Turning driver bugs into Vulkan CTS tests

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About me

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Driver bugs

- Applications can exercise Vulkan in unexpected ways.
- Interesting usage exposes driver paths that may not be well-tested.
  - A Vulkan feature may work correctly on its own while passing all relevant CTS tests.
  - Valid and commonly used patterns are equally important to test.
- **A real driver bug can become a useful regression test!**

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Tests for driver bugs

- The challenge:
  - Test case must reproduce the bug.
  - Add enough coverage that allows exercising similar paths.
- Helpful bug reports and collaboration.
- Every detail of the original scenario can matter.
- **Many thanks to the issue reporters and the community for their continuous input and support!**

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Some examples of driver bugs and their CTS test cases...

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An inconsistent dynamic state

Copy or blit operation after a rendering operation can fail the subsequent operation

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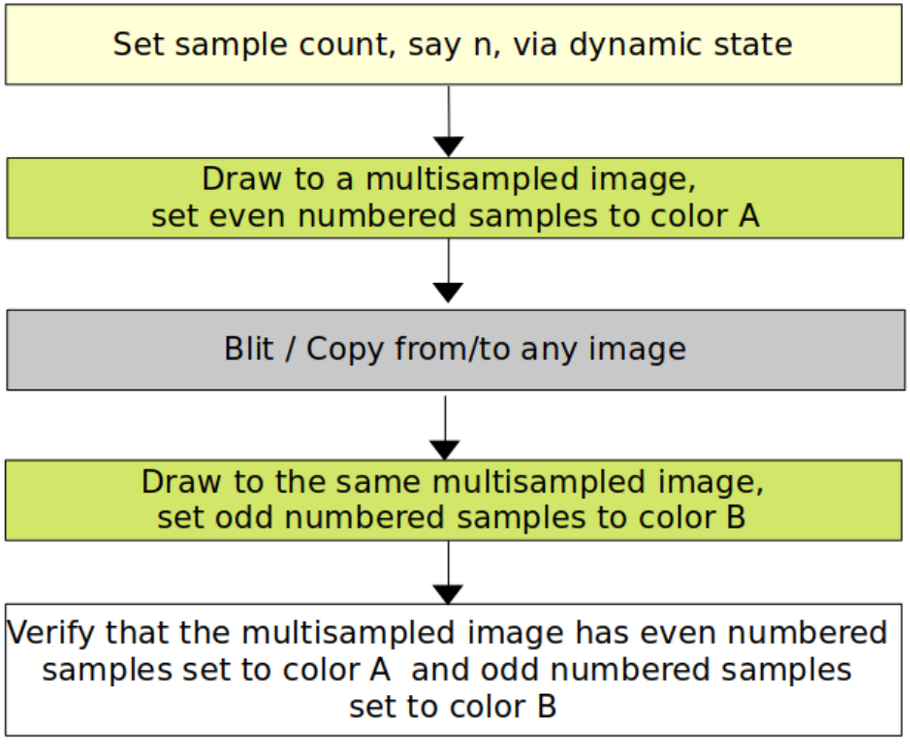
Test for inconsistent dynamic state

`dEQP-VK.api.copy_and_blit.dynamic_state.*`



Render #1

Render #2
Note: Dynamic state is not set again

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Order of operation matters

Setting up exact sequence of operations triggered the bug

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A stale cache

Sample an image in a different view format after copying it may fail the sampling operation

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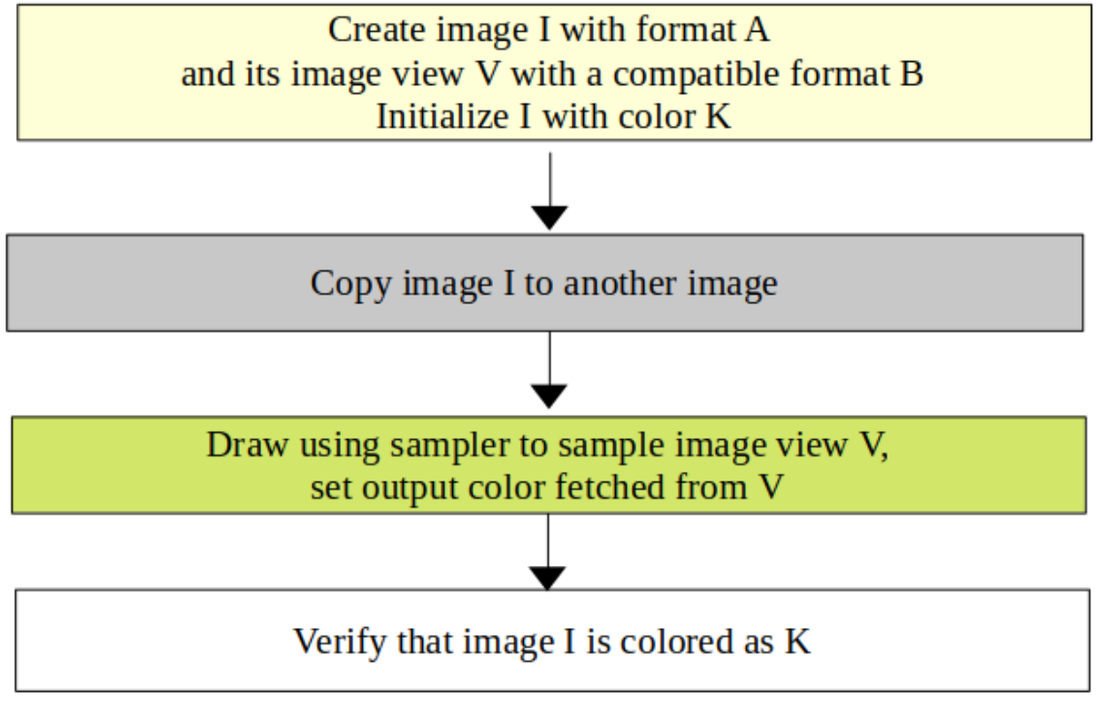
Test for stale cache

`dEQP-VK.api.copy_and_blit.reinterpret.*`



Note: Any barrier between copy and sampling must avoid destination access VK_ACCESS_SHADER_READ_BIT

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Deeper insight is useful

Knowing that "the hardware sampler could reuse cache populated by an earlier copy operation" helped in designing the test case

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Conclusion

- Find the smallest valid Vulkan scenario that triggers the bug.
- May take several iterations of test modifications.
- The test result must be observable.
- Check for false positives.
- Enough relevant coverage is present.

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Thank you!

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