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Conscious of Streams Managing Parallel Stimulus

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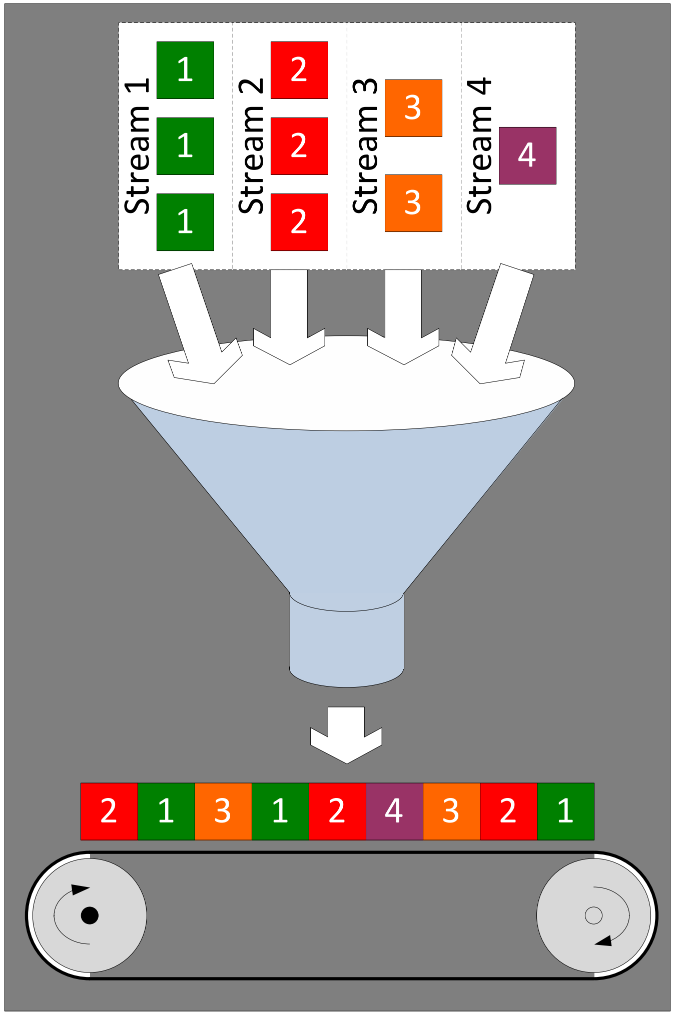
Overview

- What's in a Stream?
- Why use Parallel Stimulus?
- Concerns for Testbench Architecture
- Solution Space
- At What Cost Flexibility?
- Summary

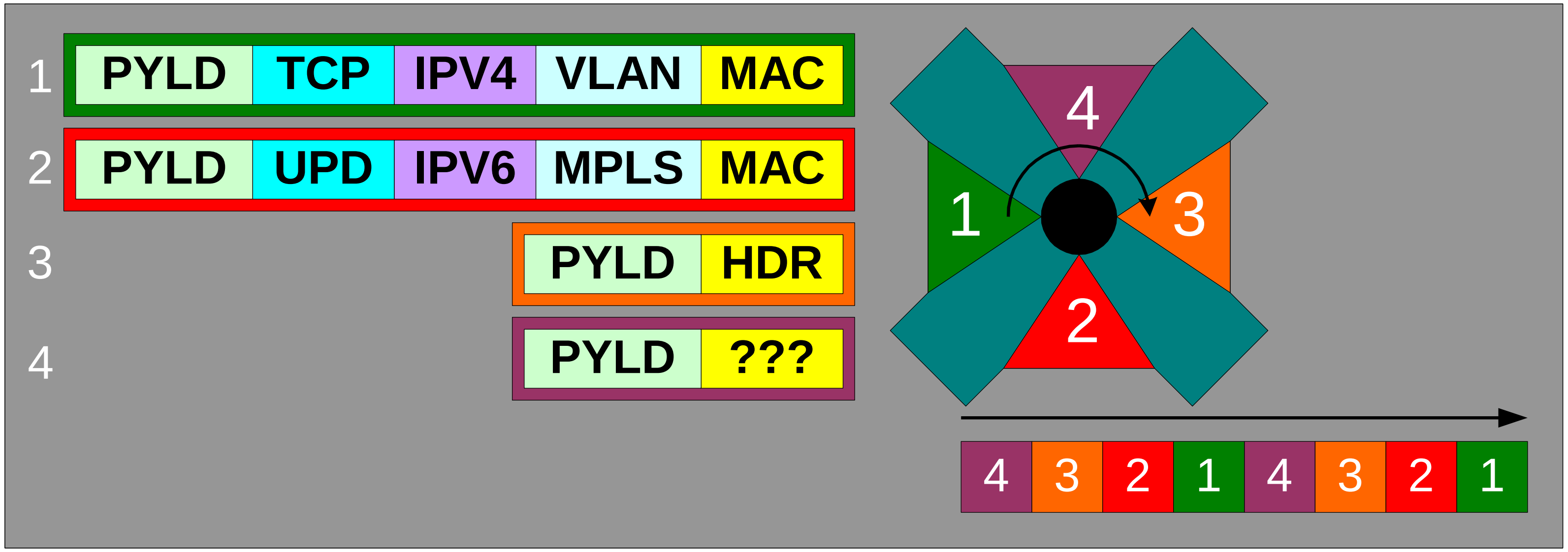
What's in a Stream?

- Many to one Stimulus
- Autonomous Flows
- Multi-Channel Interface
- Segmenting Interface
- Periodic Process
  - Refresh Request
  - Status Polling Routine



What's in a Stream?

- Constraints defining transaction specifics
- Unique transaction types
- TDM mechanisms
- *Could* be handled in single transaction



Why Use Parallel Stimulus?

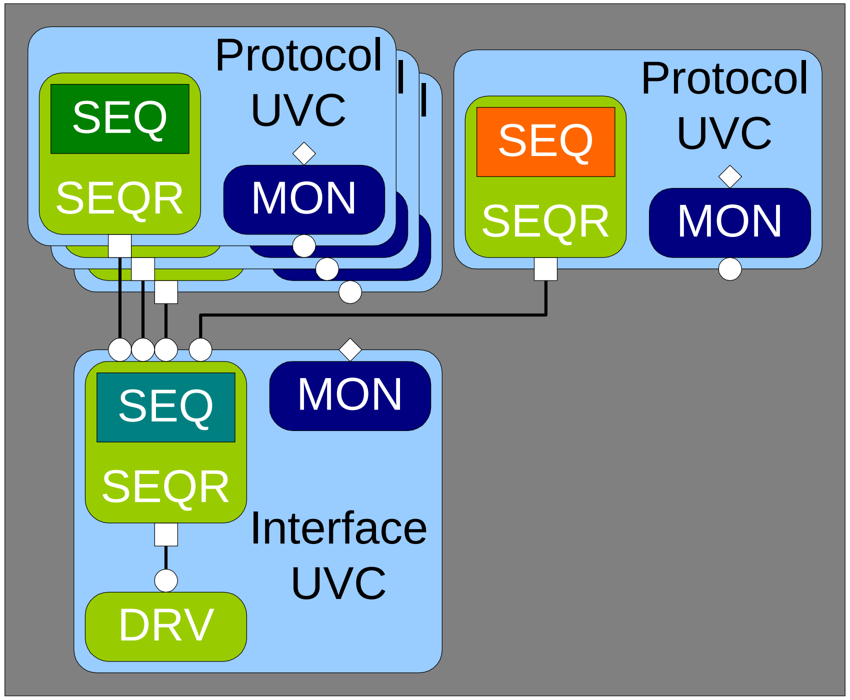
- Constraint Simplification
  - Disable unneeded constraints
  - Set fields to constant values
  - Mix protocols without adding constraint complexity
  - Result: Better performance
- Stream Autonomy
  - Streams must not block each other
    - Per-channel flow control
  - Metered Delivery
    - Bandwidth provisioning
    - Guaranteed periodicity

Testbench Architecture Concerns

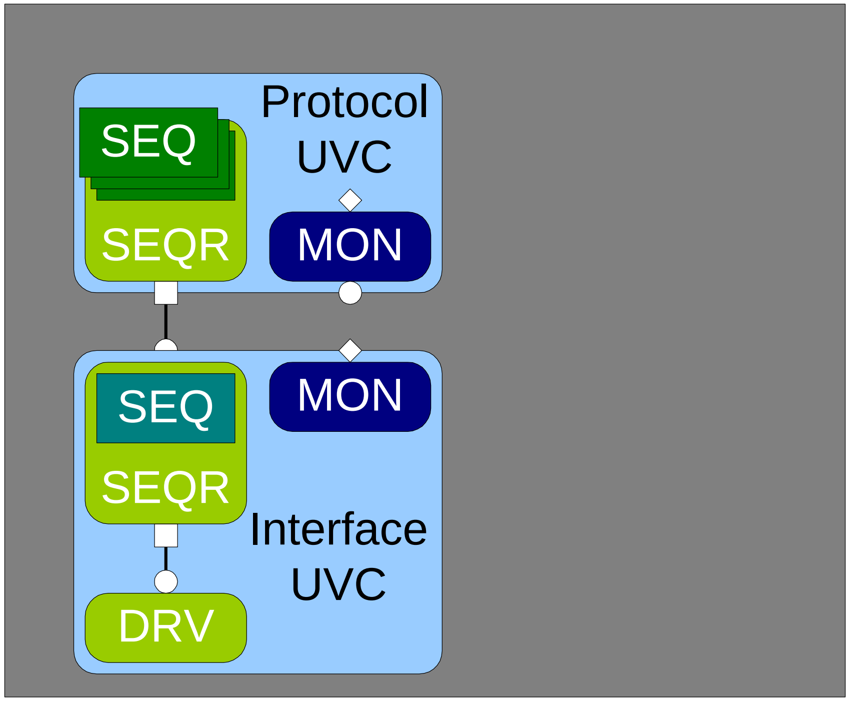
- Performance
  - Runtime image size
  - CPU time
- Scalability
  - 10 to 20 streams required today
  - 500 to 1000 streams next year?
- Test development
  - How easy to manage active streams?
  - How easy to configure specific streams?

Options for Parallel Streams

Parallel UVCs

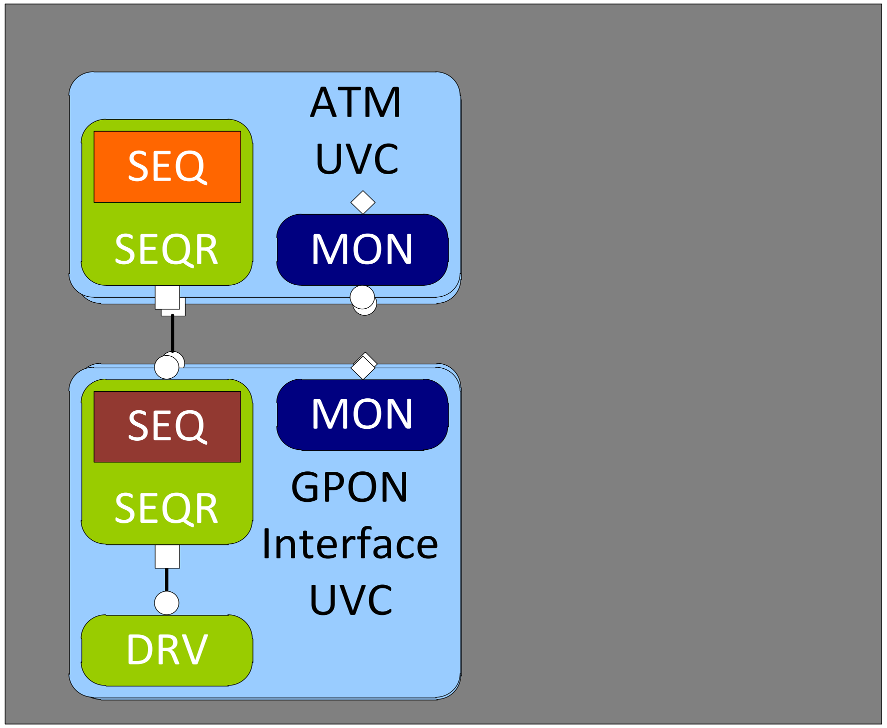


Parallel Sequences



Protocol Isolation

- Separates high level protocol from interface protocol
- Reuse Protocol UVC on different interface
- Use different Protocols on same interface



Parallel UVCs

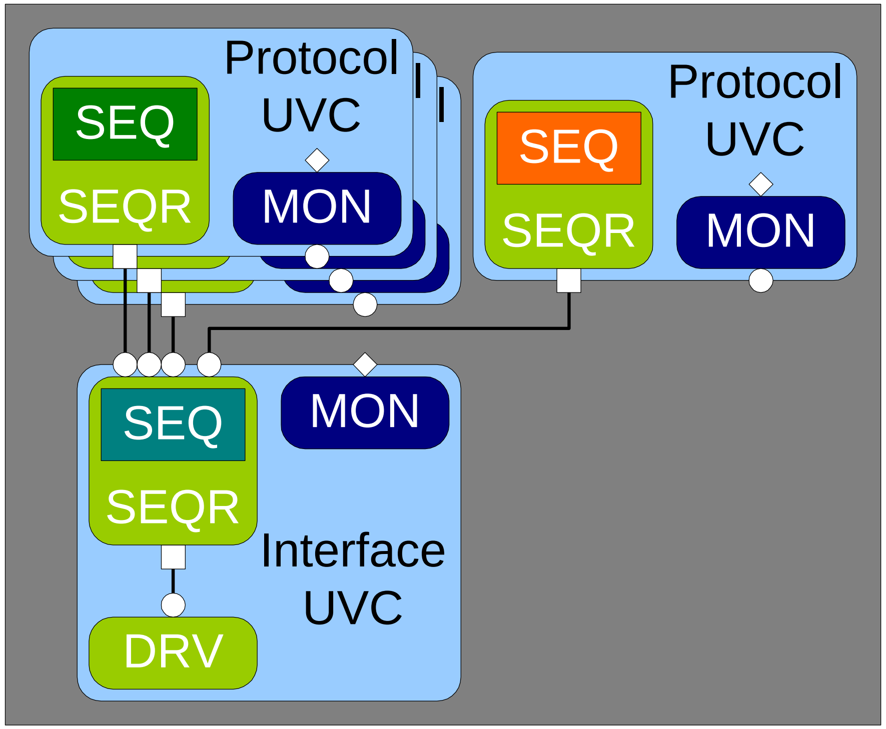
- One Protocol UVC provides stimulus for one stream
- Constraint simplification

➕ Multi-Protocol Support

➕ Maximum Flexibility

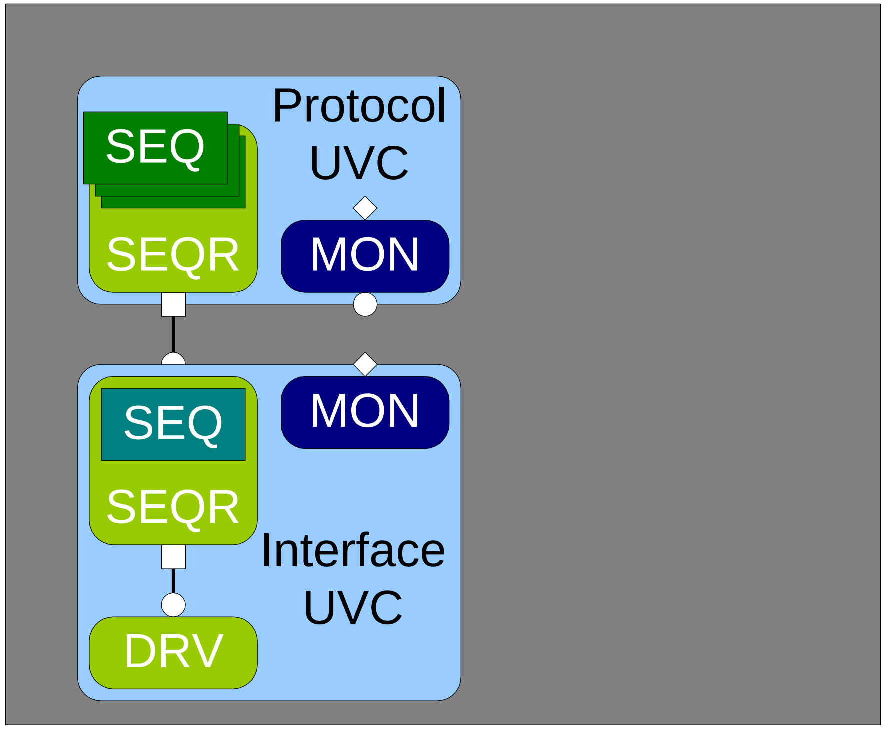
  ✖ At cost of complexity

✖ Poor scalability



Parallel Sequences

- One sequence provides stimulus for one stream
- ✗ Multi-Protocol support not inherent
- Reasonable flexibility
- ✚ Good scalability
  - – Some added complexity
    - How do we stop?



Managing Test Configuration

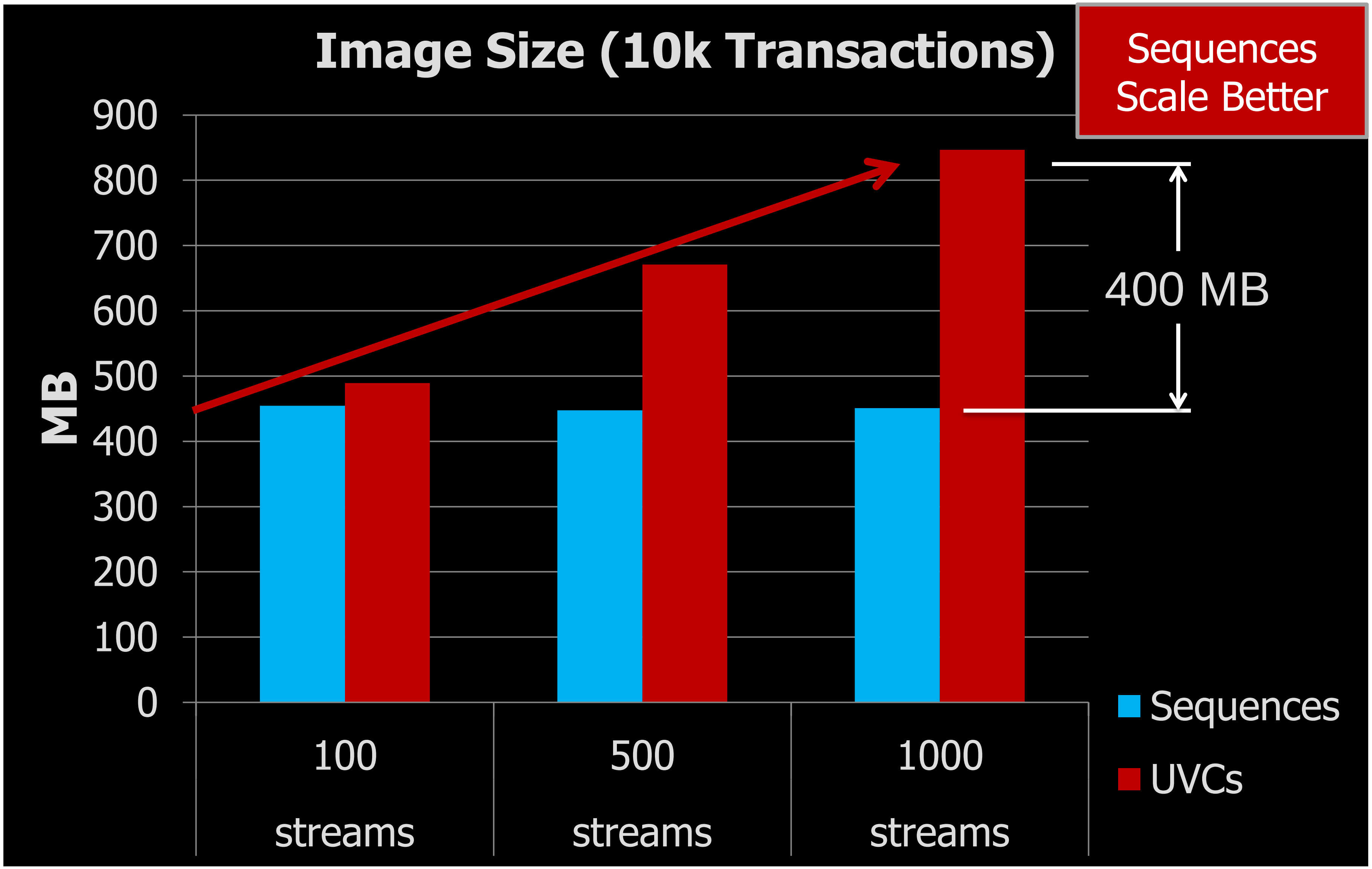
```
class multi_stream_sequence extends uvm_sequence;
  ...
  virtual task body();
    for (int i = 0;i < max_streams;i++) run_stream(i);
    wait (terminal_condition == 1);
    for (int i = 0;i < max_streams;i++)
      p_sequencer.state_kind[i] = DISABLED;
  endtask

  task run_stream(int i);
    fork
      forever begin
        wait (p_sequencer.state_kind[i] == ENABLED);
        `uvm_do_on(seq, p_sequencer.some_sequencer)
      end
    join_none
  endtask
endclass
```

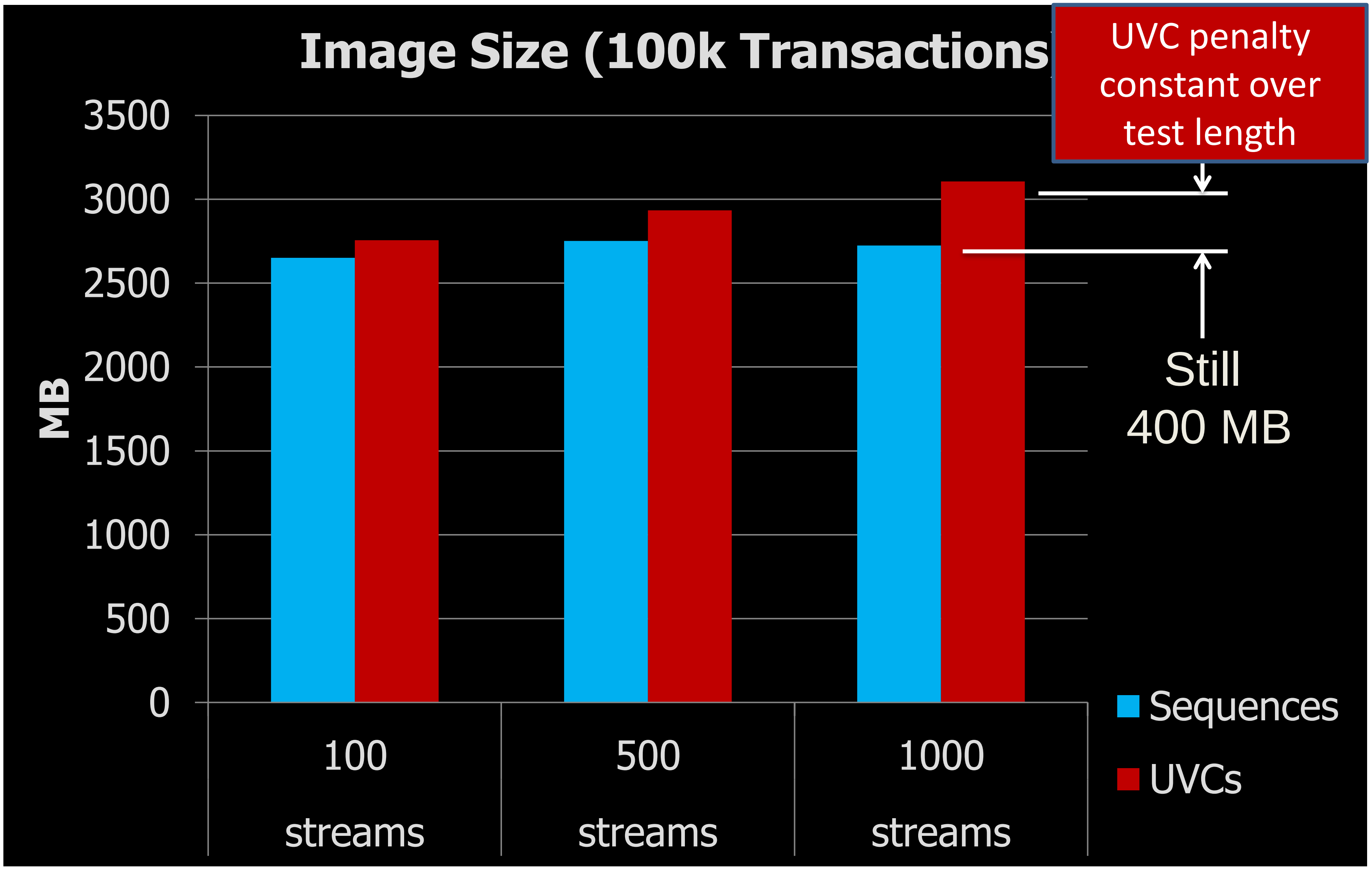
1) Launch all streams
2) Meet test criteria
3) Disable all streams

- Stall if DISABLED.
- Otherwise issue sequence.
- Metering can be added at top or bottom of loop

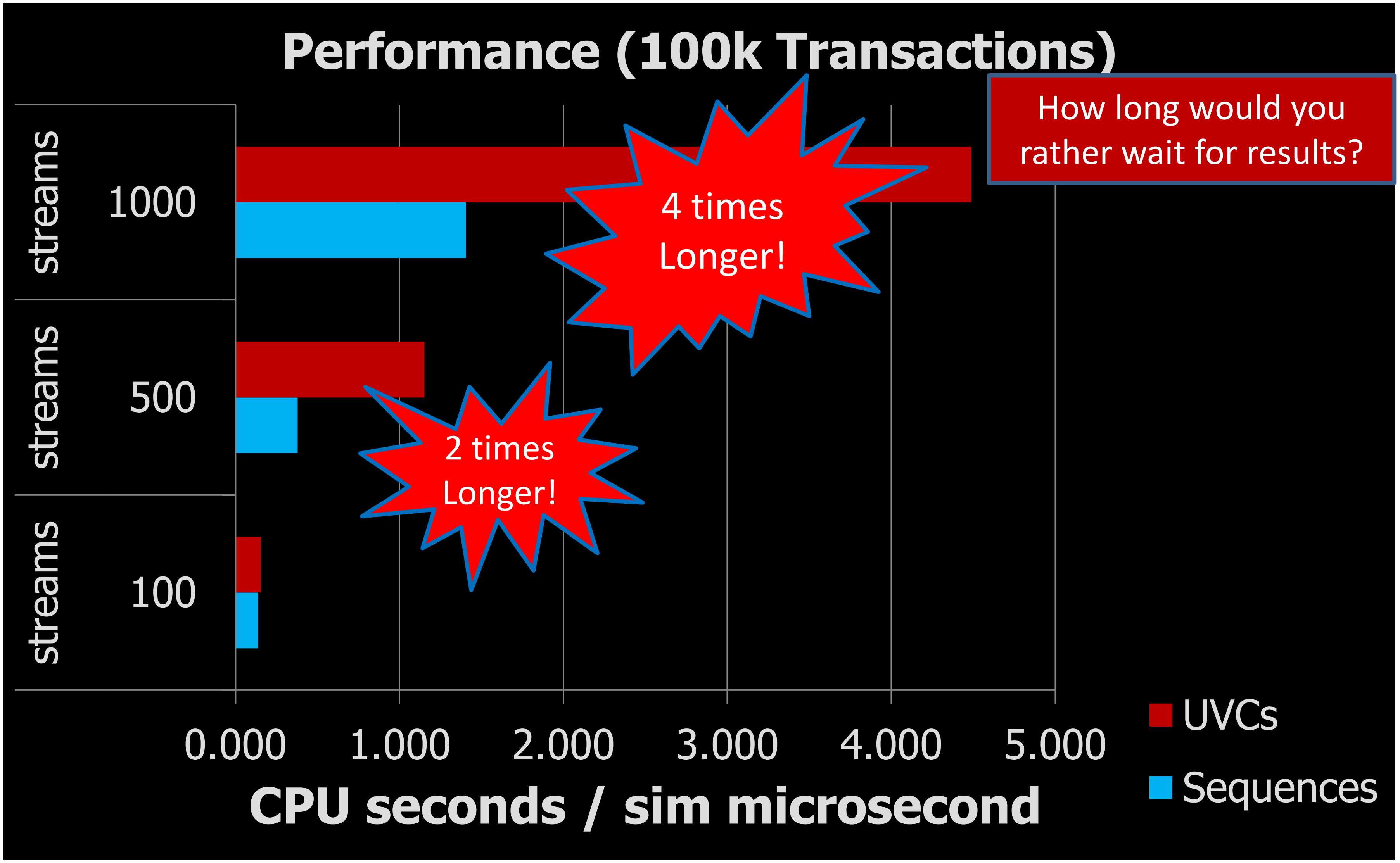
At What Cost Flexibility



At What Cost Flexibility?



At What Cost Flexibility?



Going Forward

- Are results consistent across platforms?
- Are results consistent across UVCs?
- API for managing multi-stream configuration
  - Increase sequence reuse
  - Simplify test writing
- API for ending active stimulus phase
  - Total sequences?
  - Sequences issued per stream?
- Handling non-native transactions in sequencer
  - Eliminates need for parallel UVC approach

Summary

- Managing streams as isolated cases is easier
- Managing sequences more natural and simpler than managing UVCs
- Parallel sequences more scalable
- Parallel sequences more efficient