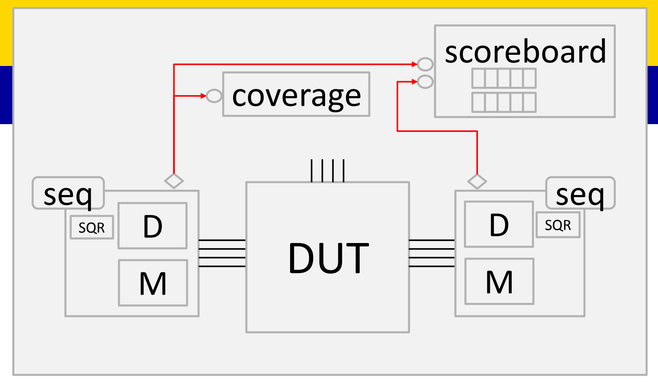
2015 DESIGN AND VERIFICATION™ DVCON CONFERENCE AND EXHIBITION UNITED STATES

Are You Smarter Than Your Testbench?
With a little work you could be




```
20 class abc_monitor extends uvm_monitor;
21   `uvm_component_utils(abc_monitor)
22
23   virtual abc_if bfm;
24   uvm_analysis_port #(abc_item) ap;
...
37   abc_item t;
38   task run_phase(uvm_phase phase);
...
47     t = abc_item::type_id::create(
         $sformatf("t%0d", transaction_count++));
48     `W_NEW(t)
49     forever begin
...
53       bfm.monitor(transaction_ok,
           t.rw, t.addr, t.data, t.burst);
55       if (transaction_ok) begin
...
60         `W_MARK(t)
61         ap.write(t);
62         t = abc_item::type_id::create(
            $sformatf("t%0d",
              transaction_count++));
63         `W_NEW(t)
64       end
65     end
66   endtask
67 endclass
```

abc_monitor

```
20 class abc_driver extends uvm_driver #(abc_item);
21   `uvm_component_utils(abc_driver)
22
23   virtual abc_if bfm;
24   uvm_analysis_port #(abc_item) ap;
...
35   task run_phase(uvm_phase phase);
36     abc_item item;
37     abc_reset_item reset_item;
...
44     forever begin
45       seq_item_port.get_next_item(item);
46       `W_MARK(item)
...
65       `W_MARK(item)
66       ap.write(item);
67       seq_item_port.item_done();
68     end
69   endtask
70 endclass
```

abc_driver

```
// Run regression with +UVM_VERBOSITY=UVM_LOW
// Regular `uvm_info: 20x seconds
//    Fast `uvm_info:   x seconds

import uvm_pkg::*;
`include "uvm_macros.svh"

`ifdef uvm_info
`undef uvm_info
`endif

`define uvm_info(ID,MSG,VERBOSITY) \
  begin \
    if ( VERBOSITY <= UVM_LOW ) \
      if (uvm_report_enabled(VERBOSITY,UVM_INFO,ID)) \
        uvm_report_info (ID, MSG, VERBOSITY, \
          `__FILE__, `__LINE__); \
  end

module top();
  initial
    for (int i = 0; i < 100_000_000; i++ ) begin
      `uvm_info("INIT", msg, UVM_MEDIUM)
      `uvm_info("INIT", msg,  UVM_HIGH)
    end
endmodule
```

`uvm_info

```
20 class abc_sequence extends uvm_sequence#(abc_item);
21   `uvm_object_utils(abc_sequence)
...
48   abc_item item;
49   task body();
52     abc_reset_item reset_item;
...
58     `S_CREATE_OBJECT(reset_item, abc_reset_item, "reset_item")
59     `W_NEW(reset_item)
60     `S_START_ITEM(reset_item)  // start_item(reset_item)
61     `W_MARK(reset_item)
62     `S_FINISH_ITEM(reset_item) // finish_item(reset_item)
63     `W_MARK(reset_item)
...
72     while(1) begin
...
78       // item = abc_item::type_id::create(
         //   $sformatf("item%0d", transaction_count++));
79       `S_CREATE_OBJECT(item, abc_item,
           $sformatf("item%0d", transaction_count++))
80       `W_NEW(item)
81
82       fork
83         automatic abc_item item_f = item;
84         begin
85         `W_MARK(item_f)
86         `S_START_ITEM(item_f) // start_item(item_f)
87         if (!item_f.randomize() with { ... })
...
92         `W_MARK(item_f)
93         `S_FINISH_ITEM(item_f) // finish_item(item_f)
94         `W_MARK(item_f)
96         end
97       join_none
...
102    end
...
105  endtask
106 endclass
```

abc_sequence

```
Counted Report --------------------
Counted by file_line
                1 : abc_pkg/abc_seq_lib.svh:141
                2 : abc_pkg/abc_seq_lib.svh:58
             1983 : abc_pkg/abc_seq_lib.svh:79
                4 : xyz_pkg/xyz_seq_lib.svh:56
             3954 : xyz_pkg/xyz_seq_lib.svh:74
Counted by seq_full_name
                1 : uvm_test_top.env.agent1.sequencer.seq
             1985 : uvm_test_top.env.agent1.sequencer.seq1
             1973 : uvm_test_top.env.agent2.sequencer.seq2
             1985 : uvm_test_top.env.agent3.sequencer.seq3
Counted by seq_item_type_name
             1984 : abc_item
                2 : abc_reset_item
             3954 : xyz_item
                4 : xyz_reset_item
Counted by seq_type_name
                1 : abc_dump
             1985 : abc_even_sequence
             3958 : xyz_sequence

// Used for Sequence Items, from within a Sequence.
// lhs = type_t::::type_id::create(typename)
`define S_CREATE_OBJECT(lhs, type_t, typename)
```

Allocation

```
 2 class abc_checkerboard extends
     uvm_subscriber#(abc_item);
 3   `uvm_component_utils(abc_checkerboard)
 4
 5   uvm_tlm_fifo #(abc_item) fifo;
 6   uvm_analysis_port #(abc_item) ap;
 7
 8   abc_item t;
 9   bit _end;
...
23   function void write(abc_item t);
24     `W_MARK(t)
25     fork
26       #10 fifo.try_put(t);
27     join_none
28   endfunction
29
30   task calc(abc_item t);
32     `W_MARK(t)
...
35     `W_PRINT(t)
36     `W_DESTROY(t)
37   endtask
38
39   task run_phase (uvm_phase phase);
41     forever begin
...
45       fifo.get(t);
46       `W_MARK(t)
...
51       if (_end)
52         calc(t);
53       else
54         ap.write(t);
55     end
56   endtask
57 endclass
```

abc_checkerboard

Where has my transaction been?

```
Report (0x000D01AD) ------------------------------
>> @2570: <item22> (abc_pkg/abc_seq_lib.svh:80)       [in body      / NEW ]
>> @2570: <item22> (abc_pkg/abc_seq_lib.svh:85)       [in body      / uvm_test_top.env.agent1.sequencer.seq1]
>> @2570: <item22> (abc_pkg/abc_seq_lib.svh:92)       [in body      / uvm_test_top.env.agent1.sequencer.seq1]
>> @2570: <item22> (abc_pkg/abc_driver.svh:46)        [in run_phase / uvm_test_top.env.agent1.driver]
>> @2730: <item22> (abc_pkg/abc_driver.svh:65)        [in run_phase / uvm_test_top.env.agent1.driver]
>> @2730: <item22> (abc_pkg/abc_checkerboard.svh:24) [in write     / uvm_test_top.env.agent1.checkerboard2_0]
>> @2730: <item22> (abc_pkg/abc_seq_lib.svh:94)       [in body      / uvm_test_top.env.agent1.sequencer.seq1]
>> @2740: <item22> (abc_pkg/abc_checkerboard.svh:46) [in run_phase / uvm_test_top.env.agent1.checkerboard2_0]
>> @2746: <item22> (abc_pkg/abc_checkerboard.svh:24) [in write     / uvm_test_top.env.agent1.checkerboard2_1]
>> @2756: <item22> (abc_pkg/abc_checkerboard.svh:46) [in run_phase / uvm_test_top.env.agent1.checkerboard2_1]
...
>> @2874: <item22> (abc_pkg/abc_checkerboard.svh:24) [in write     / uvm_test_top.env.agent1.checkerboard2_9]
>> @2884: <item22> (abc_pkg/abc_checkerboard.svh:46) [in run_phase / uvm_test_top.env.agent1.checkerboard2_9]
>> @2894: <item22> (abc_pkg/abc_checkerboard.svh:32) [in calc      / uvm_test_top.env.agent1.checkerboard2_9]
```

```
20 class abc_coverage extends
       uvm_subscriber#(abc_item);
21   `uvm_component_utils(abc_coverage)
22
23   abc_item t;
...
54   virtual function void sample(abc_item t);
55     `W_MARK(t)
56     this.t = t;
57     cg.sample();
58   endfunction
...
66   function void write(abc_item t);
67     `W_MARK(t)
68     sample(t);
...
71   endfunction
72 endclass
```

abc_coverage

```
36 class axx_basic_sequence extends axx_sequence_base;
37   `uvm_object_utils(axx_basic_sequence)
...
43   task body();
44     abc_even_sequence seq1;
45     xyz_sequence seq2, seq3;
...
52     seq1 = abc_even_sequence::type_id::create("seq1");
53     seq2 = xyz_sequence::type_id::create("seq2");
54     seq3 = xyz_sequence::type_id::create("seq3");
...
65     fork
66       `S_START_SEQUENCE(seq1, env.agent1.sequencer) // seq1.start(env.agent1.sequencer)
67       `S_START_SEQUENCE(seq2, env.agent2.sequencer) // seq2.start(env.agent2.sequencer)
68       `S_START_SEQUENCE(seq3, env.agent3.sequencer) // seq3.start(env.agent3.sequencer)
69     join
...
72   endtask
73 endclass
```

axx_sequence

```
Sequence Types Running Report --------------------
Sequence      4 : 'xyz_sequence' (last started at 0)
Sequence      2 : 'abc_even_sequence' (last started at 0)
Sequence      2 : 'abc_dump' (last started at 79790)
Sequence      1 : 'b' (last started at 179810)
Sequence      1 : 'a' (last started at 0)

`define S_START_SEQUENCE(seq, sqr) // seq.start(sqr)
```

Sequences Used?

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```
proc go { n } {
  for {set i 0} { $i < $n } { incr i } {
    step -current;
    set msg [vsim_kernel tb 0]
    puts $msg
  }
}

bp xyz.sv
run -all
go 100
```

“auto-single-step”

```
# STATS: Load Average Report (loadav) --------------------
# STATS: uvm_test_top.env.agent1: loadav [      6     2.8       1]
# STATS: uvm_test_top.env.agent2: loadav [    5.5     2.7    0.99]
# STATS: uvm_test_top.env.agent3: loadav [    5.9     2.7    0.99]

// Should be used from within a sequence as
//   start_item(item)  => `START_ITEM(item)
//   finish_item(item) => `FINISH_ITEM(item)
```

Load Average