

# 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

pi4-37 "SSID" "Century Link6"

pi4-3 "SSID" "Century Link3"

pi4-20 "SSID" "Century Link4"

RPi5 8Gb



192.168.12.208  
pi5-70

RPi ZeroW



192.168.1.141  
wifextender

RPi5 8Gb



192.168.12.237  
pi5-80

RPi5 8Gb



192.168.12.196  
pi5-90

RPi4 4Gb



192.168.12.129  
remte-vpn

RPi4 4Gb



pico\_w  
remote5  
192.168.16.114

192.168.42.116  
pi4-20

pico\_w  
remote7  
192.168.12.120  
pico\_w  
remote8  
192.168.12.106  
pico\_w  
remote9  
192.168.12.108

RPi3 1Gb



192.168.42.119  
pi4-3

RPi3 1Gb



192.168.42.105  
pi4-37

pico\_w  
remote5  
192.168.32.106

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  
wififxtender

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

pi4-20  
Pico\_w Zone3  
SSID Century Link4  
remote5 192.168.16.114

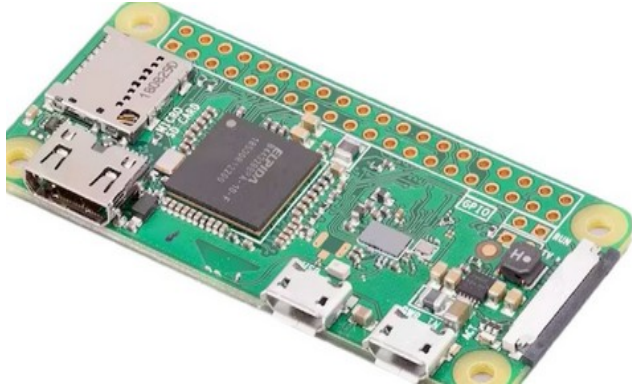
pi4-37  
Pico\_w Zone2  
SSID Century Link6  
remote5 192.168.32.106

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+

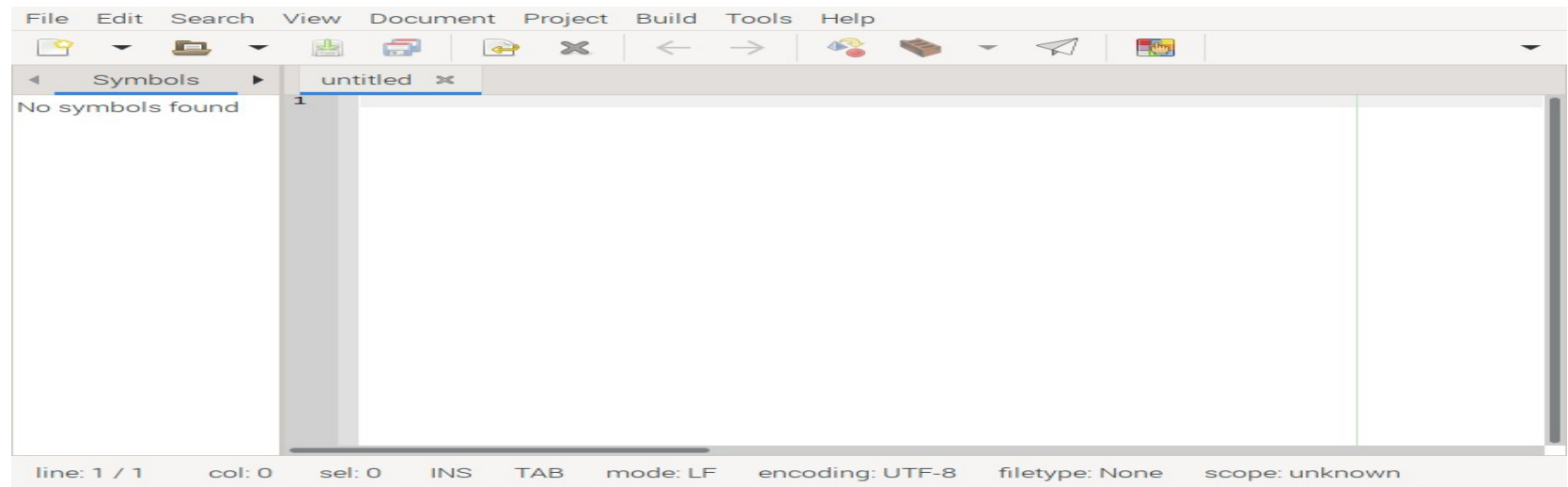


RPi4B



RPi3A

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



The screenshot displays the MATLAB IDE interface. The menu bar includes File, Edit, Search, View, Document, Project, Build, Tools, and Help. The toolbar contains icons for saving, opening, and navigating files. The 'Symbols' pane on the left indicates 'No symbols found'. The main editor window shows the script 'disp\_S.m' with the following code:

```
58 fid = fopen('Sblu.bin','r'); blu = fread(fid, 512, 'float');
59
60 fid = fopen('rcrd.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 'rcrd 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
```

The status bar at the bottom provides the following information: 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.

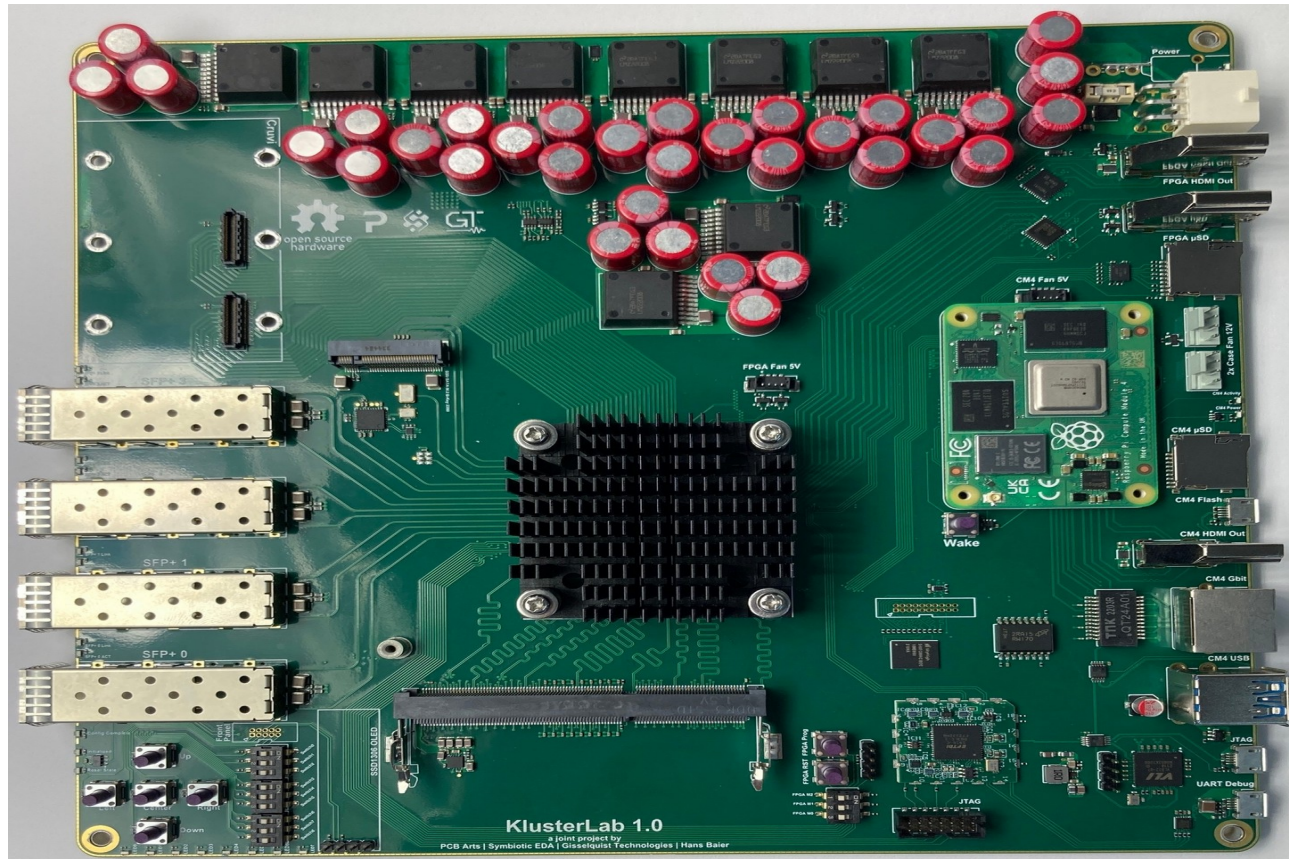
Please contribute if you find this software useful.
For more information, visit https://www.octave.org/get-involved.html

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

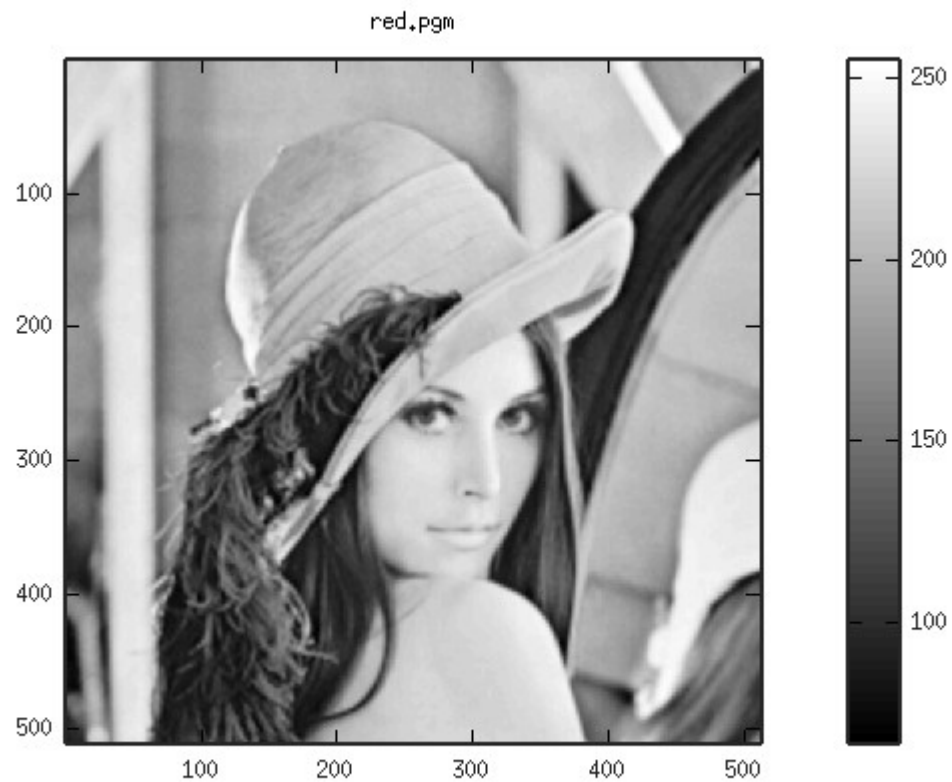
octave:1> disp_S
octave:2> 
```



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



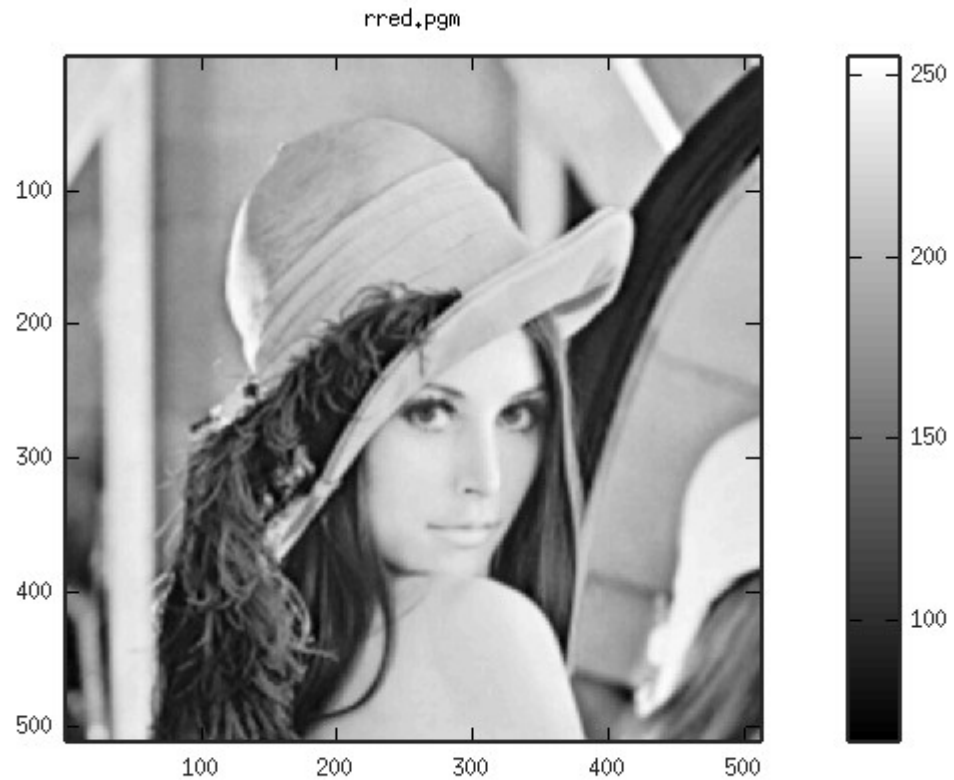
## 500 x 500 red subband lena



y2= 205,843

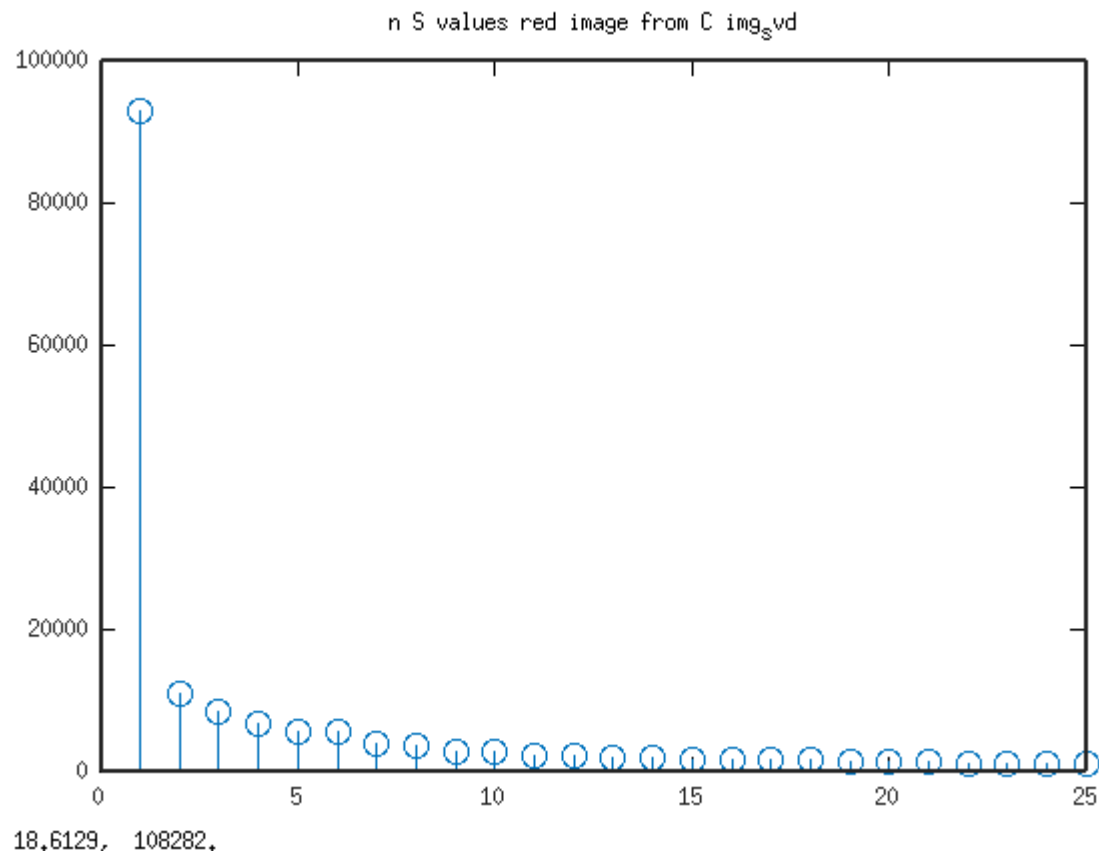


## 500 x 500 red subband lena reconstructed after performing KLT

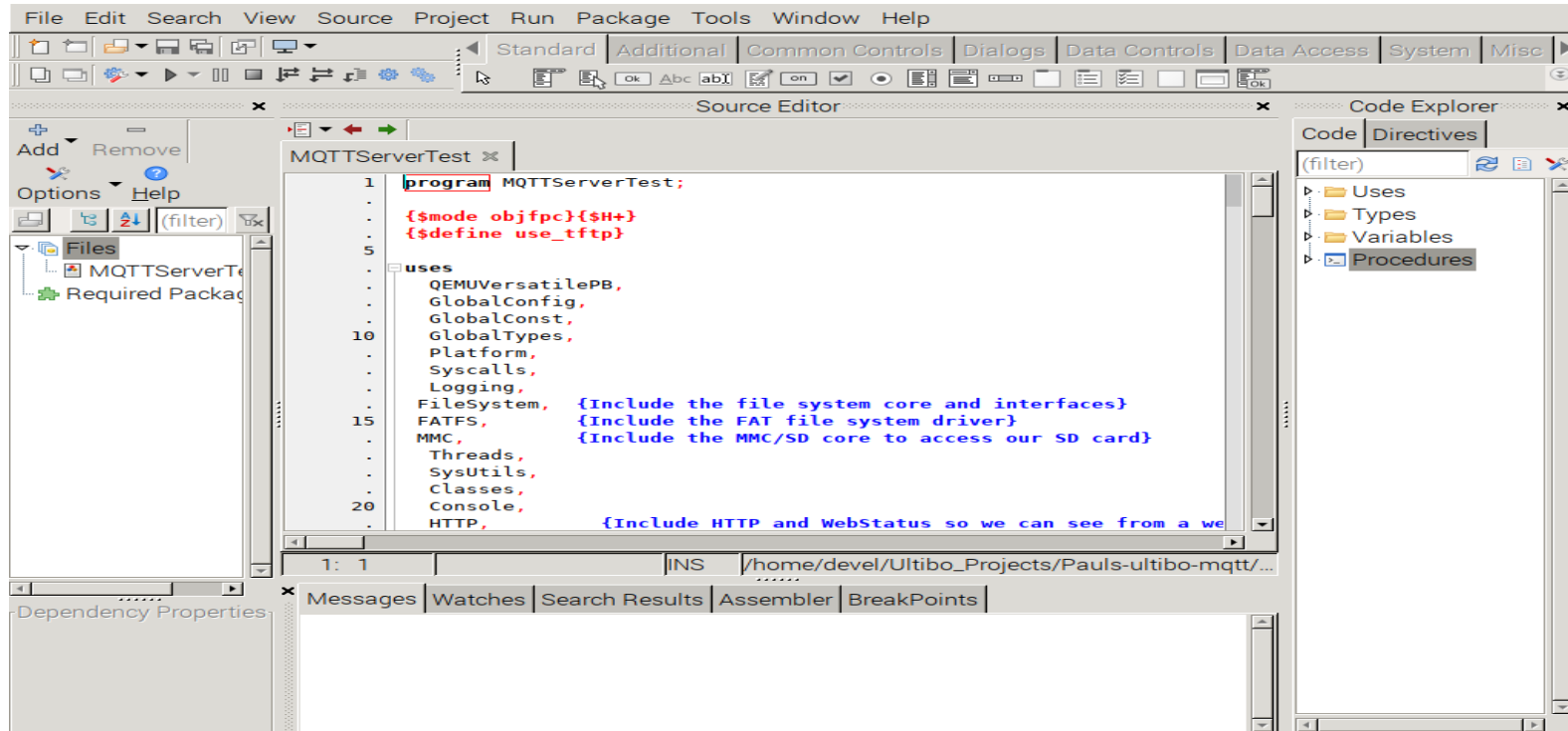


$\mu_2 = 52.8614$

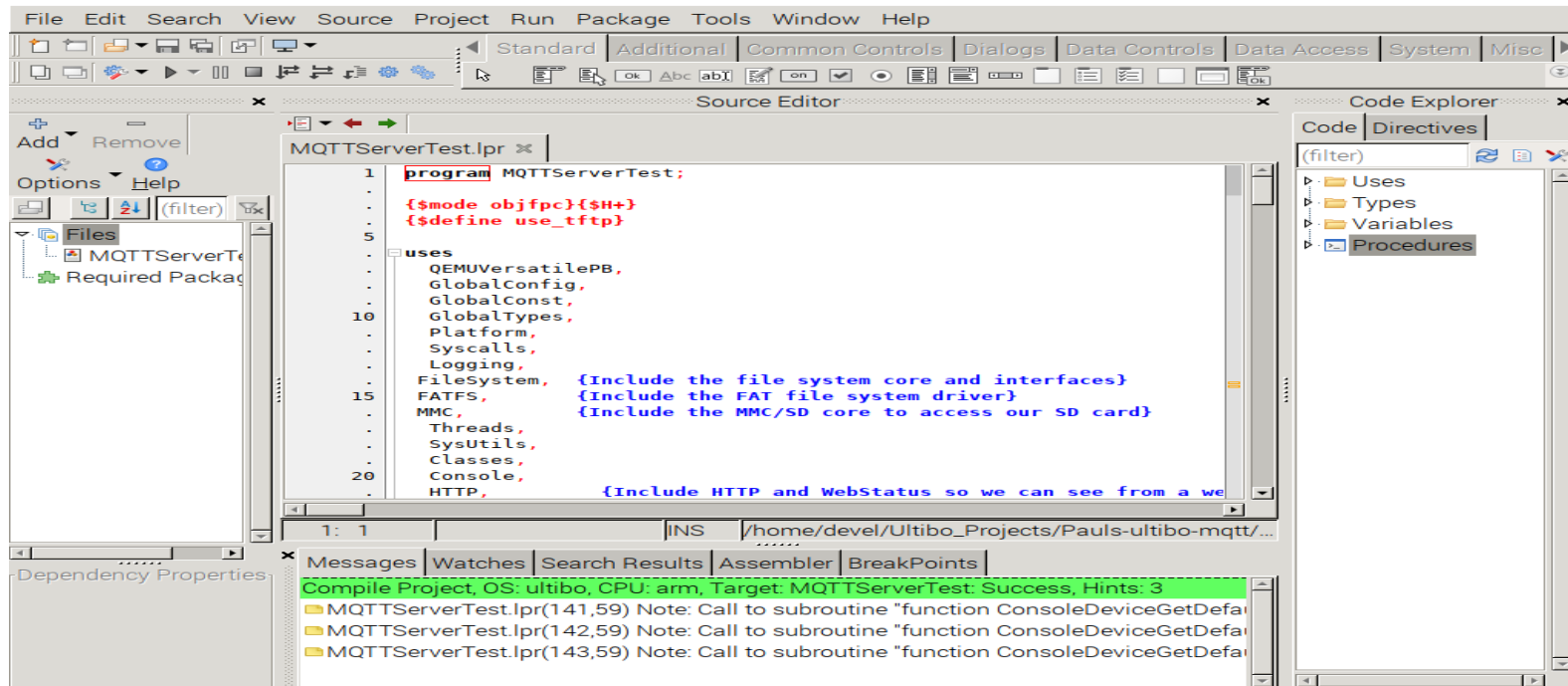
## n S values red image from C img\_svd



# Goal: Accessing 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



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

devel@pi4-20:~/Ultibo\_Projects/jpeg2000/QEMU \$ ./startqemu.s



# ATT Router

