Embedded Image Capture

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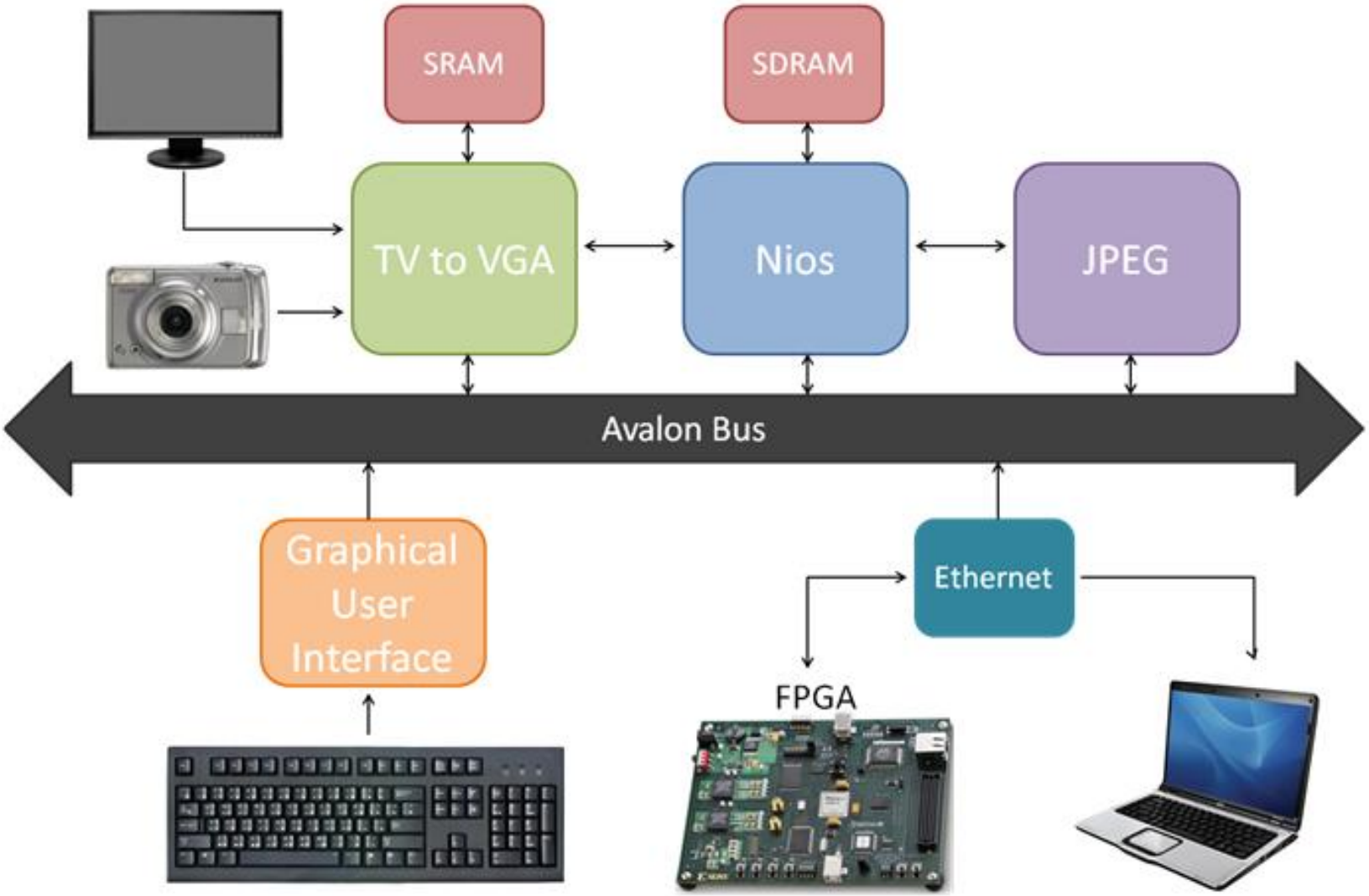
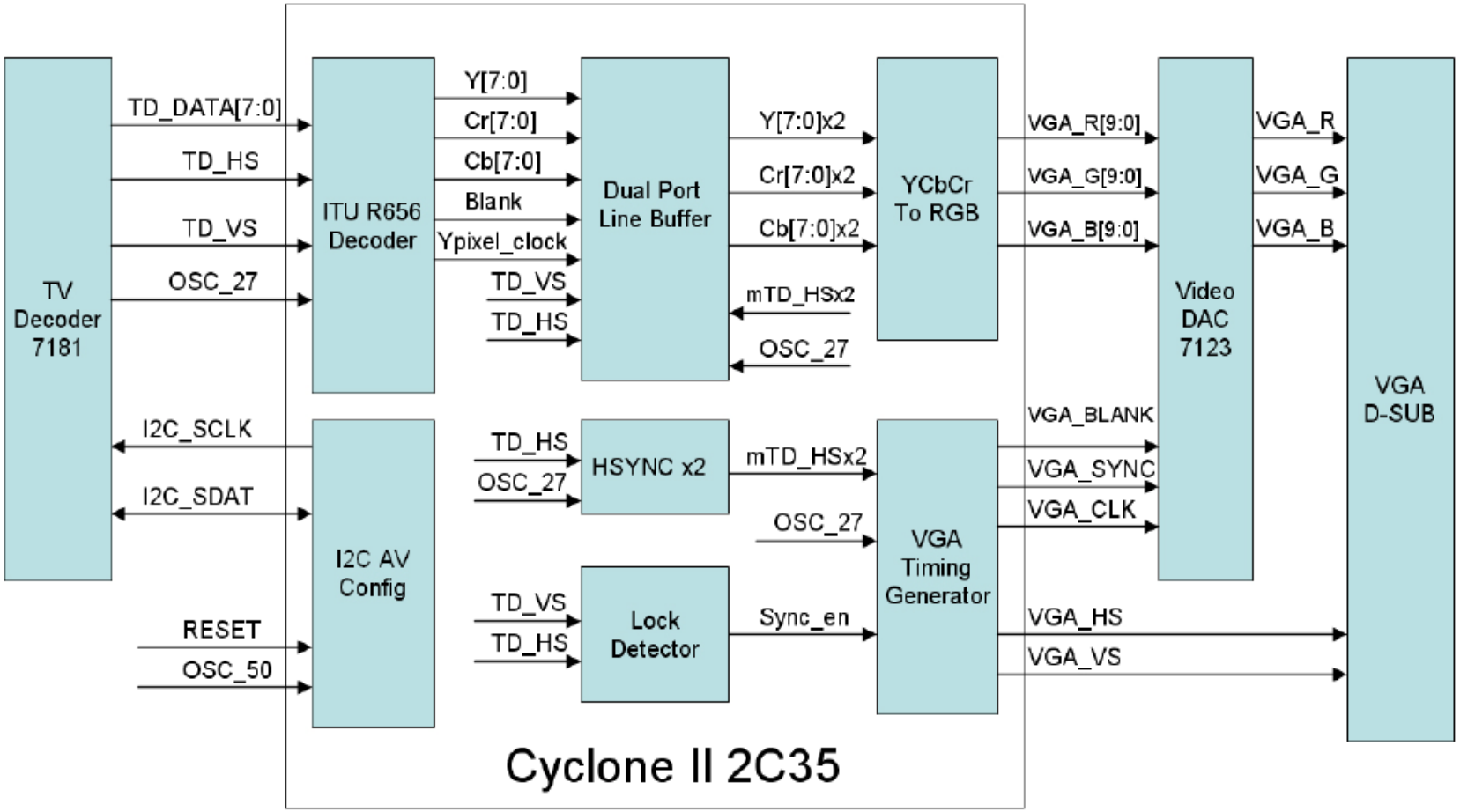
Block Diagram



Control Signals

Keyboard Button	Functionality
Spacebar	Freeze image
Up and down keys	Change screen mode
Delete	Request image deletion
Left key	Move to next image
Right key	Move to previous image
Enter	Save image
Right Shift Enter	Send image to remote board
Left Shift Enter	Send compressed image to computer

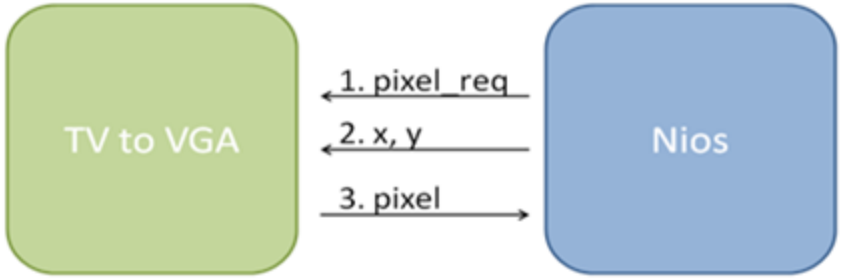
Block Diagram



Sending Images

0	Send x position
1	Send y position
2	Send request
3	Receive pixel

Address Number	Functionality
21	Send x position
22	Send y position
24	Send request
24	Send pixel



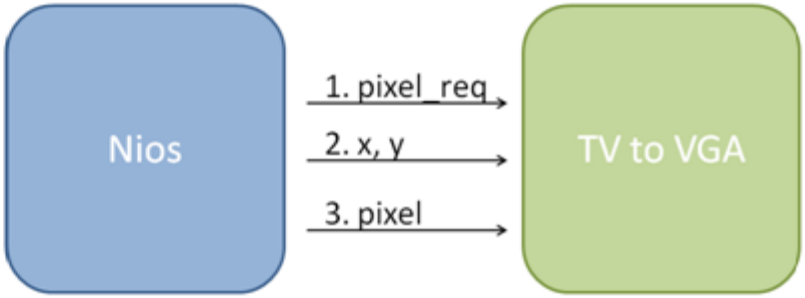
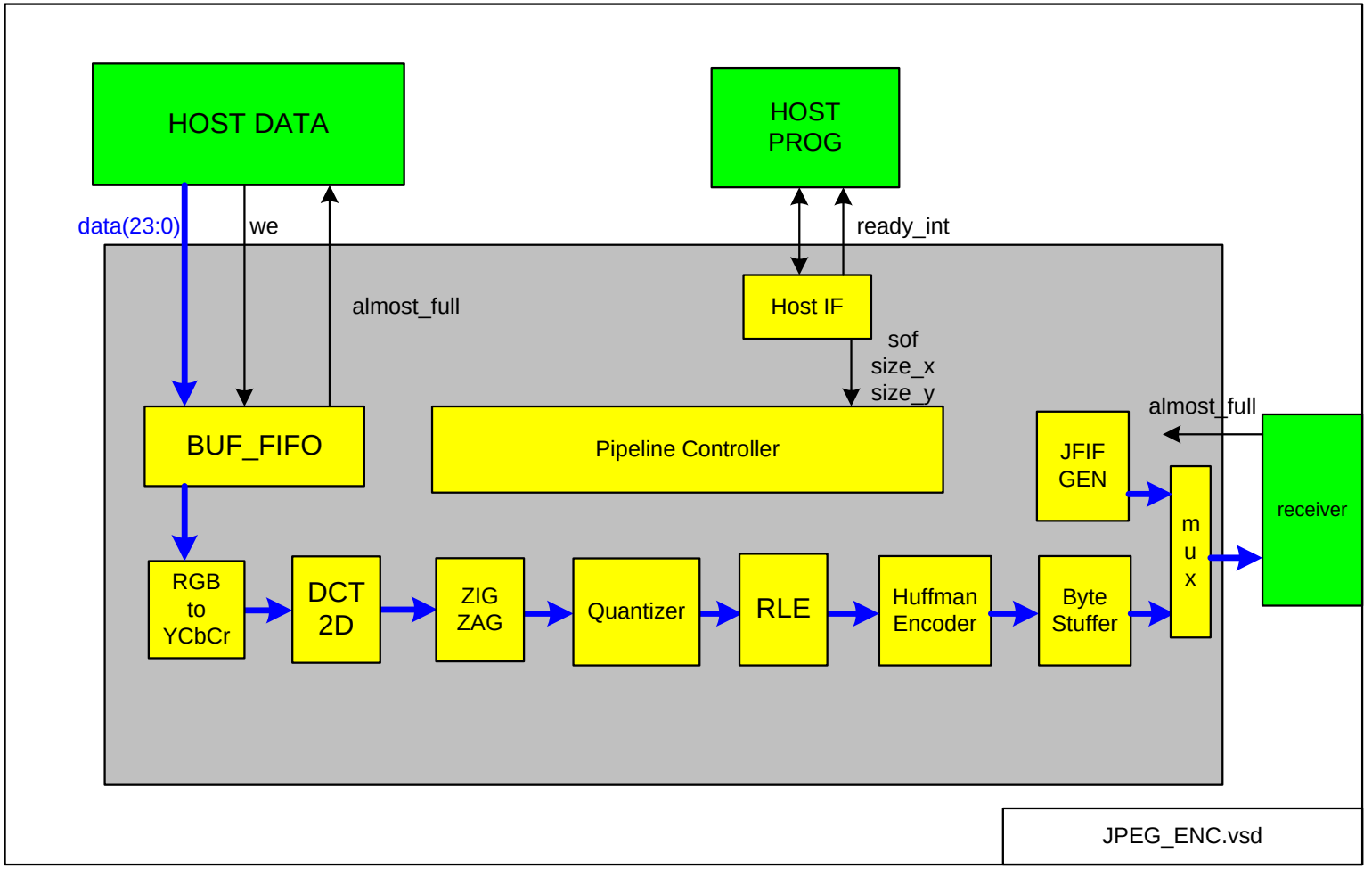


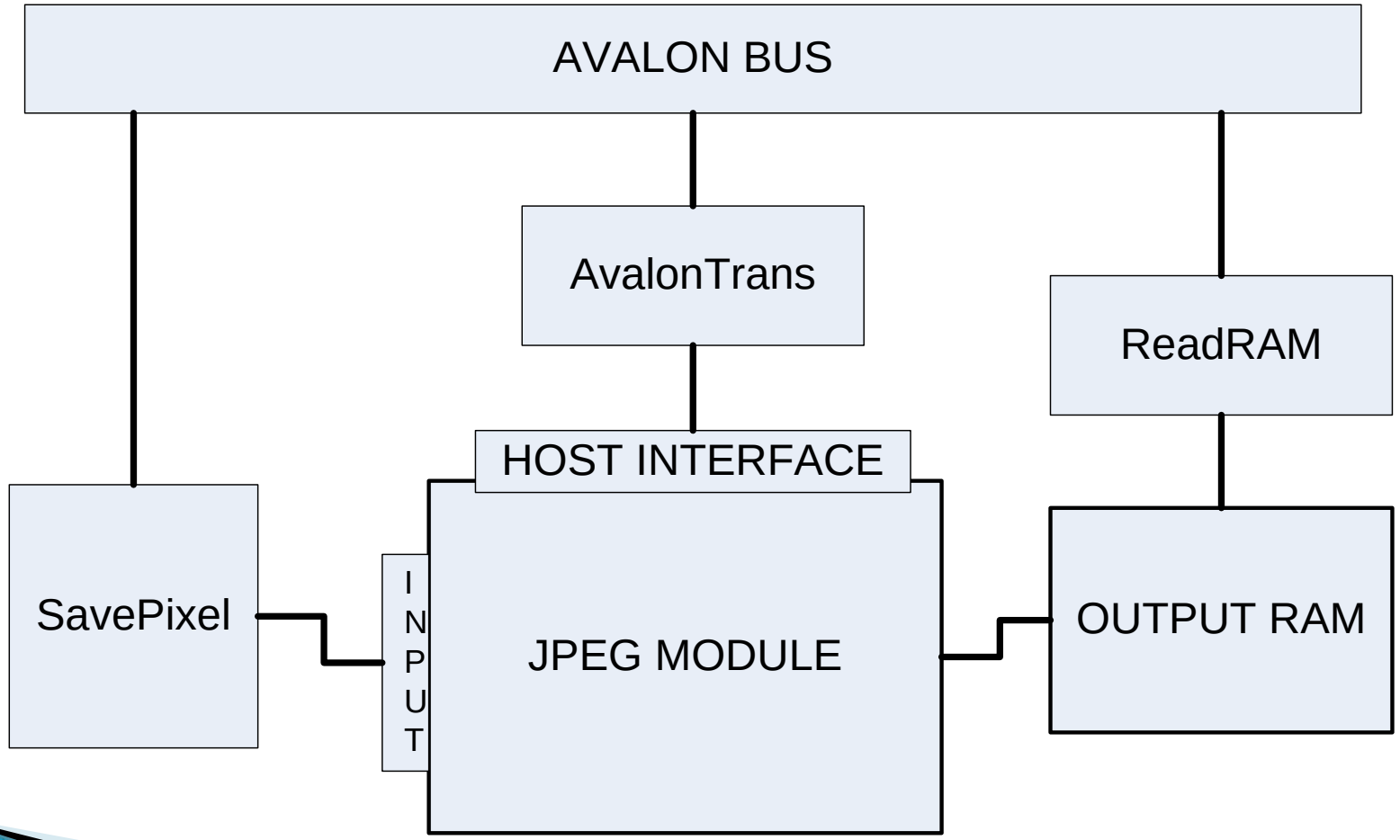
Image Data Structures

```
unsigned char saved_images[MAX_NUM_IMAGES][3] [IMG_X_SIZE] [IMG_Y_SIZE];
// data structure for linking images
struct image
{
        struct image *prev;
        int is_taken
        int image_num;
        struct image *next;
};
```

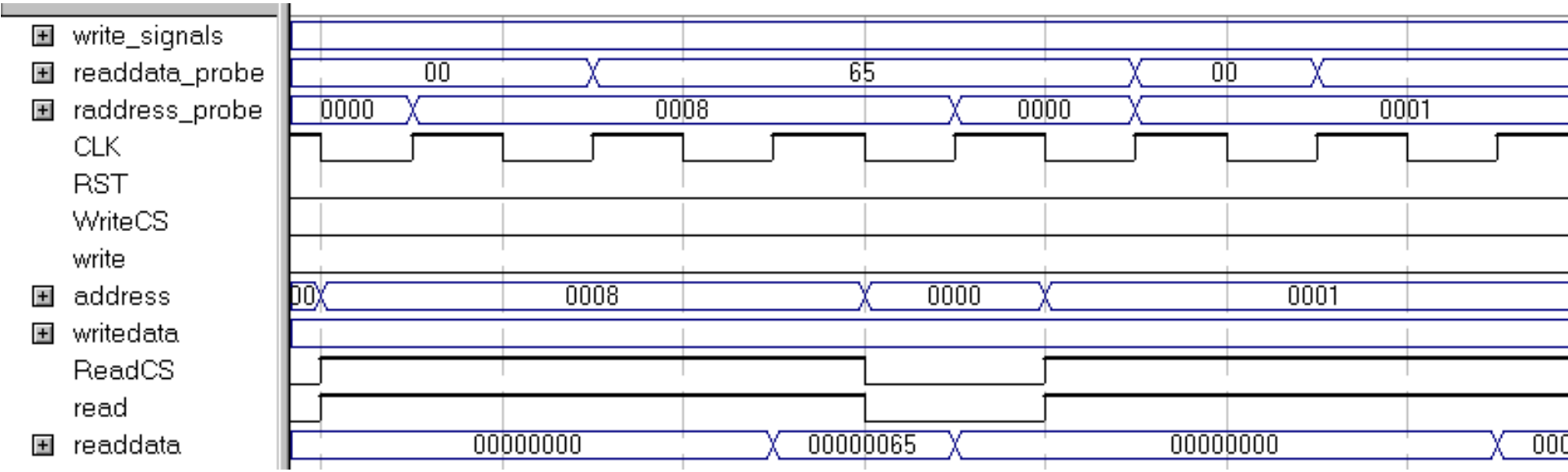
JPEG


HOST DATA
HOST PROG
data(23:0)
we
ready_int
almost_full
Host IF
sof
size_x
size_y
almost_full
BUF_FIFO
Pipeline Controller
JFIF GEN
receiver
m u x
RGB to YCbCr
DCT 2D
ZIG ZAG
Quantizer
RLE
Huffman Encoder
Byte Stuffer
JPEG_ENC.vsd

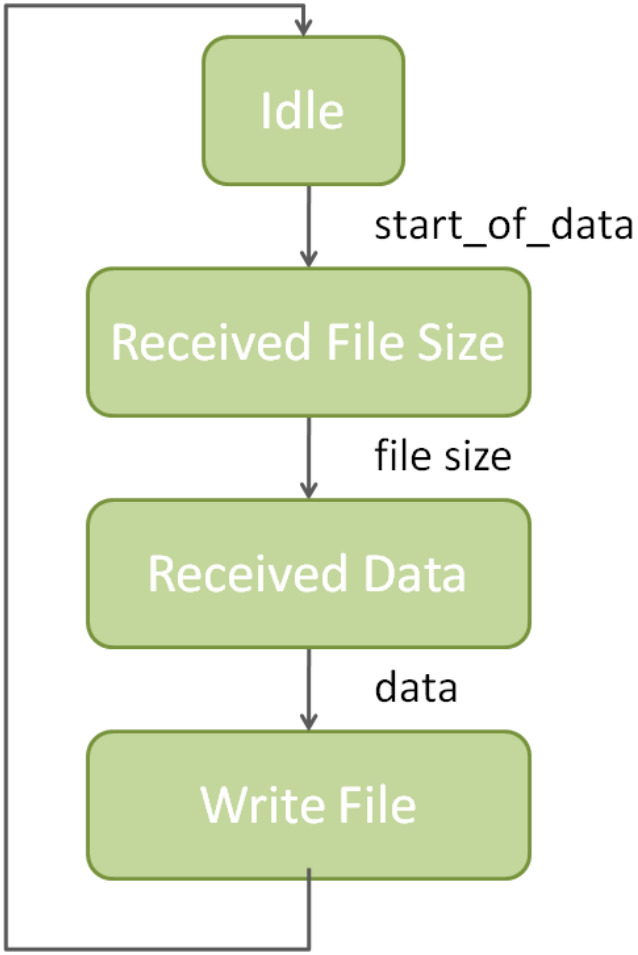
Block Diagram



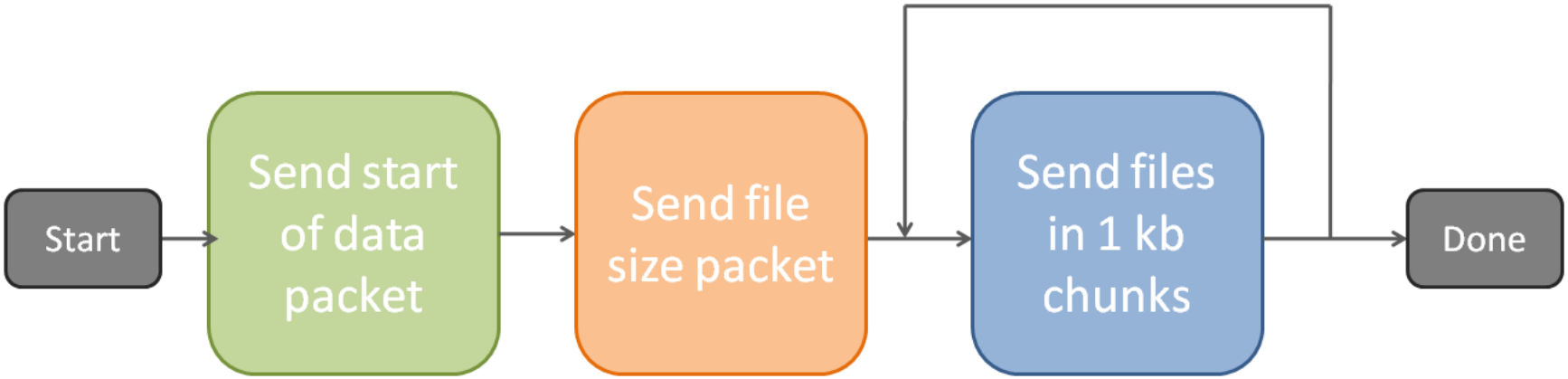
Timing


write_signals
readdata_probe
raddress_probe
CLK
RST
WriteCS
write
address
writedata
ReadCS
read
readdata
00
65
00
0000
0008
0000
0001
00
0008
0000
0001
00000000
00000065
00000000

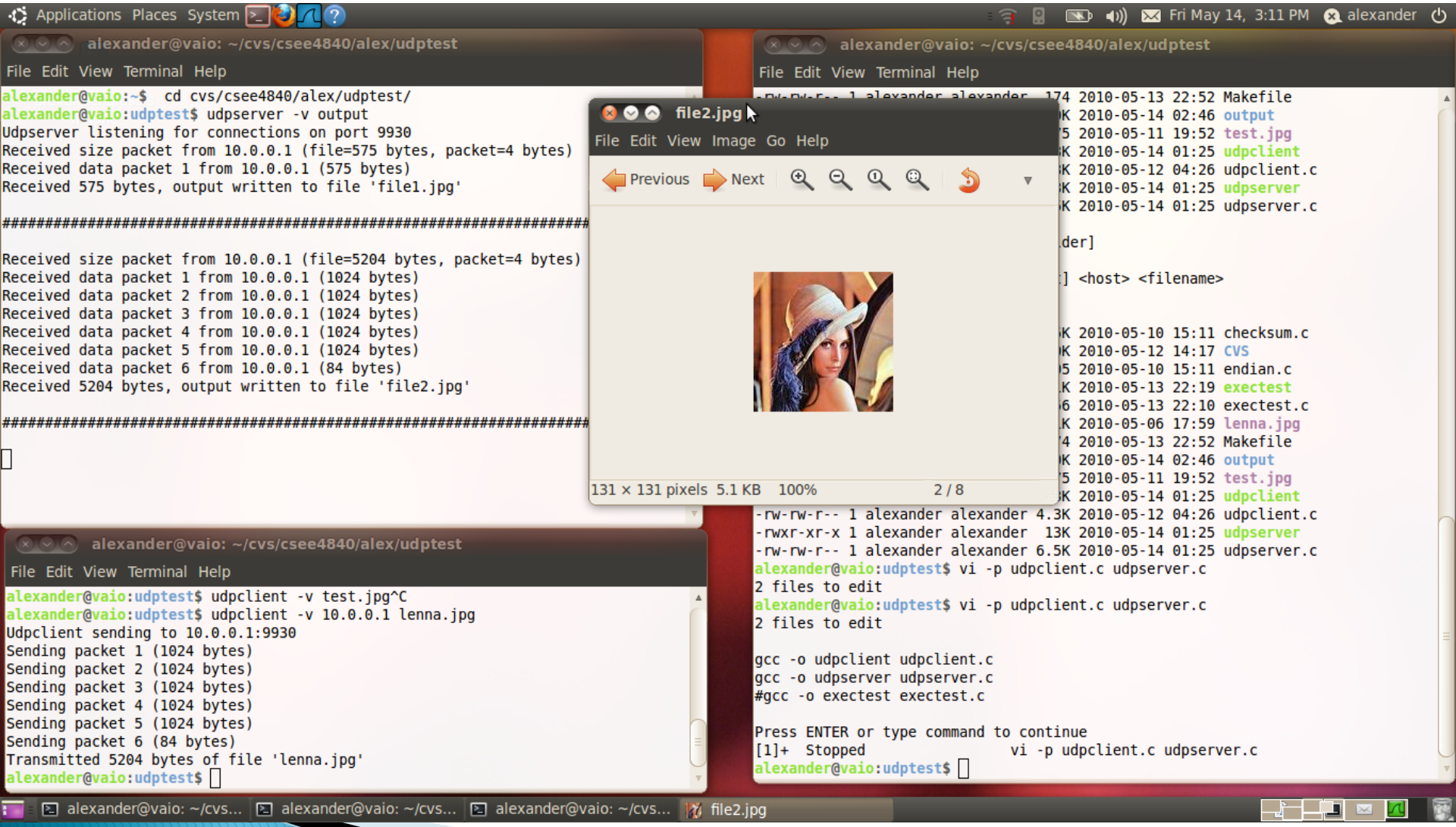
UDP Server


Idle
start_of_data
Received File Size
file size
Received Data
data
Write File

UDP Client


Start
Send start of data packet
Send file size packet
Send files in 1 kb chunks
Done

UDP Apps


Applications Places System
Fri May 14, 3:11 PM alexander
alexander@vaio: ~/cvs/csee4840/alex/udptest
File Edit View Terminal Help
alexander@vaio:~$ cd cvs/csee4840/alex/udptest/
alexander@vaio:udptest$ udpserver -v output
Udpserver listening for connections on port 9930
Received size packet from 10.0.0.1 (file=575 bytes, packet=4 bytes)
Received data packet 1 from 10.0.0.1 (575 bytes)
Received 575 bytes, output written to file 'file1.jpg'
Received size packet from 10.0.0.1 (file=5204 bytes, packet=4 bytes)
Received data packet 1 from 10.0.0.1 (1024 bytes)
Received data packet 2 from 10.0.0.1 (1024 bytes)
Received data packet 3 from 10.0.0.1 (1024 bytes)
Received data packet 4 from 10.0.0.1 (1024 bytes)
Received data packet 5 from 10.0.0.1 (1024 bytes)
Received data packet 6 from 10.0.0.1 (84 bytes)
Received 5204 bytes, output written to file 'file2.jpg'
file2.jpg
File Edit View Image Go Help
Previous Next
131 × 131 pixels 5.1 KB 100% 2 / 8
alexander@vaio: ~/cvs/csee4840/alex/udptest
File Edit View Terminal Help
alexander@vaio:udptest$ udpclient -v test.jpg^C
alexander@vaio:udptest$ udpclient -v 10.0.0.1 lenna.jpg
Udpclient sending to 10.0.0.1:9930
Sending packet 1 (1024 bytes)
Sending packet 2 (1024 bytes)
Sending packet 3 (1024 bytes)
Sending packet 4 (1024 bytes)
Sending packet 5 (1024 bytes)
Sending packet 6 (84 bytes)
Transmitted 5204 bytes of file 'lenna.jpg'
alexander@vaio:udptest$
alexander@vaio: ~/cvs/csee4840/alex/udptest
File Edit View Terminal Help
-rw-rw-r-- 1 alexander alexander 4.3K 2010-05-12 04:26 udpclient.c
-rwxr-xr-x 1 alexander alexander 13K 2010-05-14 01:25 udpserver
-rw-rw-r-- 1 alexander alexander 6.5K 2010-05-14 01:25 udpserver.c
alexander@vaio:udptest$ vi -p udpclient.c udpserver.c
2 files to edit
alexander@vaio:udptest$ vi -p udpclient.c udpserver.c
2 files to edit
gcc -o udpclient udpclient.c
gcc -o udpserver udpserver.c
#gcc -o exectest exectest.c
Press ENTER or type command to continue
[1]+ Stopped vi -p udpclient.c udpserver.c
alexander@vaio:udptest$
alexander@vaio: ~/cvs...
alexander@vaio: ~/cvs...
alexander@vaio: ~/cvs...
file2.jpg

Who did what

- Albert -> Capture Master
- Nektarios -> Jpeg Master
- Alex -> Ethernet Master

Lessons Learned

- Hardware design is hard
- You cannot debug without simulators
- Jpeg encoding is really tricky
- UDP packets should have checksum and minimum size
- Refreshed our Verilog and gained new VHDL knowledge
- Murphy's law