Combo Logic - if Statement

- SystemVerilog provides `always_comb` to model combinatorial logic
- A sensitivity list is inferred (any RHS expressions)
- Also sensitive to changes within the contents of functions used
- LHS variables cannot be written from any other processes
- Warnings occur if non-combo logic is detected (latch inference)
- Use blocking assignment inside `always_comb`

```
module simple_combo(
  input    a, b, c, d,
  output reg  z);
//make a AOI22 gate
  always_comb
    z = ~(a & b) | (c & d);
endmodule
```
module mux2_1 ( 
    input    sel, 
    input    din_0, din_1, 
    output reg d_out 
); 

    always_comb 
      if (sel) 
        d_out = din_1; 
      else 
        d_out = din_0; 
    endmodule
Combo Logic - if Statement

Nested IF statements can produce slow logic
Can you see the implied priority?

module serial_mux (  
    input a,b,c,d,x,y,z,  
    output reg d_out  
);  

    always_comb  
        if (z)  
            d_out = a;  
        else if (y)  
            d_out = b;  
        else if (x)  
            d_out = c;  
        else  
            d_out = d;  
    endmodule
IF with no concluding else produces what...

module mux_broken ( 
    input  a,b,c,d,x,y,z,
    output reg d_out 
);

always_comb
    if (z) 
        d_out = a;
    else if (y) 
        d_out = b;
    else if (x) 
        d_out = c;
    // else
    // d_out = d;
endmodule
Combo Logic - if Statement

IF without concluding else... did it compile correctly?

Model Technology ModelSim SE vlog 6.6a Compiler 2010.03 Mar 19 2010
-- Compiling module serial_mux_broken
Top level modules:
    serial_mux_broken
slana.eecs.oregonstate.edu:

What about synthesis?

Inferred memory devices in process
in routine serial_mux_broken line 6 in file 'serial_mux_broken.sv'.
===========================================================================
| Register Name  | Type  | Width | Bus | MB | AR | AS | SR | SS | ST |
===========================================================================
| d_out_reg      | Latch | 1     | N   | N  | N  | N  | -  | -  | -  |
===========================================================================
Warning: serial_mux_broken.sv:6: Netlist for always_comb block contains a latch. 0
Presto compilation completed successfully.
Information: There are 1 potential problems in your design.
Please run 'check_design' for more information. (LINT-99)