ECE 6276
DSP Hardware System Design
Fall 2017

Lab 2

William Sutton

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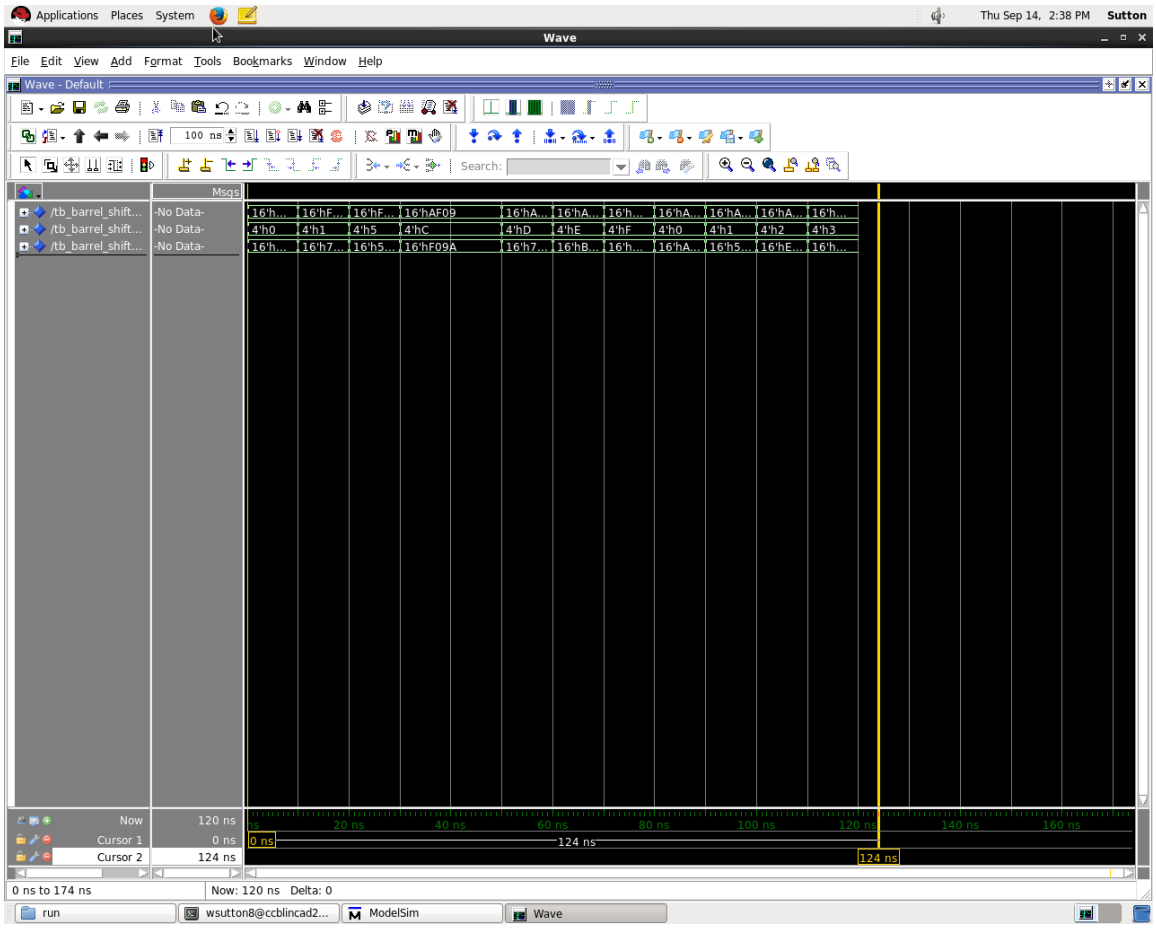
Figure 1


Applications Places System
Thu Sep 14, 2:38 PM Sutton
Wave
File Edit View Add Format Tools Bookmarks Window Help
Wave - Default
Search:
Msgs
/tb_barrel_shift...
-No Data-
4'h0 4'h1 4'h5 4'hC 4'hD 4'hE 4'hF 4'h0 4'h1 4'h2 4'h3
16'hF09A
Now 120 ns
Cursor 1 0 ns
Cursor 2 124 ns
0 ns
124 ns
0 ns to 174 ns
Now: 120 ns Delta: 0
run
ModelSim
Wave

16Bit Design File

```
--Engineer      : Abhijit Gadad
--Date          : 8/25/2017
--Name of file  : barrel_shifter_16.vhd
--Description   : implements a barrel shifter
--                of data width 8 bits

library ieee;
use ieee.std_logic_1164.all;
entity barrel_shifter is
--port list
    port(
         a   : in  std_logic_vector(15 downto 0); -- input data
         ctrl: in  std_logic_vector(3 downto 0); -- control word
         y   : out std_logic_vector(15 downto 0)  -- output data
        );
end barrel_shifter ;

architecture barrel_arch of barrel_shifter is
begin
--Comb logic which implements
--the simple functionality
    with ctrl select
        y <= a                        when "0000",
             a(0) & a(15 downto 1) when "0001",
             a(1 downto 0) & a(15 downto 2) when "0010",
             a(2 downto 0) & a(15 downto 3) when "0011",
             a(3 downto 0) & a(15 downto 4) when "0100",
             a(4 downto 0) & a(15 downto 5) when "0101",
             a(5 downto 0) & a(15 downto 6) when "0110",
             a(6 downto 0) & a(15 downto 7) when "0111",
             a(7 downto 0) & a(15 downto 8) when "1000",
             a(8 downto 0) & a(15 downto 9) when "1001",
             a(9 downto 0) & a(15 downto 10) when "1010",
             a(10 downto 0) & a(15 downto 11) when "1011",
             a(11 downto 0) & a(15 downto 12) when "1100",
             a(12 downto 0) & a(15 downto 13) when "1101",
             a(13 downto 0) & a(15 downto 14) when "1110",
```

```
            a(14 downto 0) & a(15)          when others;

end barrel_arch;
```

Comparison of 8 and 16 Bit barrel shifters

	8Bit	16Bit
Resources (Slice LUTs)	12	32
Resources (Bonded IO Buffers)	19	36
Resources (Primitives LUT6)	8	32
Resources (Primitives INBUF)	11	20
Resources (Primitives IBUFCTL)	11	20
Resources (Primitives OBUF)	8	16
Power Usage (Total)	6.051	12.015
Power Usage (Dynamic)	4.647	10.502
Power Usage (Static)	1.405	1.513