

X-Window & Networking

Goal: Accessing 1 of 5 RPi4B from the Over the Internet with graphical displays

- Examples graphical displays
 - Geany editor
 - Octave matlab like program
 - Gtkwave VCD viewer
 - Mousepad editor
 - GIMP
 - Lazarus IDE (Ulitobo Editor)
 - Bare metal for Pi
 - QEMU, Rpi Zero, RPi3B+, RPi4, and CM4

Internet

RPi3B+ 1Gb
162.197.186.179
pi4-40

pass-thru



ATT Router

RPi4B 4Gb



192.168.1.212
pi4-50

RPi4B 4Gb



192.168.1.211
pi4-30

RPi4B 4Gb



192.168.1.245
pi4-60

RPi4B 4Gb



192.168.1.229
pi4-27

RPi5 8Gb



192.168.1.93
pi5-70

RPi3B+ 1Gb



192.168.1.231
pi4-37

Century Link
192.168.14.
1

RPi ZeroW



192.168.1.235
wiiflxtender

Century
Link6

```
sudo route add -net 192.168.32 netmask 255.255.255.0 gw 192.168.1.235 eth0  
sudo route add -net 192.168.42 netmask 255.255.255.0 gw 192.168.1.235 wlan0
```

RPi4B 4Gb



192.168.42.116
pi4-20

RPi3B+ 1Gb



192.168.42.119
pi4-3

Century Link4
192.168.16.1

Century
Link3
192.168.12.
1

Internet

TMO-G4AR.lan
192.168.12.1



T-Mobile Router

RPi5 8Gb



192.168.12.208
pi5-70

RPi3B+ 1Gb



192.168.1.231
pi4-37

RPi5 8Gb



192.168.12.237
pi5-80

RPi5 8Gb



192.168.12.196
pi5-90

RPi4B 4Gb



192.168.1.212
pi4-50

RPi4B 4Gb



192.168.1.211
pi4-30

RPi4B 4Gb



192.168.1.245
pi4-60



192.168.1.229
pi4-27

Century Link
192.168.14.
1

RPi ZeroW



192.168.1.235
wilfixtender

Century
Link6

```
sudo route add -net 192.168.32 netmask 255.255.255.0 gw 192.168.1.235 eth0  
sudo route add -net 192.168.42 netmask 255.255.255.0 gw 192.168.1.235 wlan0
```

RPi4B 4Gb



192.168.42.116
pi4-20

RPi3B+ 1Gb



192.168.42.119
pi4-3

Century Link4
192.168.16.1

Century
Link3
192.168.12.
1

Internet



TMO-G4AR.lan
192.168.12.1

T-Mobile Router

RPi5 8Gb



192.168.12.208
pi5-70

RPi ZeroW



192.168.12.141
widiextender

RPi5 8Gb



192.168.12.237
pi5-80

RPi5 8Gb



192.168.12.196
pi5-90

RPi4 4Gb



192.168.12.141
remote-vpn

RPi4 4Gb



192.168.42.116
Pi4-20



Internet

RPi3B+ 1Gb
162.197.186.179
pi4-40

pass-thru



ATT Router

RPi4B 4Gb



192.168.1.212
pi4-50

RPi4B 4Gb



192.168.1.230
pi4-30

RPi4B 4Gb



192.168.1.218
pi4-2

RPi4B 4Gb



192.168.1.229
pi4-27

RPi5 8Gb



192.168.1.93
pi5-70

RPi5 8Gb



192.168.1.240
pi5-80

RPi5 8Gb



192.168.1.253
pi5-90

Century Link
192.168.14.
1

RPi ZeroW



```
sudo route add -net 192.168.42.0 netmask 255.255.255.0 gw 192.168.1.235 eth0  
sudo route add -net 192.168.42.0 netmask 255.255.255.0 gw 192.168.1.235 wlan0
```

192.168.1.235
wiiflxtender

RPi4B 4Gb



192.168.42.116
pi4-20

RPi3B+ 1Gb



192.168.42.119
pi4-3

RPi3B+ 1Gb



192.168.42.105
pi4-37

Century Link4
192.168.16.1

Century
Link3
192.168.12.
1

Century
Link6
192.168.32.
1

```
devel@pi5-90:~ $ ./scripts-rpi/route/2nd_level-tmo.sh
```

```
Kernel IP routing table
```

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
default	TMO-G4AR.lan	0.0.0.0	UG	600	0	0	wlan0
192.168.12.0	0.0.0.0	255.255.255.0	U	600	0	0	wlan0
192.168.42.0	wifiextender.la	255.255.255.0	UG	0	0	0	wlan0

```
SIOCADDRT: File exists
```

```
Kernel IP routing table
```

Destination	Gateway	Genmask	Flags	Metric	Ref	Use	Iface
default	TMO-G4AR.lan	0.0.0.0	UG	600	0	0	wlan0
192.168.12.0	0.0.0.0	255.255.255.0	U	600	0	0	wlan0
192.168.42.0	wifiextender.la	255.255.255.0	UG	0	0	0	wlan0

```
devel@pi5-90:~ $ traceroute 192.168.42.116
```

```
traceroute to 192.168.42.116 (192.168.42.116), 30 hops max, 60 byte packets
```

```
1 wifiextender.lan (192.168.12.141) 77.323 ms 77.362 ms 77.354 ms
2 pi4-20 (192.168.42.116) 77.347 ms 77.405 ms 77.399 ms
```


pi4-50

Pico_w Zone1

remote1 192.168.1.160

remote3 192.168.1.178

remote4 192.168.1.177

remote5 192.168.1.168

remote6 192.168.1.175

pi4-37

Pico_w Zone2

SSID Century Link6

remote5 192.168.32.106

pi4-20

Pico_w Zone3

SSID Century Link4

remote5 192.168.16.114

pi4-3

Pico_w Zone4

SSID Century Link3

remote8 192.168.12.120

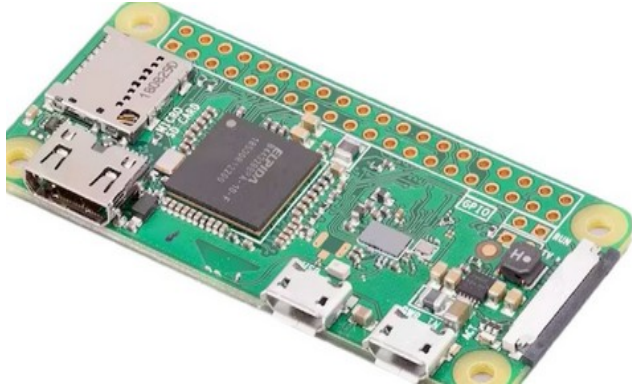
remote9 192.168.12.108

remote7 192.168.12.106

- Run Graphical Application

- Steps Required
 - Need to ssh to
- LAN Home RPi3B+ on 162.197.186.xx
- Need to ssh to 1 of 5 RPi4B
 -

RPi Models



RPi CM4



RPi3B+

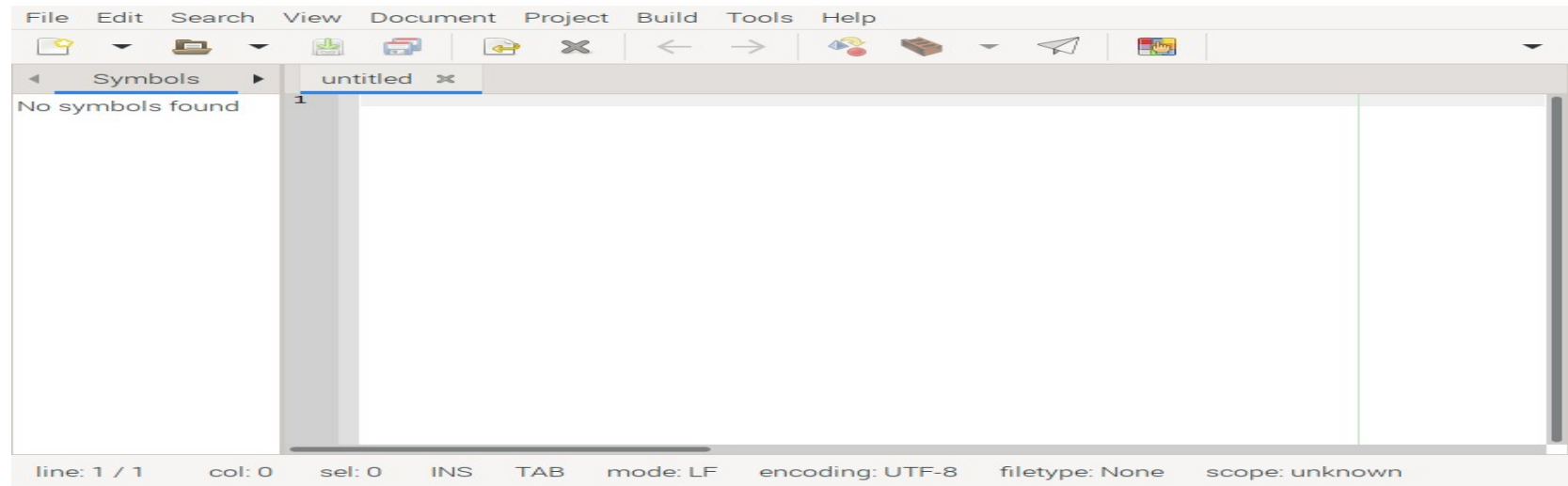


RPi4B



RPi3A

```
File Edit Tabs Help
devel@pi4-20:~/svd_rgb/src $ geany &
[1] 5418
devel@pi4-20:~/svd_rgb/src $
```



```
File Edit Search View Document Project Build Tools Help
No symbols found
disp_S.m x
58 fid = fopen('Sblu.bin','r'); blu = fread(fid, 512, 'float');
59
60 fid = fopen('rcred.bin','r'); im1 = fread(fid, [512,inf], 'int32');
61 fid = fopen('rcgrn.bin','r'); im2 = fread(fid, [512,inf], 'int32');
62 fid = fopen('rcblu.bin','r'); im3 = fread(fid, [512,inf], 'int32');
63
64 aa(1:n)= red(1:n);
65 figure
66 stem(aa)
67 title("n S values red image from C img_svd")
68
69 figure;
70 imagesc(im1);
71 colorbar;
72 colormap 'gray';
73 title 'rcred svd from c'
74
75
76 bb(1:n)= grn(1:n);
77 figure
78 stem(bb)
79 title("n S value green image from C img_svd")
80
81 figure;
82 imagesc(im2);
83 colorbar;
84 colormap 'gray';
85 title 'rcgrn svd from c'
86
```

line: 67 / 101 col: 42 sel: 35 INS TAB mode: LF encoding: UTF-8 filetype: Matlab/Octave scope: unknown

```
File Edit Tabs Help
devel@pi4-20:~/svd_rgb/src $ octave
GNU Octave, version 6.2.0
Copyright (C) 2021 The Octave Project Developers.
This is free software; see the source code for copying conditions.
There is ABSOLUTELY NO WARRANTY; not even for MERCHANTABILITY or
FITNESS FOR A PARTICULAR PURPOSE. For details, type 'warranty'.

Octave was configured for "aarch64-unknown-linux-gnu".

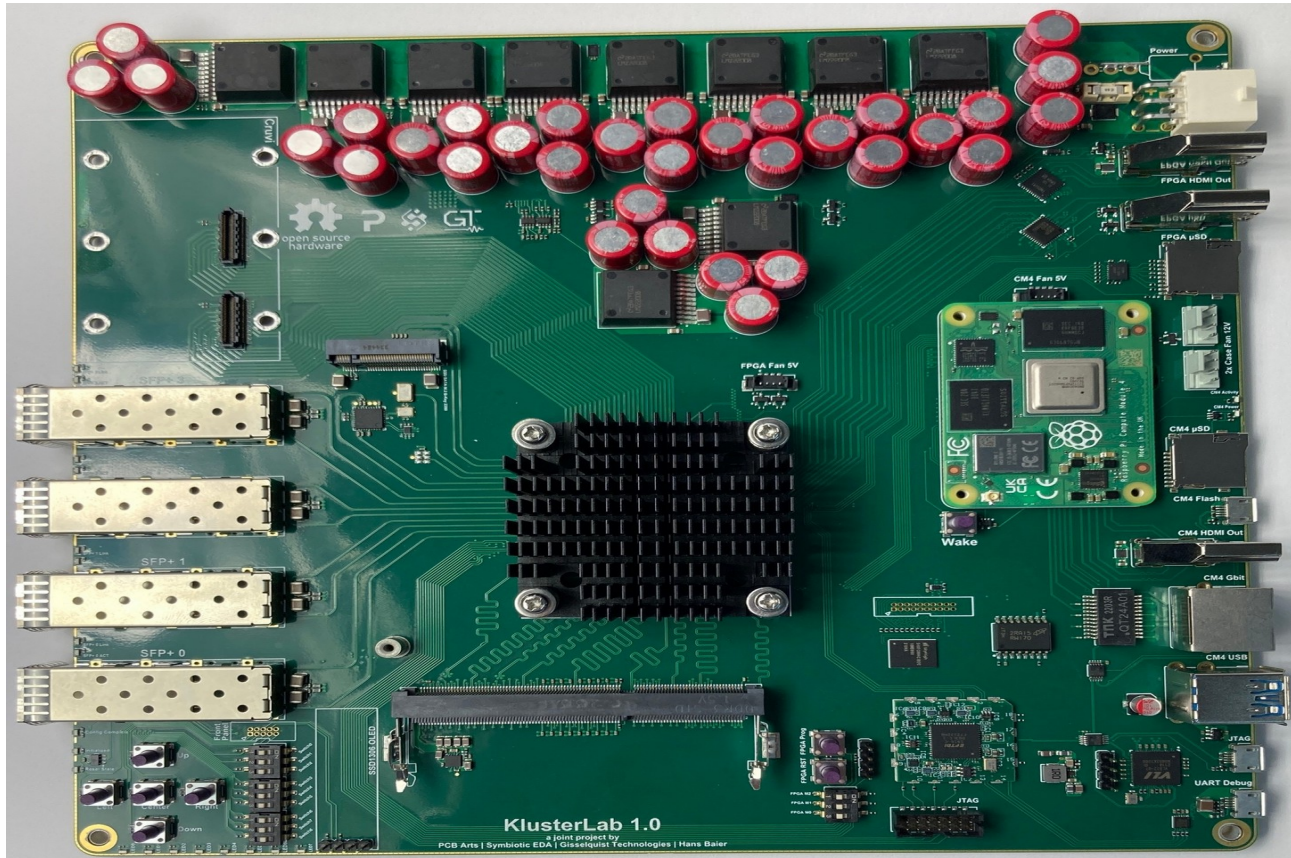
Additional information about Octave is available at https://www.octave.org.

Please contribute if you find this software useful.
For more information, visit https://www.octave.org/get-involved.html

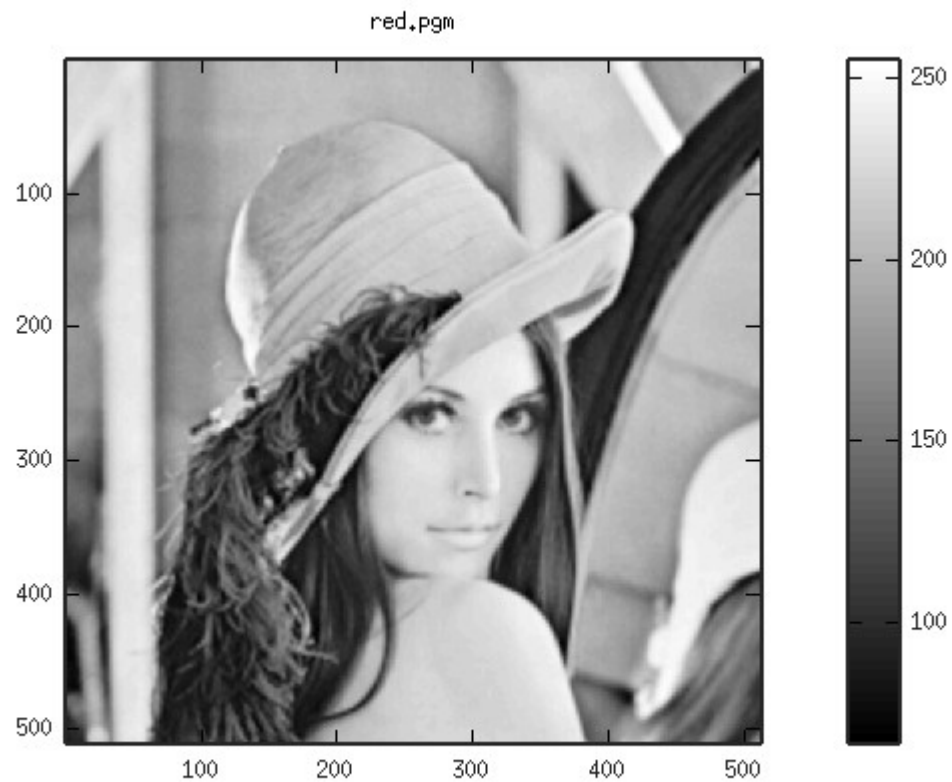
Read https://www.octave.org/bugs.html to learn how to submit bug reports.
For information about changes from previous versions, type 'news'.

octave:1> disp_S
octave:2> 
```


Rpi CM4 with FPGA Kintex-7 160T with 4 Ethernet 10Gb

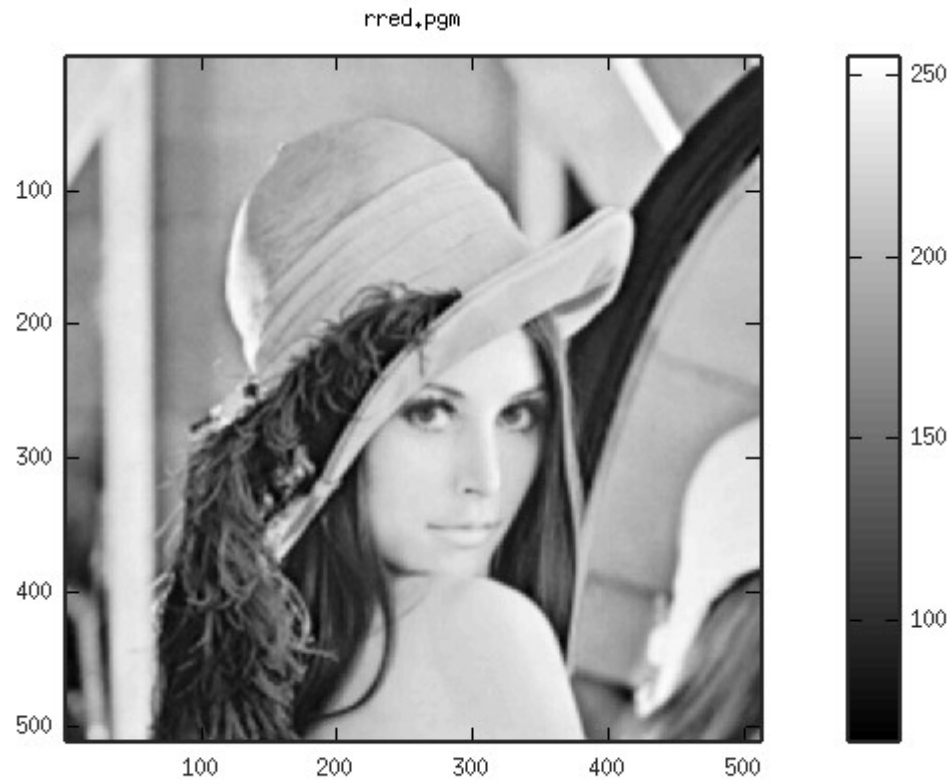


500 x 500 red subband lena



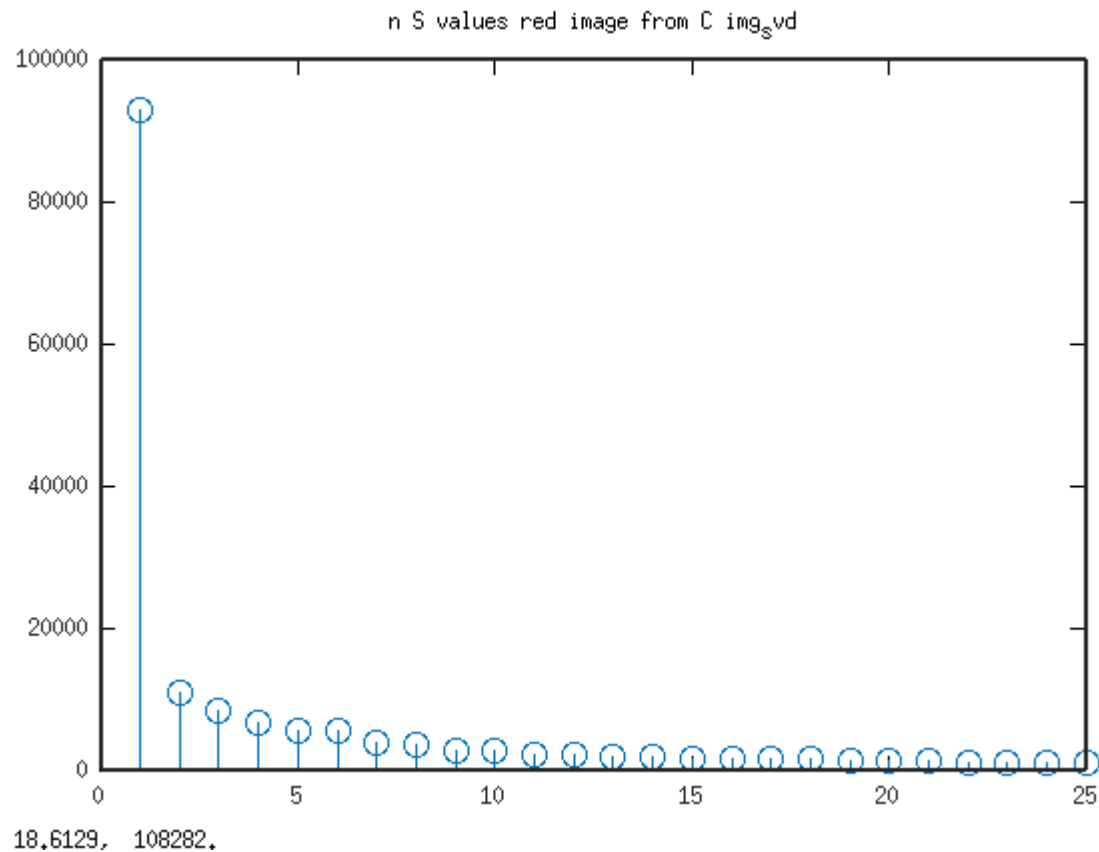
y2= 205,843

500 x 500 red subband lena reconstructed after performing KLT

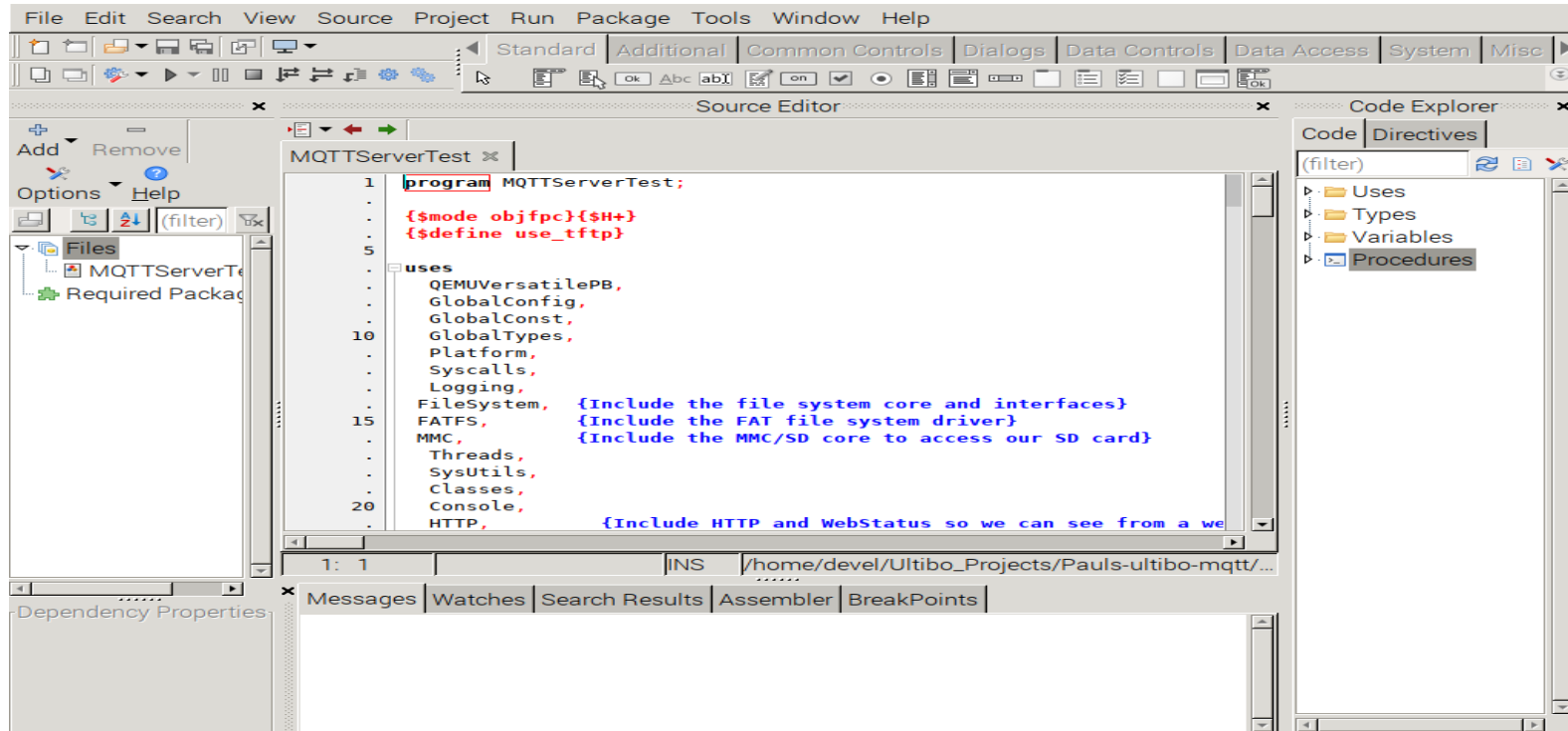


$\mu_2 = 52.8614$

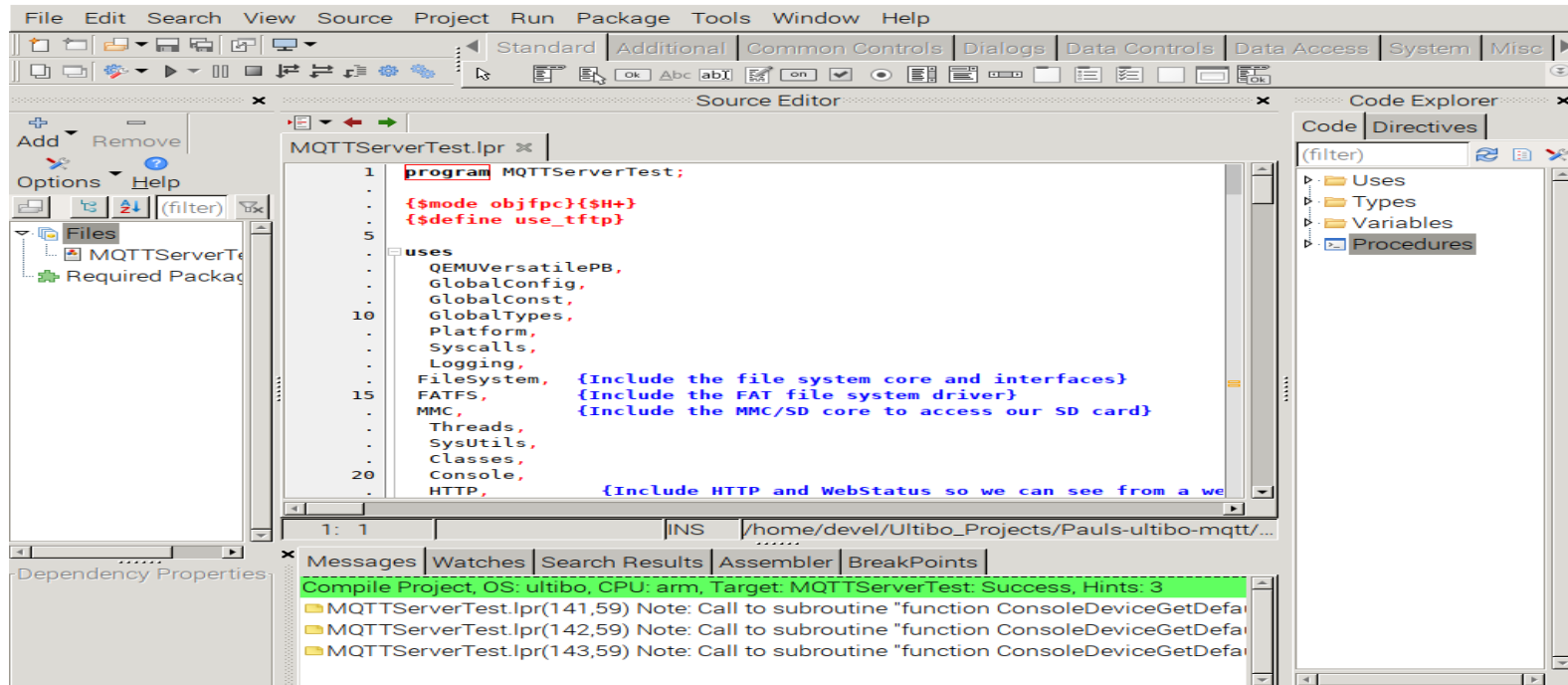
n S values red image from C img_svd



Goal: Accessing 1of 5 RPi4B from the Over the Internet with graphical displays

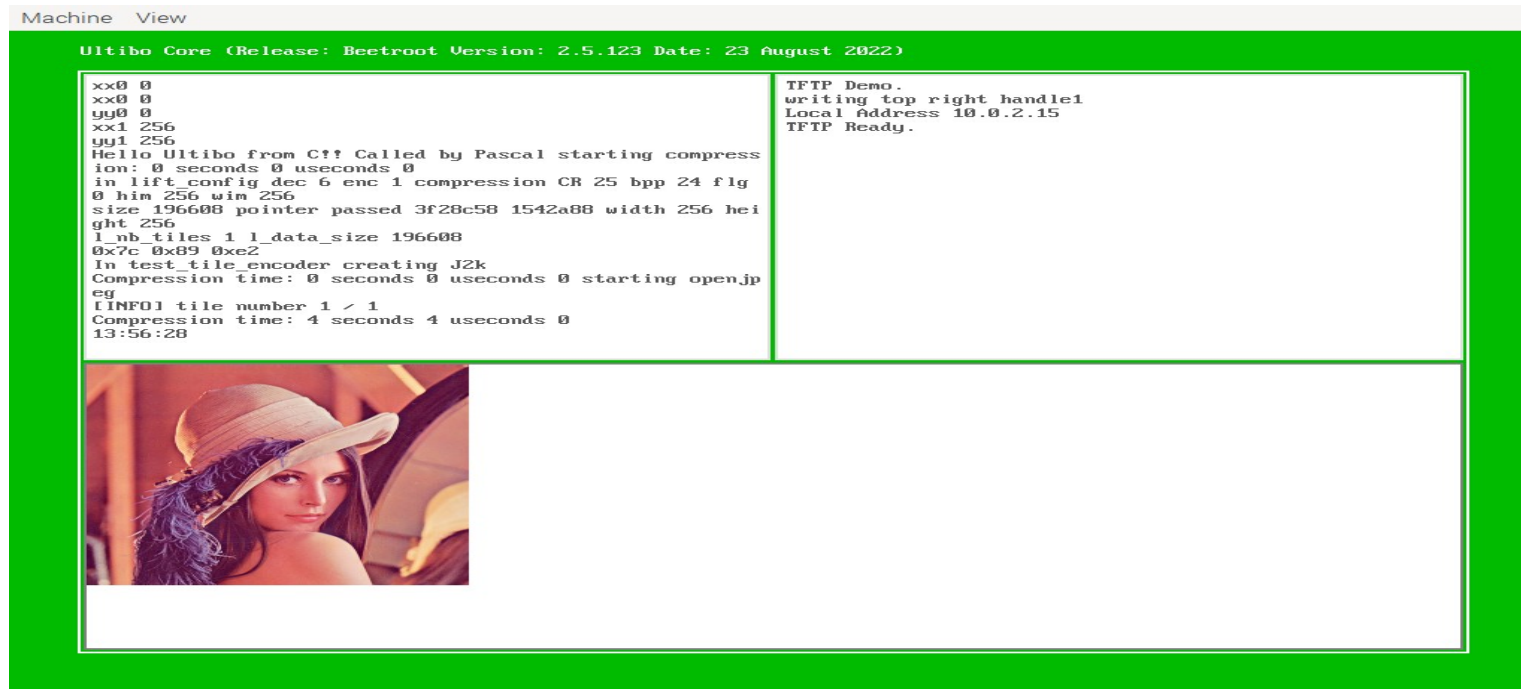


Goal: Accessing 1 of 5 RPi4B from the Over the Internet with graphical displays



Goal: Accessing 1of 5 RPi4B from the Over the Internet with graphical displays

```
devel@pi4-20:~/Ultibo_Projects/jpeg2000/QEMU $ ./startqemu.s
```



ATT Router

