
Tue Mar 20 17:47:38 MDT 2018
Tue Mar 20 20:49:01 MDT 2018
Note: The 3 hours and 16 min could be reduced with the use of local repository.
du -s local-apt-repo/
***1513164	local-apt-repo/***
The download of required packages takes considerable time.
9.0)
cd deploy/
10.0)
fdisk /dev/sdb
11.)
date > t1.txt; gzip -dc image_2018-03-20-RaspbianUltibo.zip | dd bs=16M of=/dev/sdb; date >> t1.txt
0+165834 records in
0+165834 records out
7730102272 bytes (7.7 GB, 7.2 GiB) copied, 696.3 s, 11.1 MB/s
Wed Feb 21 11:40:20 MST 2018
Wed Feb 21 11:56:51 MST 2018

The stretch build has 1313 pkgs installed
~~The 2018-02-21-RaspbianUltibo build has 1427 pkgs installed~~
The 2018-03-20-RaspbianUltibo build has 1434 pkgs installed

ssh -Y pi@192.168.1.185

uname -a
Linux raspberrypi 4.9.59-v7+ #1047 SMP Sun Oct 29 12:19:23 GMT 2017 armv7l GNU/Linux

Filesystem 1K-blocks Used Available Use% Mounted on
/dev/root 30596716 7078208 22182604 25% /
devtmpfs 443792 0 443792 0% /dev
tmpfs 448400 0 448400 0% /dev/shm
tmpfs 448400 17236 431164 4% /run
tmpfs 5120 4 5116 1% /run/lock
tmpfs 448400 0 448400 0% /sys/fs/cgroup
/dev/mmcblk0p1 41868 21328 20540 51% /boot
tmpfs 89680 0 89680 0% /run/user/1000
Testing new build with the dependencies need to install the Lazaraus/FPC

Added a file pi-gen/stage4/00-install-packages/02-packages
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
diffuse
gitk
tcl-dev
telnet
tftp
hexedit
cmake
flex
bison

./build.sh
Creates the pi-gen/work/2018-03-20-RaspbianUltibo tree.
vidal@sim2:~$ ls pi-gen/work/2018-03-20-RaspbianUltibo/stage0/rootfs/var/cache/apt/archives/*.deb | wc
220 220 15327
vidal@sim2:~$ ls pi-gen/work/2018-03-20-RaspbianUltibo/stage1/rootfs/var/cache/apt/archives/*.deb | wc
15 15 1613
vidal@sim2:~15 15 1043$ ls pi-gen/work/2018-03-20-RaspbianUltibo/stage2/rootfs/var/cache/apt/archives/*.deb | wc
214 214 15221
vidal@sim2:~$ ls pi-gen/work/2018-03-20-RaspbianUltibo/stage3/rootfs/var/cache/apt/archives/*.deb | wc
427 427 30630
vidal@sim2:~$ ls pi-gen/work/2018-03-20-RaspbianUltibo/stage4/rootfs/var/cache/apt/archives/*.deb | wc
536 536 38434
vidal@sim2:~$ ls pi-gen/work/2018-03-20-RaspbianUltibo/stage5/rootfs/var/cache/apt/archives/*.deb | wc

9 9 664
1427 packages are required