Driver PS/2 - Mouse

Course: Integrated Systems Design II

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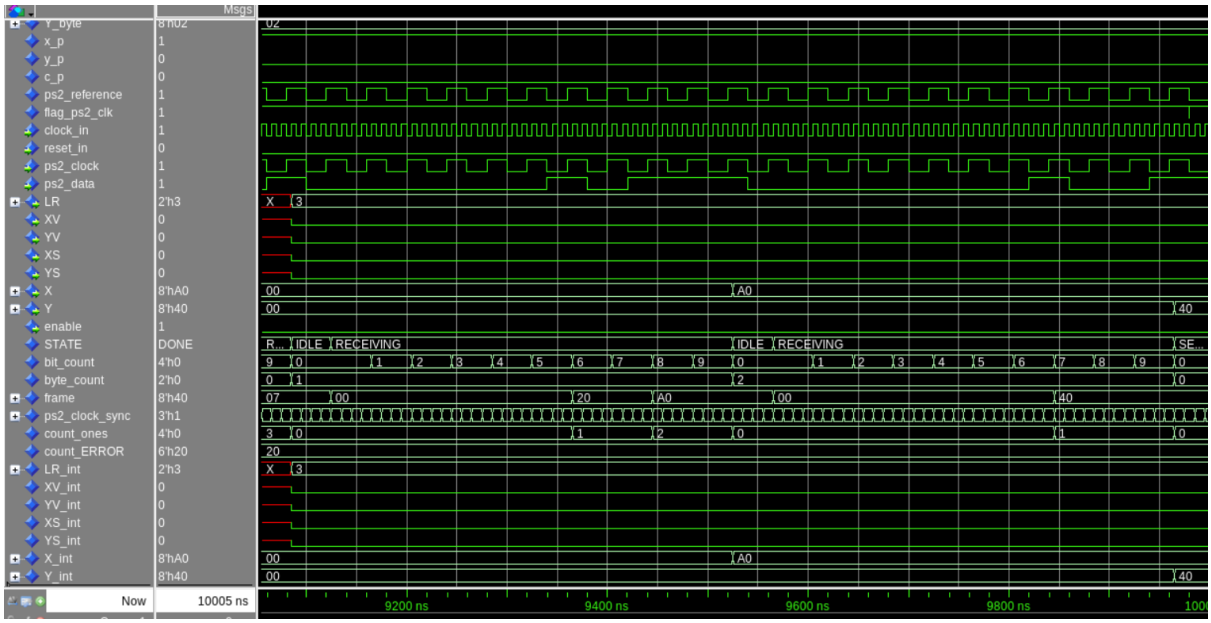

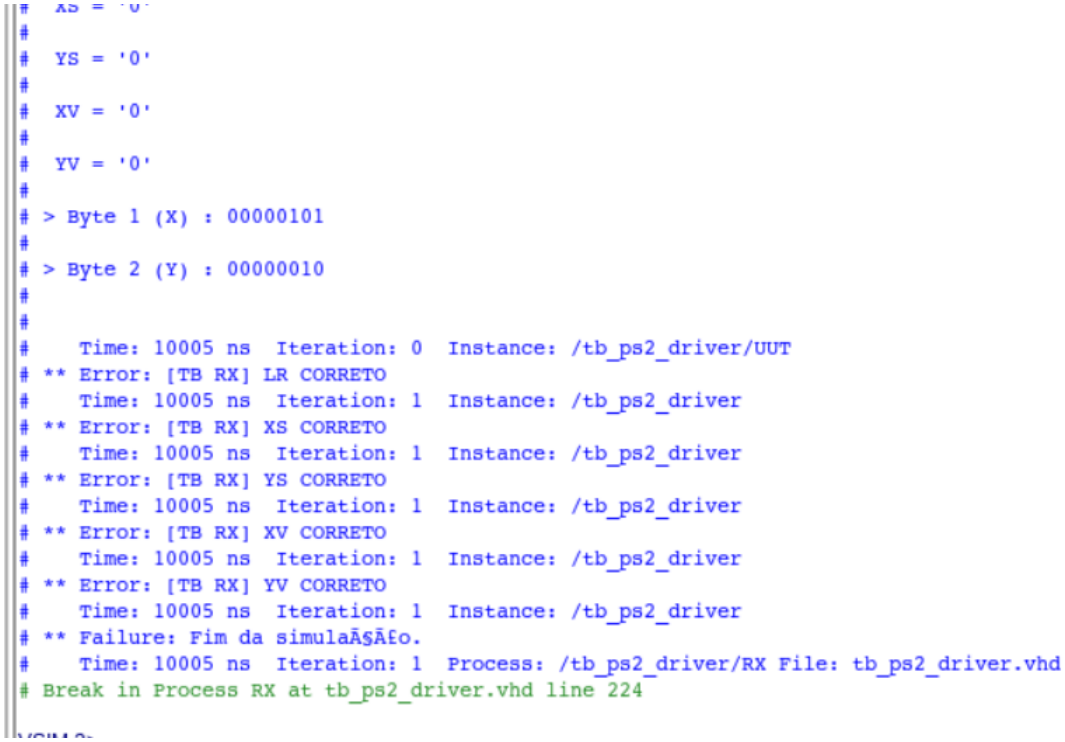

Quando o driver detecta um erro de paridade durante a recepção de um byte via protocolo PS/2, ele entra em um estado específico de erro que implementamos para garantir a integridade da comunicação. Nesse estado, o sistema não tenta interpretar imediatamente os próximos sinais recebidos; em vez disso, ele aguarda um intervalo predeterminado antes de voltar a aceitar novos dados. Essa lógica foi implementada com um contador (count_ERROR) que, ao detectar o erro, é iniciado com um valor proporcional à posição do byte em que ocorreu o erro. O contador é então incrementado a cada ciclo de borda de descida do clock PS/2, simulando uma janela de espera que corresponde ao tempo necessário para que os bits residuais do frame corrompido sejam descartados. Após esse tempo de espera, o sistema retorna ao estado IDLE, pronto para iniciar a recepção de um novo frame. Essa abordagem ajuda a evitar que o driver intérprete fragmentos de dados inválidos como se fossem uma nova transmissão legítima.

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read_hdl -vhdl …

elaborate …

```
        : in file 'ps2_driver.vhd' on line 44.
@genus:root: 11> elaborate ps2_mouse
Info    : Elaborating Design. [ELAB-1]
        : Elaborating top-level block 'ps2_mouse' from file 'ps2_driver.vhd'.
Info    : Binding to architecture. [ELAB-5]
        : Elaborating architecture 'rtl' for entity 'ps2_mouse'.
Warning : Using default parameter value for module elaboration. [CDFG-818]
        : Elaborating block 'ps2_mouse' with default parameters value.
Warning : Type conversion truncates constant value. [CDFG-370]
        : Constant 2'h2 truncated to 2'h2 in file 'ps2_driver.vhd' on line 96.
Warning : Type conversion truncates constant value. [CDFG-370]
        : Constant 2'h2 truncated to 2'h2 in file 'ps2_driver.vhd' on line 96.
Info    : Done Elaborating Design. [ELAB-3]
        : Done elaborating 'ps2_mouse'.
Checking for analog nets...
Check completed for analog nets.
Checking for source RTL...
Check completed for source RTL.
Running Unified Mux Engine Tricks...
Completed Unified Mux Engine Tricks
-----------------------------------------------------
| Trick            | Accepts | Rejects | Runtime (ms) |
-----------------------------------------------------
| ume_constant_bmux |       0 |       0 |         0.00 |
-----------------------------------------------------
Starting clip mux common data inputs [v1.0] (stage: post_elab, startdef: ps2_mouse, recur: true)
Completed clip mux common data inputs (accepts: 0, rejects: 0, runtime: 0.000s)
Starting clip the non-user hierarchies [v2.0] (stage: post_elab, startdef: ps2_mouse, recur: true)
Completed clip the non-user hierarchies (accepts: 0, rejects: 0, runtime: 0.000s)
UM:   flow.cputime  flow.realtime  timing.setup.tns  timing.setup.wns  snapshot
UM:*                                                                 elaborate
design:ps2_mouse
@genus:root: 12>
```

read_sdc ./constraints.sdc

```
design:ps2_mouse
@genus:root: 6> read_sdc ./constraints.sdc
Statistics for commands executed by read_sdc:
 "create_clock"             - successful      1 , failed      0 (runtime  0.01)
 "get_ports"                - successful     19 , failed      0 (runtime  0.01)
 "set_input_transition"     - successful     16 , failed      0 (runtime  0.01)
 "set_load"                 - successful      2 , failed      0 (runtime  0.01)
 "set_load_unit"            - successful      1 , failed      0 (runtime  0.00)
read_sdc completed in 00:00:01 (hh:mm:ss)
@genus:root: 7>
```

Report_timing:

```
@genus:root: 15> report_timing
============================================================
  Generated by:           Genus(TM) Synthesis Solution 21.12-s068_1
  Generated on:           Jul 02 2025  05:25:17 pm
  Module:                 ps2_mouse
  Operating conditions:   _nominal_ (balanced_tree)
  Wireload mode:          enclosed
  Area mode:              timing library
============================================================


Path 1: MET (9380 ps) Setup Check with Pin STATE_reg[0]/CP->D
          Group: clock_in
     Startpoint: (R) bit_count_reg[1]/CP
          Clock: (R) clock_in
       Endpoint: (F) STATE_reg[0]/D
          Clock: (R) clock_in

                    Capture       Launch
       Clock Edge:+   10000            0
      Src Latency:+       0            0
      Net Latency:+       0 (I)        0 (I)
          Arrival:=   10000            0

            Setup:-      62
     Required Time:=    9938
      Launch Clock:-       0
         Data Path:-     558
             Slack:=    9380

#-------------------------------------------------------------------------------------------------------
#    Timing Point     Flags    Arc    Edge       Cell        Fanout Load Trans Delay Arrival Instance
#                                                                (fF)  (ps)  (ps)   (ps)  Location
#-------------------------------------------------------------------------------------------------------
  bit_count_reg[1]/CP -        -      R     (arrival)            49    -     0     0       0    (-,-)
  bit_count_reg[1]/Q  -        CP->Q  F     HS65_GS_DFPQX9        4 13.1    34    73      73    (-,-)
  g10945/Z            -        A->Z   R     HS65_GS_IVX9          2  5.7    22    22      95    (-,-)
  g10937__6260/Z      -        B->Z   F     HS65_GS_NAND2X7       5 12.0    34    26     121    (-,-)
  g10930__9945/Z      -        B->Z   F     HS65_GS_OR3X9         3  9.1    26    68     189    (-,-)
  g10923__1881/Z      -        B->Z   R     HS65_GS_NAND2X7       5 14.8    44    32     221    (-,-)
  g10921/Z            -        A->Z   F     HS65_GS_IVX9          2  6.5    18    19     240    (-,-)
  g10916__5122/Z      -        B->Z   R     HS65_GS_NAND2X7       2  5.3    23    17     257    (-,-)
  g10912__6783/Z      -        E->Z   R     HS65_GS_AO212X4       2  6.4    35    51     308    (-,-)
  g10895__4319/Z      -        D->Z   F     HS65_GS_OAI211X5      1  2.0    24    23     331    (-,-)
  g10871__5115/Z      -        B->Z   R     HS65_GS_AOI12X2       4 13.0   190   110     441    (-,-)
  g10866/Z            -        A->Z   F     HS65_GS_IVX9          3 10.0    52    54     495    (-,-)
  g10852__5115/Z      -        B->Z   R     HS65_GS_AOI22X6       1  3.2    43    41     536    (-,-)
  g10774__6260/Z      -        B->Z   F     HS65_GS_OAI22X6       1  2.3    59    23     558    (-,-)
  STATE_reg[0]/D      <<<      -      F     HS65_GS_DFPQX9        1    -     -     0     558    (-,-)
#-------------------------------------------------------------------------------------------------------

@genus:root: 16>
```

Report_power:

```
@genus:root: 16> report_power
Info    : Joules engine is used. [RPT-16]
        : Joules engine is being used for the command report_power.
Info    : ACTP-0001 [ACTPInfo] Activity propagation started for stim#0 netlist
        : ps2_mouse
Info    : ACTP-0009 [ACTPInfo] Activity Propagation Progress Report : 100%
Info    : ACTP-0001 Activity propagation ended for stim#0
Info    : PWRA-0001 [PwrInfo] compute_power effective options
        : -mode : vectorless
        : -skip_propagation : 1
        : -frequency_scaling_factor : 1.0
        : -use_clock_freq : stim
        : -stim :/stim#0
        : -fromGenus : 1
Info    : ACTP-0001 Timing initialization started
Info    : ACTP-0001 Timing initialization ended
Info    : PWRA-0002 [PwrInfo] Skipping activity propagation due to -skip_ap
        : option....
Warning: PWRA-0302 [PwrWarn] Frequency scaling is not applicable for vectorless
        : flow. Ignoring frequency scaling.
Warning: PWRA-0304 [PwrWarn] -stim option is not applicable with vectorless mode
        : of power analysis, ignored this option.
Info    : PWRA-0002 Started 'vectorless' power computation.
Info    : PWRA-0009 [PwrInfo] Power Computation Progress Report : 100%
Info    : PWRA-0002 Finished power computation.
Info    : PWRA-0007 [PwrInfo] Completed successfully.
        : Info=6, Warn=2, Error=0, Fatal=0
Instance: /ps2_mouse
Power Unit: W
PDB Frames: /stim#0/frame#0
  ------------------------------------------------------------------------
    Category         Leakage     Internal    Switching        Total    Row%
  ------------------------------------------------------------------------
      memory     0.00000e+00  0.00000e+00  0.00000e+00  0.00000e+00   0.00%
    register     7.07201e-06  4.05318e-05  4.73318e-05  9.49355e-05  81.41%
       latch     0.00000e+00  0.00000e+00  0.00000e+00  0.00000e+00   0.00%
       logic     4.77159e-06  4.46142e-06  7.05747e-06  1.62905e-05  13.97%
        bbox     0.00000e+00  0.00000e+00  0.00000e+00  0.00000e+00   0.00%
       clock     0.00000e+00  0.00000e+00  5.39000e-06  5.39000e-06   4.62%
         pad     0.00000e+00  0.00000e+00  0.00000e+00  0.00000e+00   0.00%
          pm     0.00000e+00  0.00000e+00  0.00000e+00  0.00000e+00   0.00%
  ------------------------------------------------------------------------
    Subtotal     1.18436e-05  4.49932e-05  5.97792e-05  1.16616e-04 100.00%
  Percentage          10.16%       38.58%       51.26%      100.00% 100.00%
  ------------------------------------------------------------------------
@genus:root: 17>
```

Report_area:

```
@genus:root: 17> report_area
============================================================
  Generated by:           Genus(TM) Synthesis Solution 21.12-s068_1
  Generated on:           Jul 02 2025  05:26:00 pm
  Module:                 ps2_mouse
  Operating conditions:   _nominal_ (balanced_tree)
  Wireload mode:          enclosed
  Area mode:              timing library
============================================================

 Instance Module  Cell Count  Cell Area  Net Area   Total Area     Wireload
-----------------------------------------------------------------------------
ps2_mouse               197    889.720     0.000      889.720 area_0Kto1K (S)
  (S) = wireload was automatically selected
@genus:root: 18>
```