

My Take Away From

Joint ICTP-IAEA School on FPGA-based SoC and its Applications for Nuclear and Related Instrumentation

25 January - 19 February 2021
An ICTP-IAEA Virtual Meeting
Trieste, Italy

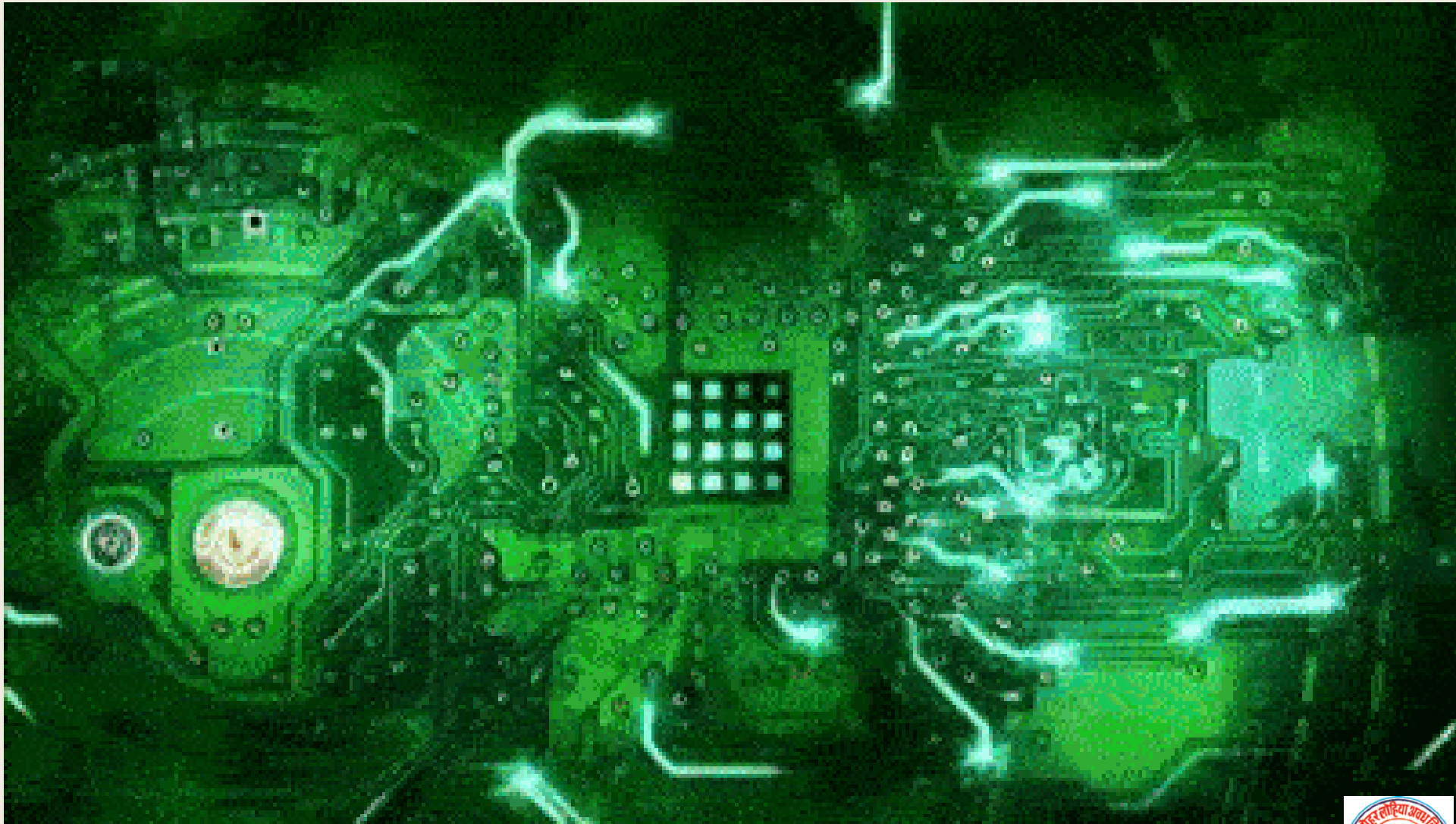


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University Ayodhya

Understanding the Ecosystem



Integration with FPGA

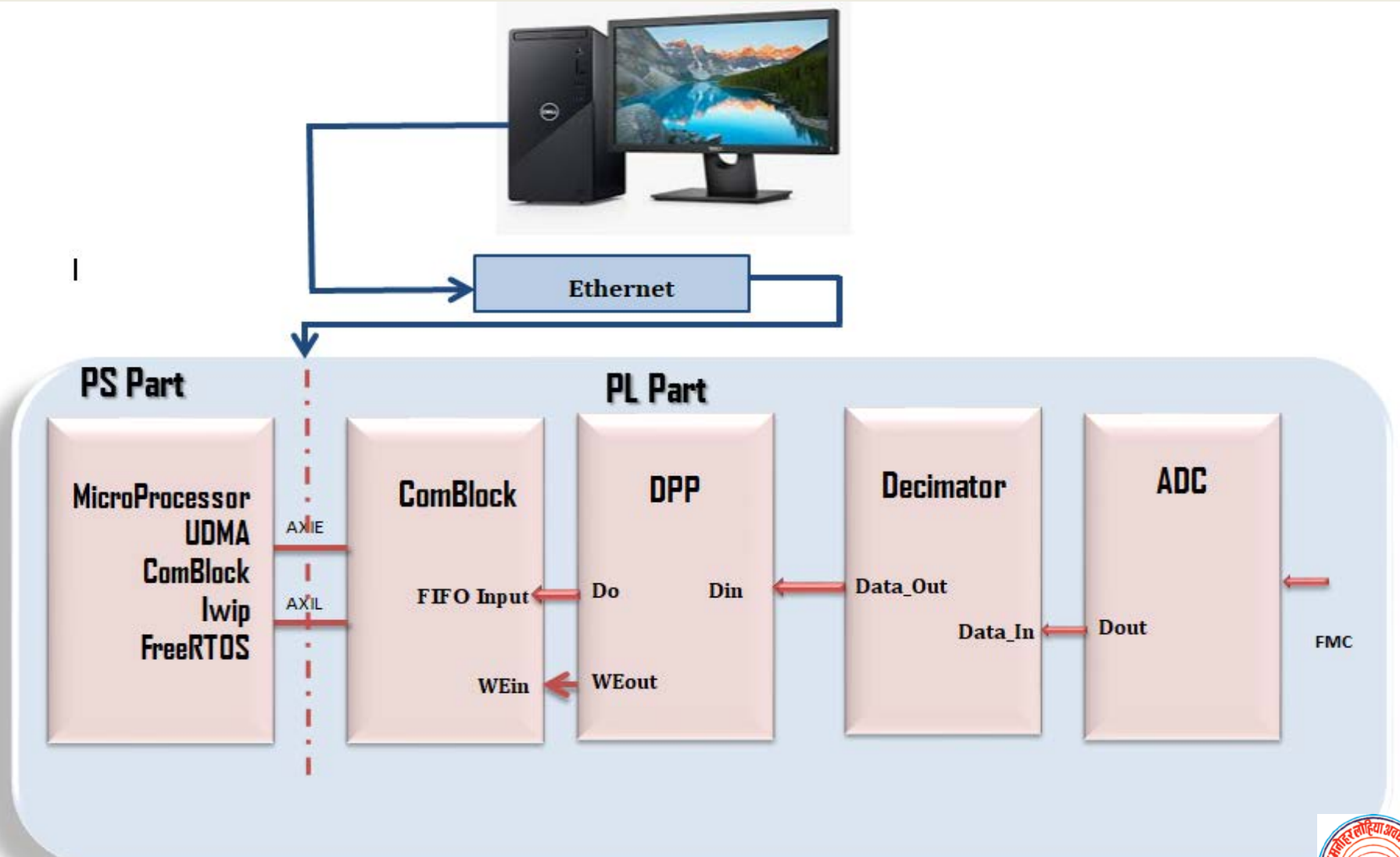


Purpose of Attending

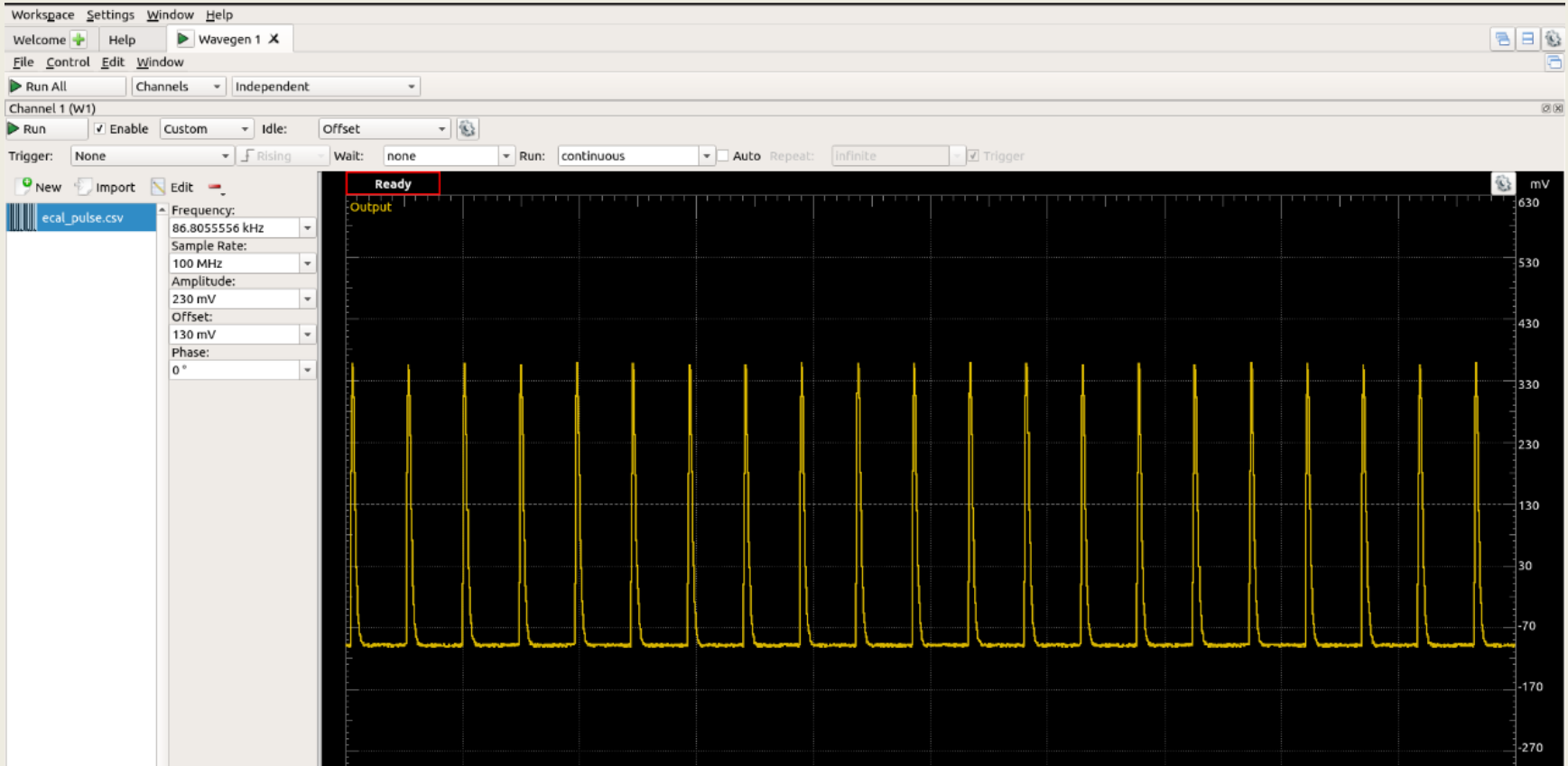
- Applied Aspects Real Time Application Development
- ML algorithm implementation
- My research wants lower latency so computation over the edge than cloud



Final Day Project



Final Day Project



Few new learning out of many..

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```
#include <stdio.h>
#include <string.h>

#include "lwip/sockets.h"
#include "netif/xadapter.h"
#include "lwipopts.h"
#include "xil_printf.h"
#include "FreeRTOS.h"
#include "task.h"
#include "udma.h"
#define THREAD_STACKSIZE 1024

u16_t echo_port = 7;

void print_echo_app_header()
{
    xil_printf("%20s %d %s\r\n", "echo server",
              echo_port,
              "$ telnet <board_ip> 7");
}

/* thread spawned for each connection */
void process_echo_request(void *p)
{
    int sd = (int)p;
    int RECV_BUF_SIZE = 2048;
    char recv_buf[RECV_BUF_SIZE];
    int n, nwrote;

    while (1) {
        /* read a max of RECV_BUF_SIZE bytes from socket */
        if ((n = read(sd, recv_buf, RECV_BUF_SIZE)) < 0) {
            xil_printf("%s: error reading from socket %d, closing socket\r\n", __FUNCTION__, sd);
            break;
        }
    }
}
```

Application Over RTOS

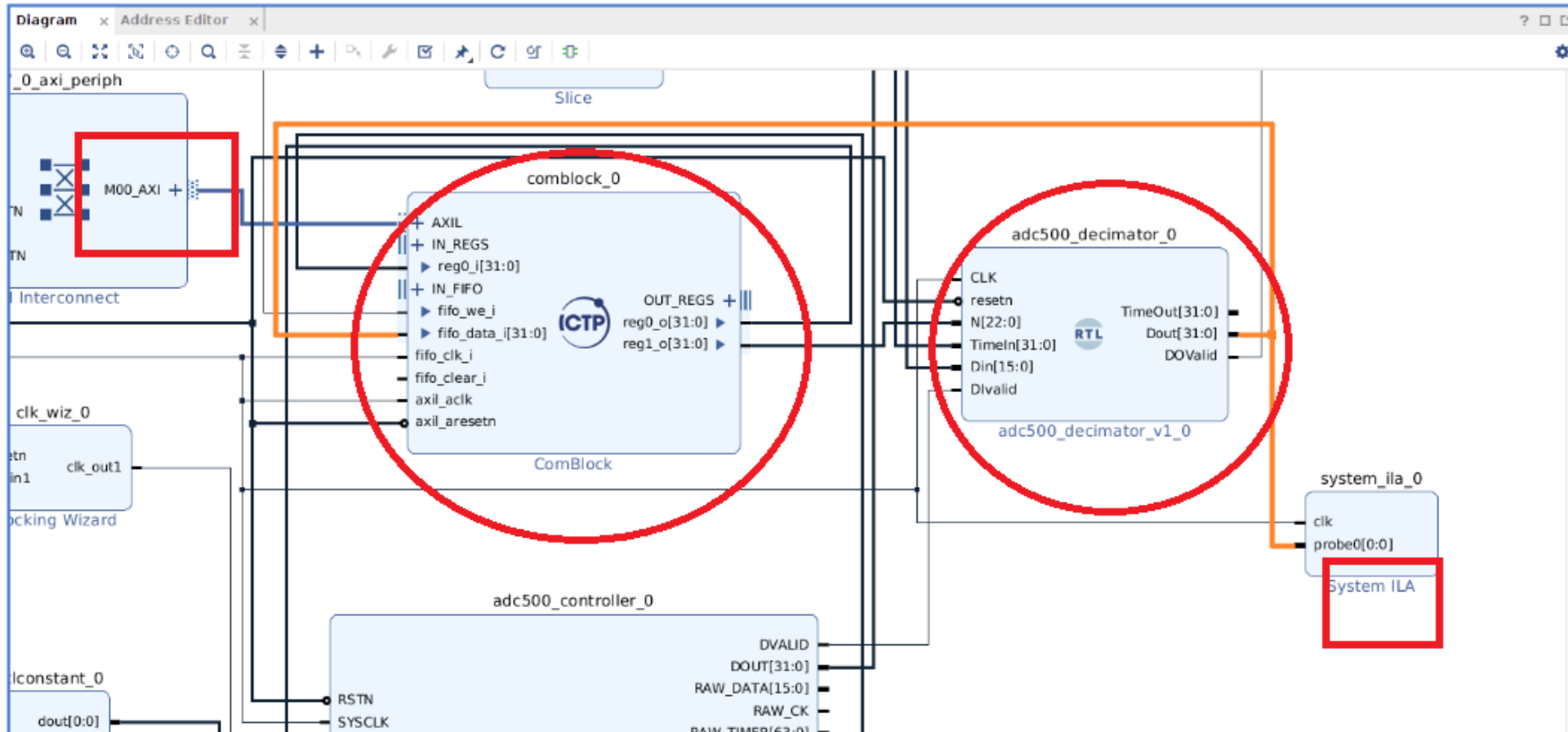
- stdio.h
- string.h
- lwip/sockets.h
- netif/xadapter.h
- lwipopts.h
- xil_printf.h
- FreeRTOS.h
- task.h
- udma.h
- THREAD_STACKSIZE
- echo_port: u16_t
- print_echo_app_header(): void
- process_echo_request(void*): void
- echo_application_thread(): void

.tcl

```
16:59:12 INFO : Context for processor 'ps7_cortexa9_0' is selected.
16:59:12 INFO : 'con' command is executed.
16:59:12 INFO : -----XSDB Script (After Launch)-----
targets -set -nocase -filter {name =~ "ARM*#0" && jtag_cable_name =~ "Digilent Zed con
-----End of Script-----
16:59:12 INFO : Disconnected from the channel tcfchan#1.
```



Decimator, ILA, ComBlock, AXI Interface



Flexibility

- Communication between module
- Buses to output and to input
- Bare metal Application development
- Application on Free RTOS
- I preferred MCUs but I guess I Need To Rethink: After this School



Lovable things about this School

- Use what is best, System performance
- This online Lab is far better than offline as we got very personalized attention
- Shred screen let us know probable problems and their solution before hand
- So actually we did programs X times



- Accessed **System of IAEA** from **System of ICTP** from **My system**
- Thanks to all the technical support



Xilinx SDK environment

- Using a stand-alone BSP
- Using a FreeRTOS BSP without having to include the FreeRTOS source files as part of the application that references the BSP library.

Interesting Tasks we did..

- Registers
- File Reading
- Assigning file saved values to the hardware
- Kernel programming
- Scheduler Programming(Round Robin)
- Setting Filter Parameters I think I need to work more on it
- Above all working with “git” and interesting git-ignore



Challenges

- So the program every day started at 3:30 IST
- And our University is open
- Talks Exams Inspections, Camp, University Activities use to start from 8 am IST
- Multiple time just survived on coffee
- But after all it was just worth it...



Thanks

- Dr. Liz
- Dr. Andreas
- Vladamir
- Bruno
- Molina
- Luis
- Werner
- Dr. Cristian
- Rodrigo Melo
- Team IAEA
- And all those involved in organizing this event...
- Not the least my Breakout room partners Saleh, Shamsiah, Giesel

