FPGA based Audio Effects System

Presented by Dean Devereaux
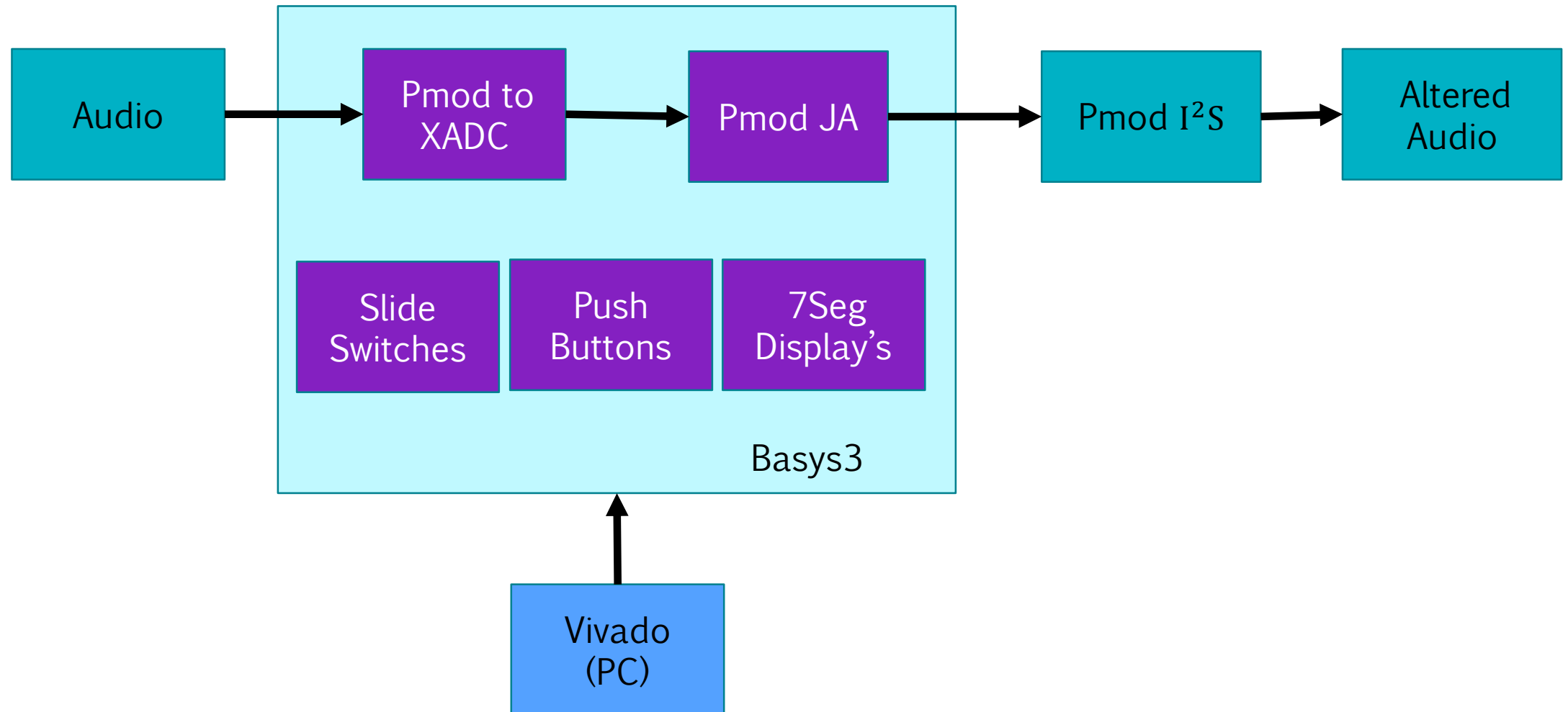
Aim of Project

- Send audio through FPGA development board

- Alter audio using an FPGA

- Program Three Effects
  - Delay
  - Non-Linear Processing
  - Spatial

Basys3

- Artix-7
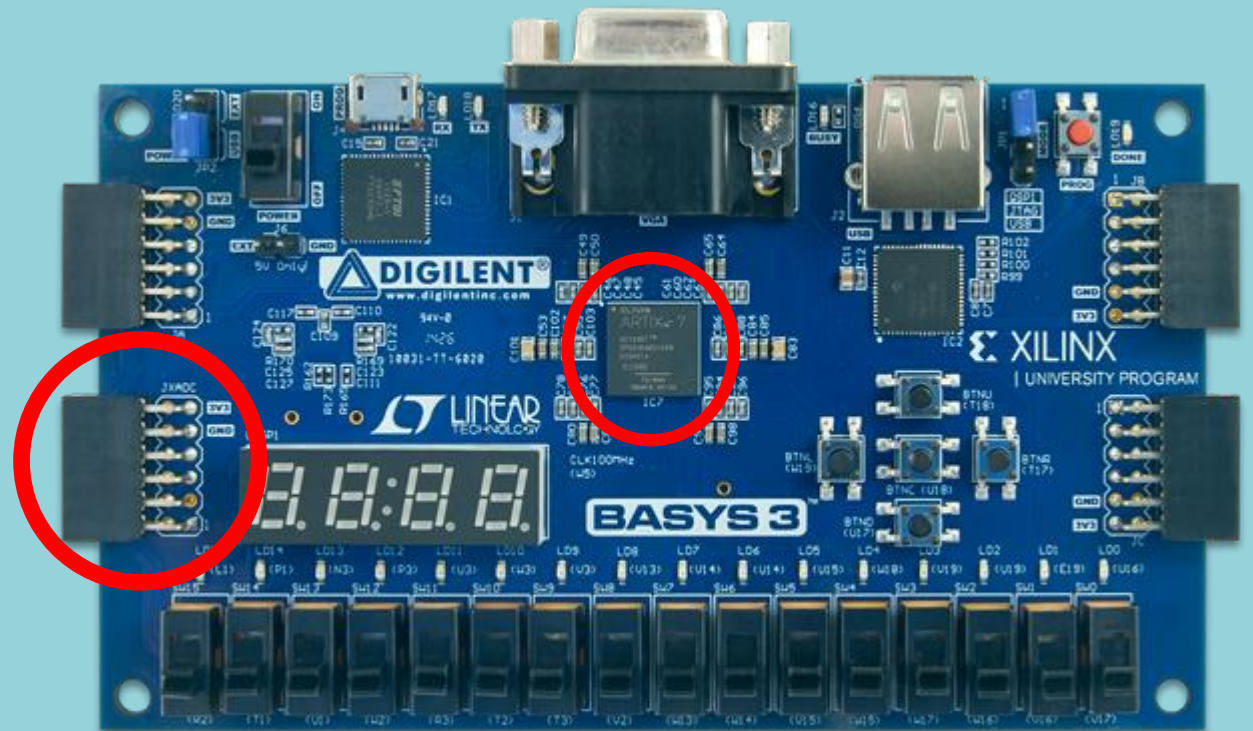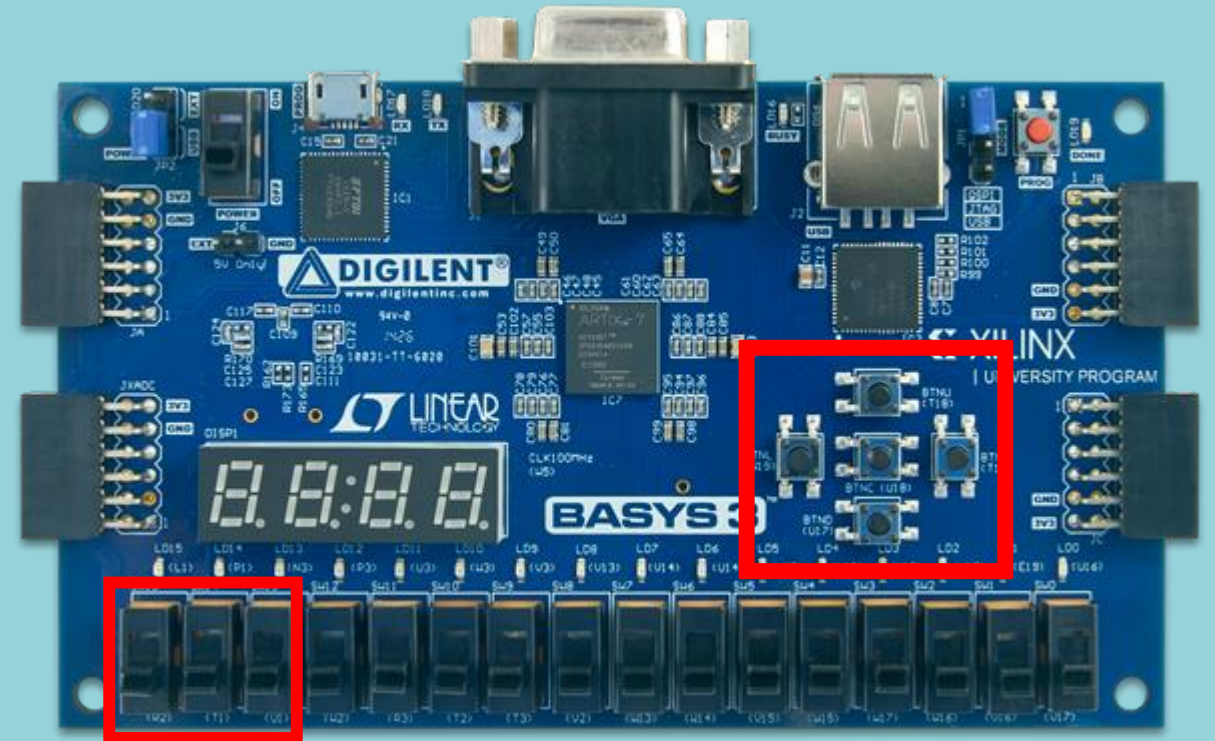
- Built in ADC

- Vivado

Block Diagram

Pmod to XADC

- Internal ADC

- 12 bits

- 1MS/s

Switches & Push Buttons

- Choose Effect

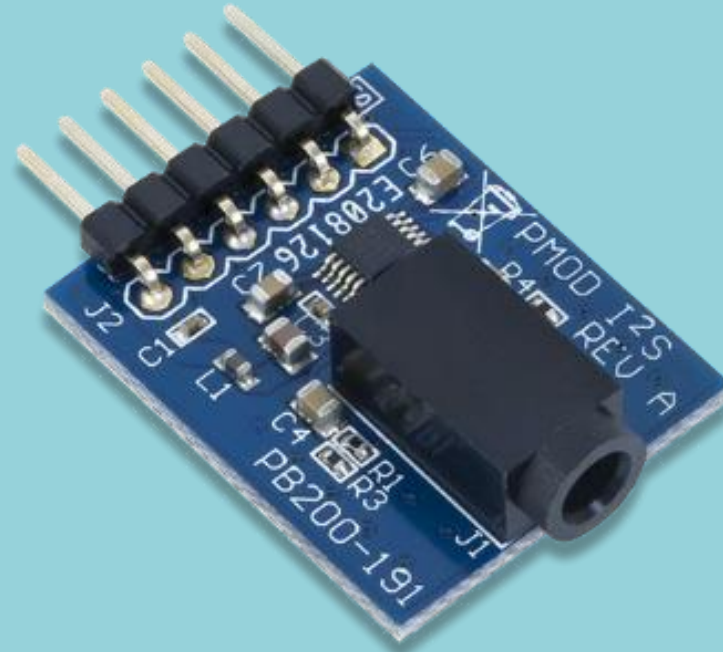- Increment/Decrement effects behavior
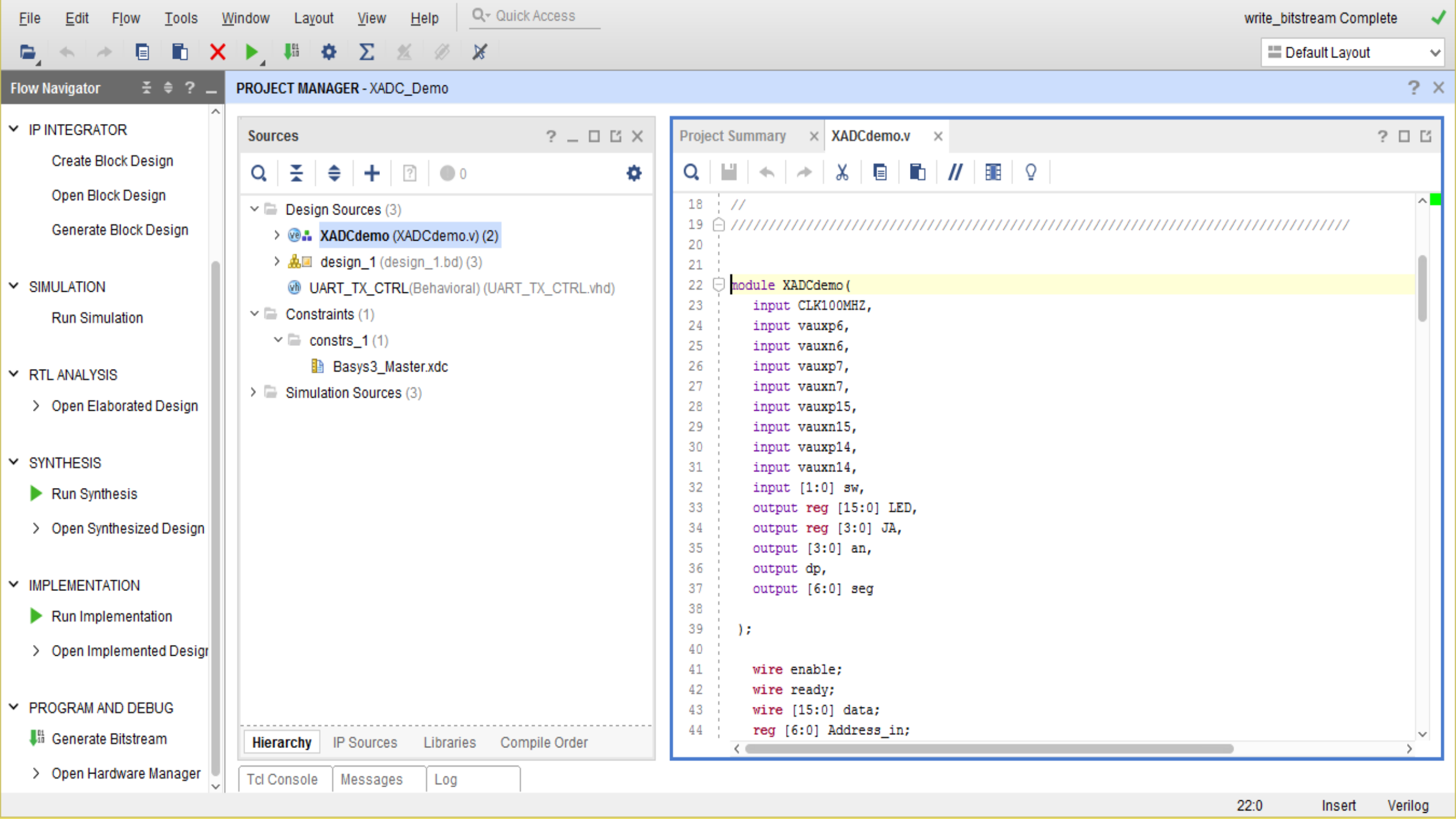
Four 7 Segment Display

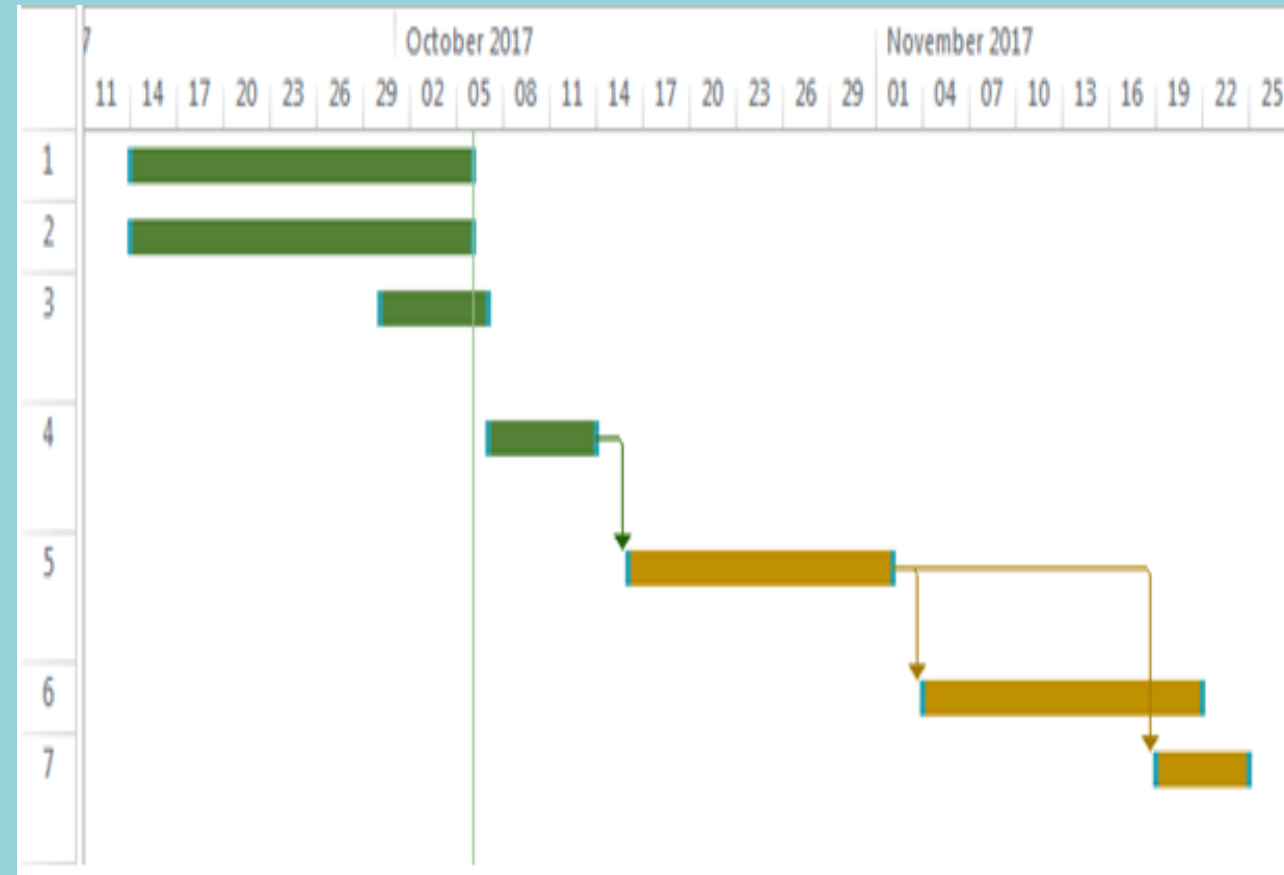- Shows audio note/chord

Pmod I²S

- DAC

- Audio Jack

Vivado

- Program Board

- Verilog/VHDL

Default Layout

Flow Navigator

PROJECT MANAGER - XADC_Demo

IP INTEGRATOR

Create Block Design

Open Block Design

Generate Block Design

SIMULATION

Run Simulation

RTL ANALYSIS

> Open Elaborated Design

SYNTHESIS

▶ Run Synthesis

> Open Synthesized Design

IMPLEMENTATION

▶ Run Implementation

> Open Implemented Design

PROGRAM AND DEBUG

⬇ Generate Bitstream

> Open Hardware Manager

Sources

Design Sources (3)
- > XADCdemo (XADCdemo.v) (2)
- > design_1 (design_1.bd) (3)
- UART_TX_CTRL(Behavioral) (UART_TX_CTRL.vhd)

Constraints (1)
- constrs_1 (1)
  - Basys3_Master.xdc

Simulation Sources (3)

Hierarchy   IP Sources   Libraries   Compile Order

Tcl Console   Messages   Log

Project Summary   ✕   XADCdemo.v   ✕

```verilog
18  //
19  /////////////////////////////////////////////////////////
20
21
22  module XADCdemo(
23      input CLK100MHZ,
24      input vauxp6,
25      input vauxn6,
26      input vauxp7,
27      input vauxn7,
28      input vauxp15,
29      input vauxn15,
30      input vauxp14,
31      input vauxn14,
32      input [1:0] sw,
33      output reg [15:0] LED,
34      output reg [3:0] JA,
35      output [3:0] an,
36      output dp,
37      output [6:0] seg
38
39  );
40
41      wire enable;
42      wire ready;
43      wire [15:0] data;
44      reg [6:0] Address_in;
```

22:0   Insert   Verilog

Completed

Work Tasks	Description	Duration
	Semester One	**11 Weeks**
#1	Review VHDL	16 days
#2	Research Basys3	16 days
#3	Examine Vivado/Basys3 tutorials	6 days
#4	Research digitization of audio	6 days
#5	Program XADC to digitize audio	13 days
#6	Program DAC to output audio	13 days
#7	Program 7 Segment display to highlight note played	6 days

Semester Two

	Semester Two	9 Weeks
#8	Research Delay effects	6 days
#9	Program Delay Effect	11 days
#10	Research Non-Linear effects	6 days
#11	Program Non-Linear effect	11 days
#12	Research Spacial effects	6 days
#13	Program Spacial effect	11 days
#14	Program Switches and LEDs for effects	6 days
#15	Program Switches and Buttons to alter effects	6days
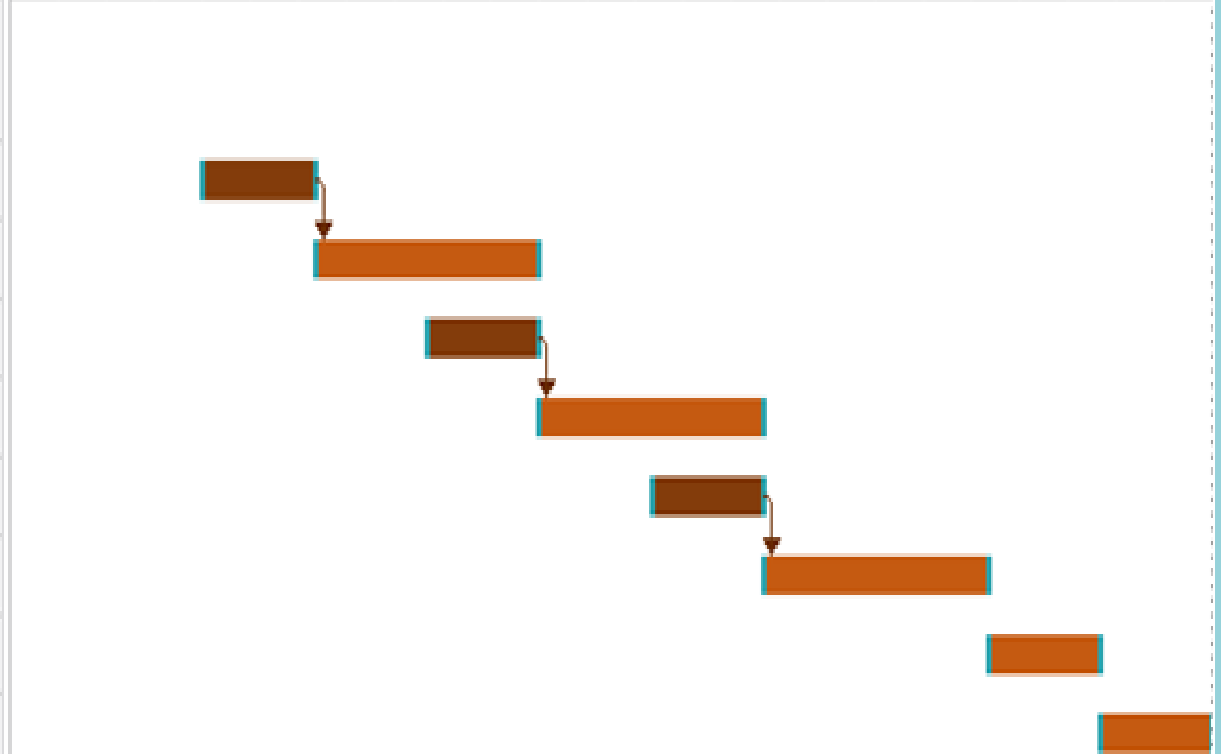
Thank You!!

Questions?

No Questions?