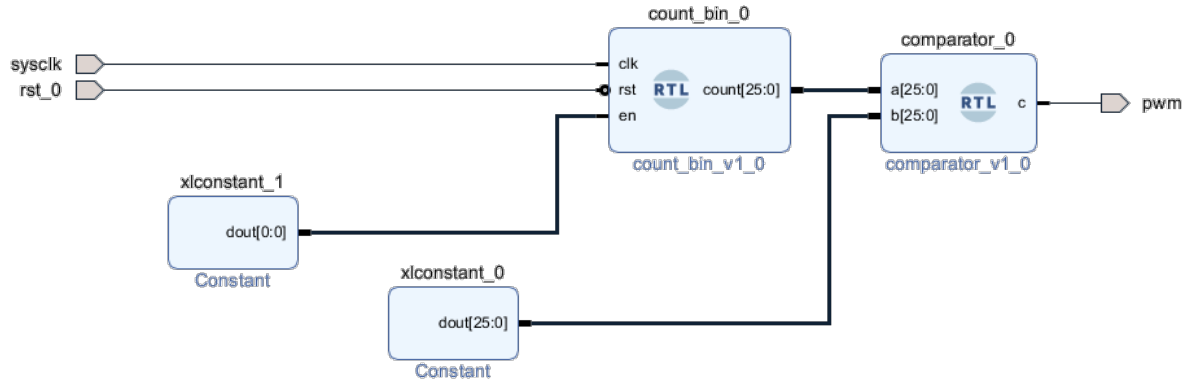
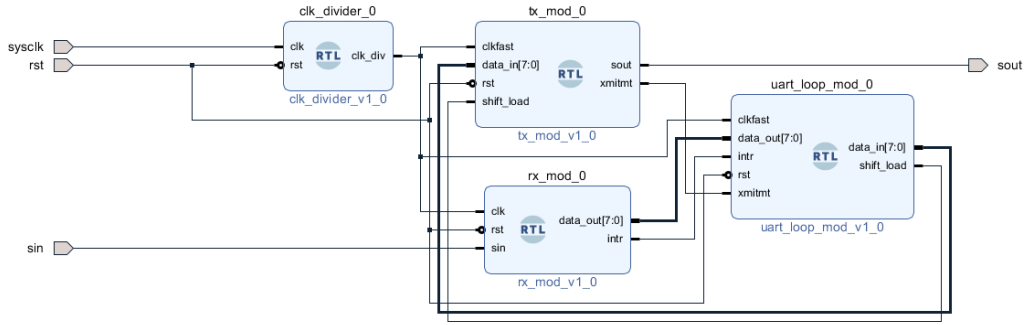
Lecture 5: ROM/RAM + (CAN)

Summary of lecture 4



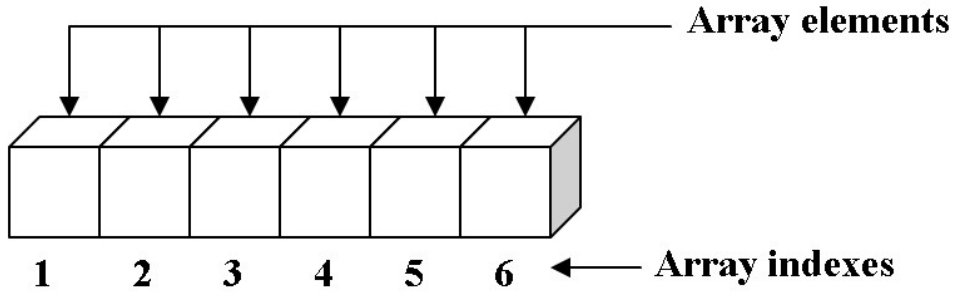


- CAN bus => Lecture 5

ROM

Array in VHDL

- Array has an index whose value selects each element.
- The index range determines:
  - Number of elements are in the array and their ordering (low *to* high, or high *downto* low).
- An index can be of any **integer** type.
- Array elements can be of **any** type.



One-dimensional array with six elements

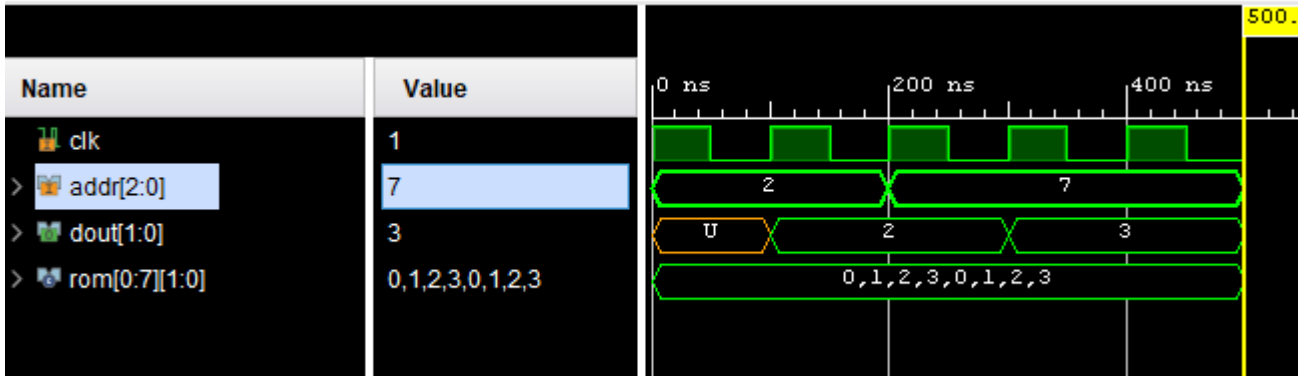
ROM

8x2

```
library IEEE;
use IEEE.STD_LOGIC_1164.ALL;
use ieee.std_logic_arith.all;


entity ROM_8_2 is
    Port ( clk  : in STD_LOGIC;
           addr : in std_logic_vector(2 downto 0);
           dout : out std_logic_vector(1 downto 0)
    );
end ROM_8_2;

architecture Behavioral of ROM_8_2 is
type rom_type is array (0 to 7) of std_logic_vector(1 downto 0);
constant rom : rom_type:=("00","01","10","11","00","01","10","11");
BEGIN
    process(clk)
    begin
        if(rising_edge(clk))then
        dout<=rom(conv_integer(unsigned(addr)));
    end if;
end process;
end Behavioral;
```



RAM

RAM

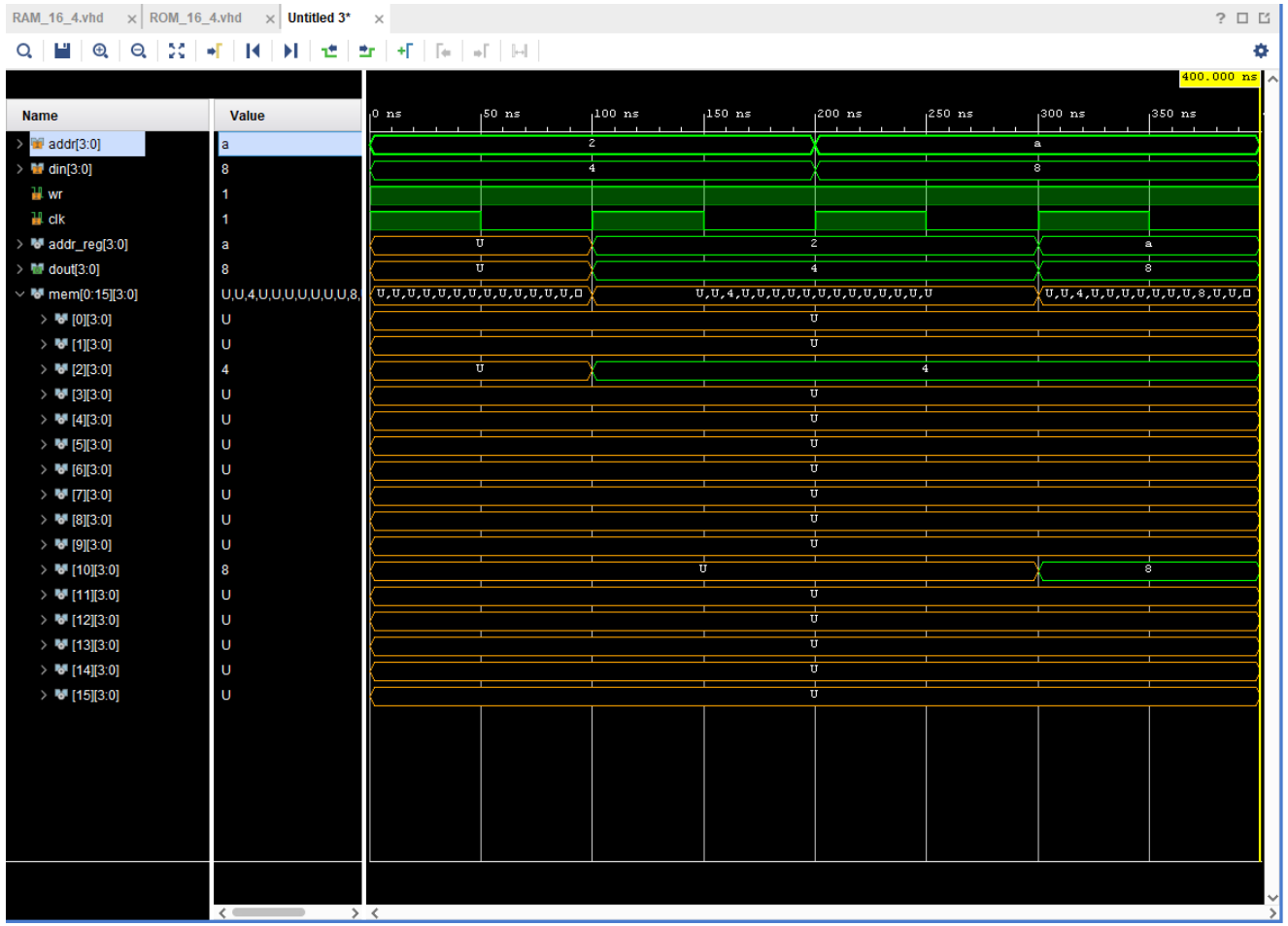
16x4

```
library IEEE;
use IEEE.STD_LOGIC_1164.ALL;
use ieee.std_logic_arith.all;

entity RAM_16_4 is
    port(
          addr : in std_logic_vector(3 downto 0);
          din : in std_logic_vector(3 downto 0);
        wr,clk: in std_logic;
         dout :out std_logic_vector(3 downto 0)
         );
end RAM_16_4;

architecture Behavioral of RAM_16_4 is
type mem_type is array (0 to 15) of std_logic_vector(3 downto 0);
signal mem : mem_type;
signal addr_reg:std_logic_vector(3 downto 0);
BEGIN
    process(clk)
    begin
        if(rising_edge(clk))then
            if(wr='1')then
            mem(conv_integer(unsigned(addr)))<=din;
            end if;
        addr_reg<=addr;
        end if;
end process;
dout<=mem(conv_integer(unsigned(addr_reg)));

end Behavioral;
```



Lab Exercise

- Build a memory system that stores/sends data ”coming from”/to your PC via serial communication.
- The system change operation (read/write) based on the switch value (0/1).