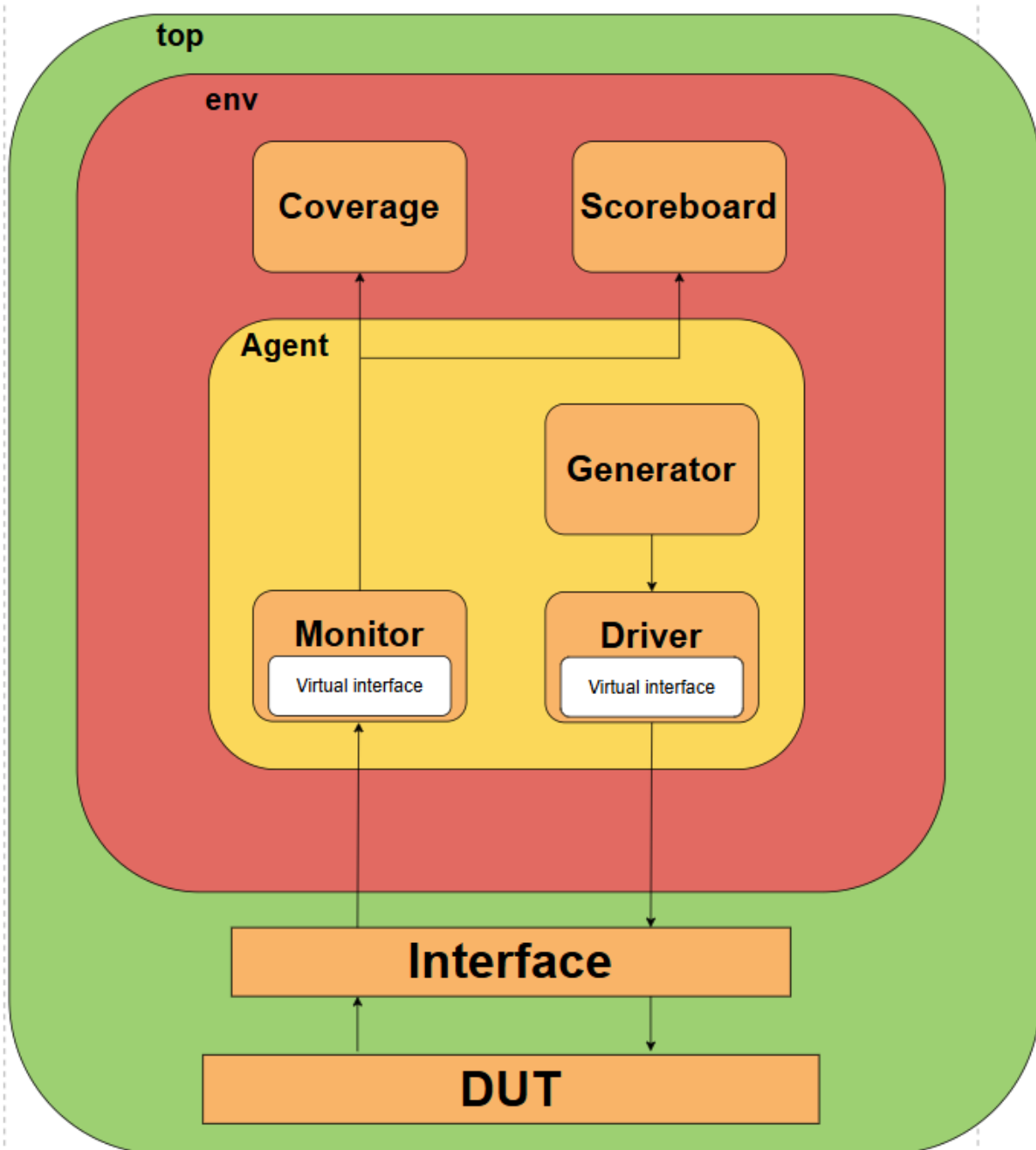




Abdelrahman Khaled Fouad

Verification Documentation of ALU

Verification Diagram



Verification plan

Label	Description	Stimulus generation	Functional Coverage
ALU_1	Testing add operation one with carry flag and one without carry flag	Exhaustive testing throughout the simulation	Bin for op = add coverage & bins for all a & b values
ALU_2	Testing XOR operation	Exhaustive testing throughout the simulation	Bin for op = XOR coverage & bins for all a & b values
ALU_3	Testing AND operation	Exhaustive testing throughout the simulation	Bin for op = AND coverage & bins for all a & b values
ALU_4	Testing OR operation	Exhaustive testing throughout the simulation	Bin for op = OR coverage & bins for all a & b values

Errors detected

1) Carry flag assertion error

- Carry (c) becomes high during non-add operations, which is incorrect.

2) Incorrect arithmetic and logical operations

- Some ADD, AND XOR, and OR results do not match the expected golden model outputs.

3) Incorrect dependency in output logic

- The output behavior appears to depend improperly on operands a and b rather than being controlled correctly by the opcode.
- This indicates inefficient or incorrect ALU design implementation.

Report summary

```
# Simulation summary: Correct=750 Errors=300
# ** Note: $stop      : ALU_top.sv(37)
#   Time: 2100 ns   Iteration: 0   Instance: /ALU_top
# Break in Module ALU_top at ALU_top.sv line 37
```

Functional Coverage

Covergroups						
Name	Class Type	Coverage	Goal	% of Goal	Status	Include
/ALU_coverage_pkg/ALU_coverage		100.00%				
TYPE ALU_cg		100.00%	100	100.00...	<div></div>	✓
CVP ALU_cg::{\#coverpoint_0#}		100.00%	100	100.00...	<div></div>	✓
CVP ALU_cg::{\#coverpoint_1#}		100.00%	100	100.00...	<div></div>	✓
CVP ALU_cg::{\#coverpoint_2#}		100.00%	100	100.00...	<div></div>	✓

Code Coverage

```
=====
=== Instance: /ALU_top/DUT
=== Design Unit: work.ALU
=====
```

Branch Coverage:

Enabled Coverage	Bins	Hits	Misses	Coverage
-----	----	----	-----	-----
Branches	1025	1024	1	99.90%
Enabled Coverage	Bins	Hits	Misses	Coverage
-----	----	----	-----	-----
Statements	1026	1026	0	100.00%

Toggle Coverage:

Enabled Coverage	Bins	Hits	Misses	Coverage
-----	----	----	-----	-----
Toggles	40	40	0	100.00%