



DCS Lab 06

Pattern

Pattern

- 這次Lab寫pattern去測錯誤的design，找到其錯誤
- 這次Lab只需要寫00_TESTBED/pattern.sv
- lab06_1.sv代表第一個spec錯誤的design，依此類推。lab06.sv 是正確的design。
- lab06_x.sv & lab06.sv 都不要動到
- 可以參考之前幾次的pattern和講義

lab06.sv

Input Signal	Bit Width	Definition
clk	1	10 ns Clock for 1 cycle
rst_n	1	Asynchronous reset when reset negedge, all output should be zero
in_number	4	範圍(-8,7), 連續給4個數字。方便之後說明, 分別用in_1、in_2、in_3跟in_4代表
mode	2	幾種運算模式, 請看下一頁
in_valid	1	in_valid high when giving number

Output Signal	Bit Width	Definition
out_valid	1	High for 4 cycles
out_result	7	Output for 4 cycles, 輸出計算後的結果, 如下頁所示

mode

需先將input四個數值(in_1~in_4)進行排序由小至大，
假設以下經過排序後sort_1最小，sort_4最大
out_result輸出如下表所示

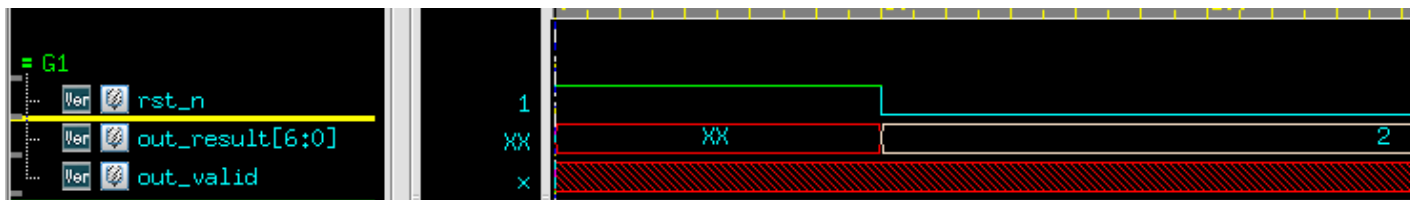
mode	Cycle 1	Cycle 2	Cycle 3	Cycle 4
0	Sort_1	Sort_2	Sort_3	Sort_4
1	Sort_4	Sort_3	Sort_2	Sort_1
2	Sort_1 + sort_2	Sort_2 + sort_3	Sort_3 + sort_4	Sort_4 + sort_1
3	Sort_1 - sort_2	Sort_2 - sort_3	Sort_4 - sort_3	Sort_4 - sort_1

Specifications

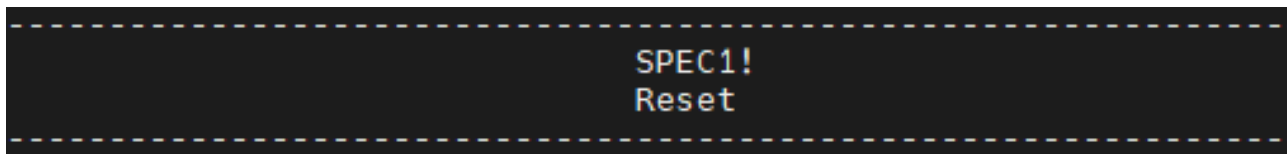
- Top module name : lab06 (File name: lab06.sv)
- **Spec1** : reset後所有的output signal要歸零
- **Spec2** : 計算完吐完值後4 cycles , out_valid要歸零 (out_valid只維持4 cycles)
- **Spec3** : outvalid 不能跟 invalid重疊
- **Spec4** : 100cycle內要計算完成(out_valid為high之前)
- **Spec5** : function要對(前一頁的公式會有錯要檢查出來)
- **Spec6** : 當out_valid是0時, out_result要歸零
- 註:請用random多跑幾組去檢測(建議100以上)

Output & Waveform

- Waveform SPEC1 error
 - reset後output signal要歸零

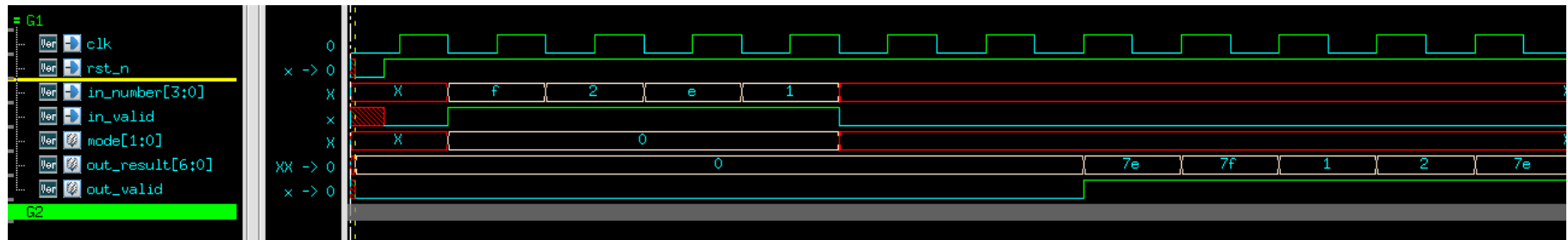


out_result , out_valid要在reset後設為0



Output & Waveform

- Waveform SPEC2 error
 - 計算完吐完值後4 cycles，out_valid要歸零(out_valid只維持4 cycles)

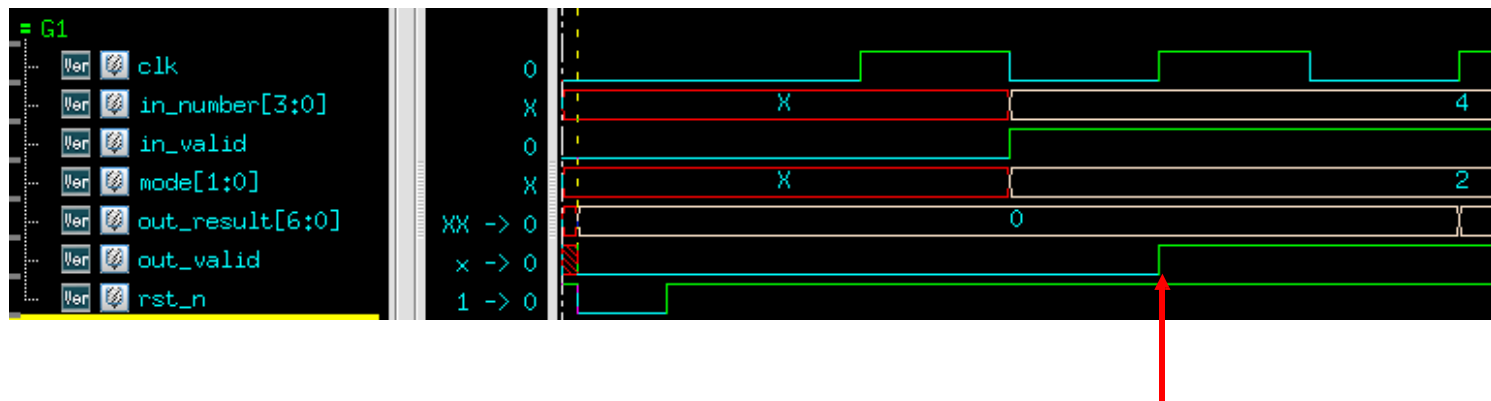


out_valid要在output 4 cycle
後設為0
只能維持4 cycle

SPEC2!
Output should be zero after check

Output & Waveform

- Waveform SPEC3 error
 - input data 給完之前，out_valid不能為high



out_valid在data給完之前必須為0

SPEC3!
Outvalid should be zero before give data finish

Output & Waveform

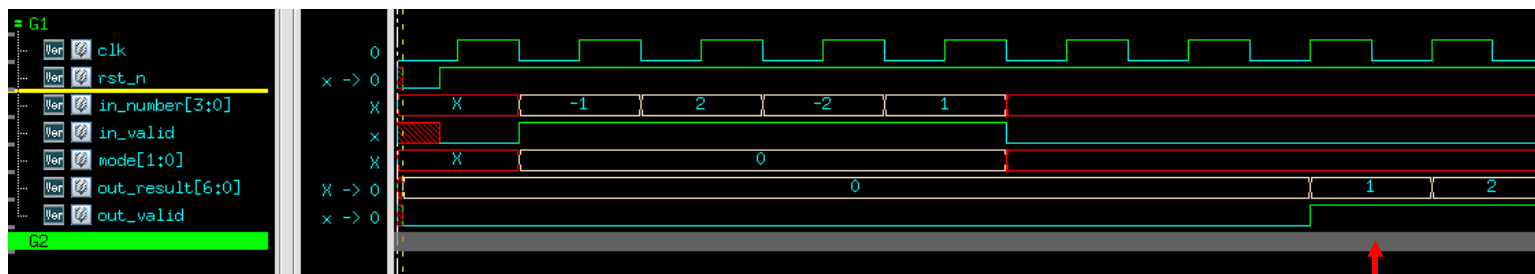
- Waveform SPEC4 error
 - 100cycle內要計算完成(out_valid為high)



SPEC4!
The execution latency are over 100 cycles

Output & Waveform

- Waveform SPEC5 error
 - function要對(前幾頁的公式會有錯要檢查出來)

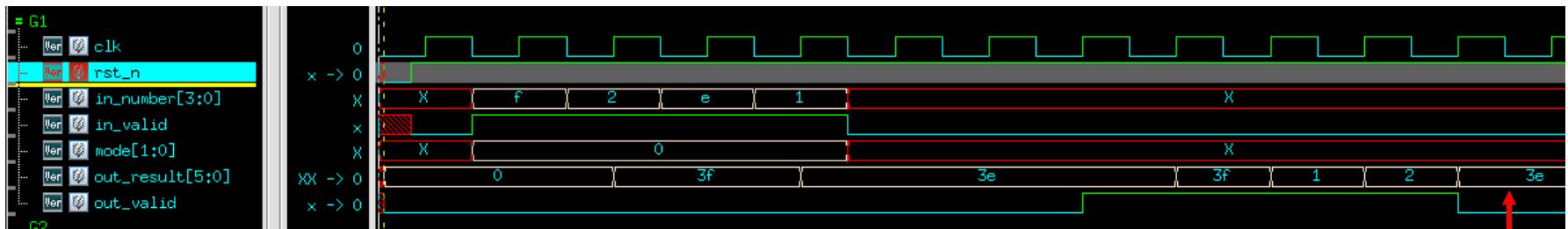


正確答案為-2

```
-----  
SPEC5!  
YOUR:    1  
GOLDEN:  -2  
-----
```

Output & Waveform

- Waveform SPEC6 error
 - 當out_valid為0時out_result要歸零



out_valid為0時
out_result要歸零

Command

- `tar -xvf ~dcsTA01/Lab06.tar`
- `./01_run_spec1` : run for check spec1(should display SPEC1 Fail)
- `./01_run_spec2` : run for check spec2(should display SPEC2 Fail)
- `./01_run_spec3` : run for check spec3(should display SPEC3 Fail)
- `./01_run_spec4` : run for check spec4(should display SPEC4 Fail)
- `./01_run_spec5` : run for check spec5(should display SPEC5 Fail)
- `./01_run_spec6` : run for check spec6(should display SPEC6 Fail)
- `./01_run` : run for right design(should display Congratulation)
- You should Pass all spec!

Command

- 請參考pattern.sv裡這段，
需要各自秀出SPEC1.2.3.4.5.6等資訊，
以免助教demo時抓不到

```

$display ("-----");
$display ("                                SPEC1!                                ");
$display ("                                Reset                                ");
$display ("-----");

$display ("-----");
$display ("                                SPEC2!                                ");
$display ("                                Outvalid should be zero after check        ");
$display ("-----");

$display ("-----");
$display ("                                SPEC3!                                ");
$display ("                                Outvalid should not be overlapped with invalid ");
$display ("-----");

$display ("-----");
$display ("                                SPEC4!                                ");
$display ("                                The execution latency are over 100  cycles        ");
$display ("-----");

$display ("-----");
$display ("                                SPEC5!                                ");
$display ("                                YOUR:  %d                                ",out_result);
$display ("                                GOLDEN: %d                                ",golden);
$display ("-----");

$display ("-----");
$display ("                                SPEC6!                                ");
$display ("                                Output should be zero when outvalid is zero        ");
$display ("-----");

```

Command

- `tar -xvf ~dcsTA01/Lab06.tar`
- Upload
 - `cd 09_upload`
 - `./01_upload`
 - `./02_download demoX`

Tips

- CYCLE 記得要給值喔~
- 不然模擬會卡住