

2012 Fall CSE140L

Digital Systems Laboratory

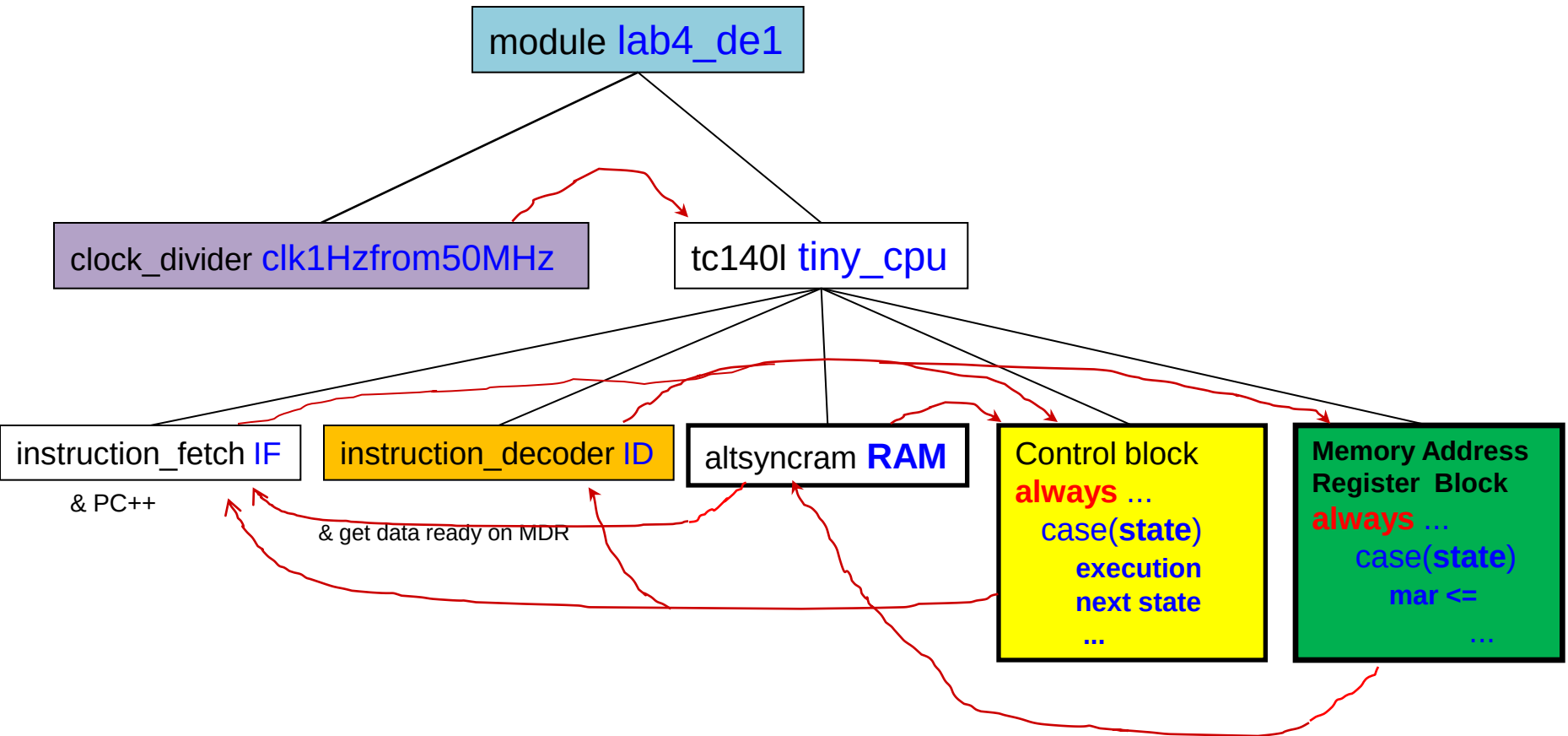
Lecture #9 & 10

by

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Our TinyComputer Verilog Code Major Flow



Question: Which block(s) should be updated?

Practical Sequential Logic Design

[LAB4.pdf](#)

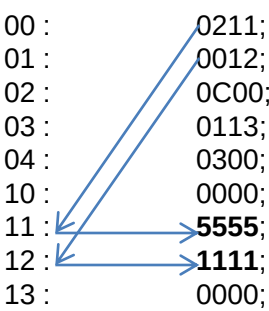
Memory Direct Addressing Mode("add.mif")

```
DEPTH = 256;           % Memory depth and width are required      %
WIDTH = 16;             % Enter a decimal number                  %

ADDRESS_RADIX = HEX;   % Address and value radices are optional  %
DATA_RADIX = HEX;      % Enter BIN, DEC, HEX, or OCT; unless     %
                       % otherwise specified, radices = HEX      %

-- Specify values for addresses, which can be single address or range
-- program add
CONTENT
    BEGIN
[00..FF]                : 0000;    % Range--Every address from 00 to FF = 0000 (Default) %
                                % Warning: Comments may or may not be correct! You must confirm %
                                % each instruction with definition in Verilog source code. %
    00 :                   0211;    % LOAD AC with MEM(11) -- initialize AC %
    01 :                   0012;    % ADD MEM(12) to AC %
    02 :                   0C00;    % OUT AC %
    03 :                   0113;    % STORE AC to MEM(13) %
    04 :                   0300;    % JUMP to 00 (loop forever) -- reset AC %
    10 :                   0000;
    11 :                   5555;
    12 :                   1111;
    13 :                   0000;
    END ;
```

"5555 6666..."



Random Number Generation Instruction("random.mif")

```
DEPTH = 256;           % Memory depth and width are required      %
WIDTH = 16;            % Enter a decimal number      %

ADDRESS_RADIX = HEX;   % Address and value radices are optional    %
DATA_RADIX = HEX;      % Enter BIN, DEC, HEX, or OCT; unless      %
                      % otherwise specified, radices = HEX        %

-- Specify values for addresses, which can be single address or range
-- program pseudo random sequencer
CONTENT
    BEGIN
[00..FF]                : 0000;    % Range--Every address from 00 to FF = 0000 (Default) %
                                % Warning: Comments may or may not be correct! You must confirm %
                                % each instruction with definition in Verilog source code. %
    00 : ← 1500;                % LOAD AC with Random number %
    01 : 0300;                  % JUMP to 00 (loop forever) %
    10 : 0000;
    11 : 5555;
    12 : 1111;
    13 : 0000;
    END ;
```

Memory Indirect Addressing Mode("addind.mif")

```

DEPTH = 256;           % Memory depth and width are required      %
WIDTH = 16;             % Enter a decimal number                  %

ADDRESS_RADIX = HEX;   % Address and value radices are optional  %
DATA_RADIX = HEX;      % Enter BIN, DEC, HEX, or OCT; unless     %
                        % otherwise specified, radices = HEX      %

-- Specify values for addresses, which can be single address or range
-- program addind
CONTENT
    BEGIN
[00..FF]                : 0000;    % Range--Every address from 00 to FF = 0000 (Default) %
                                % Warning: Comments may or may not be correct! You must confirm %
                                % each instruction with definition in Verilog source code. %

00:                      0210;      % LOAD AC with MEM(10) -- initialize AC %
01:                      1611;      % ADD IND memory contents to AC %
02:                      1613;      % ADD IND memory contents to AC %
03:                      1611;      % ADD IND memory contents to AC %
04:                      1613;      % ADD IND memory contents to AC %
05:                      1611;      % ADD IND memory contents to AC %
06:                      0300;      % JUMP to 00 (loop forever) %
10:                      0002;
11:                      0012;
12:                      0009;
13:                      0010;
14:                      0005;

    END ;

```

"2 b(=2+9) d(=b+2) 16(=d+9) 18(=0x16+2) 21(=0x18+9) 2"

Memory PC Reference Addressing Mode("addpcr.mif")

```

DEPTH = 256;           % Memory depth and width are required      %
WIDTH = 16;            % Enter a decimal number                  %

ADDRESS_RADIX = HEX;   % Address and value radices are optional   %
DATA_RADIX = HEX;      % Enter BIN, DEC, HEX, or OCT; unless      %
                        % otherwise specified, radices = HEX       %

-- Specify values for addresses, which can be single address or range
-- program addpcr
CONTENT
BEGIN
[00..FF] : 0000;          % Range--Every address from 00 to FF = 0000 (Default) %
00:      0210;          % LOAD AC with Mem(10) -- initialize AC %
01:      1710;          % ADD PCR memory content to AC %
02:      1712;          % ADD PCR memory content to AC %
03:      1714;          % ADD PCR memory content to AC %
04:      0300;          % JUMP to 00 (loop forever) %
10:      0009;
11:      0001;
12:      0005;
13:      0003;
14:      0004;
15:      0007;
16:      0006;
17:      0007;
18:      000B;
END ;

```

"9 E(=9+5) 15(=E+7) 16(=0x15+B) 20(=0x16+B) 9"