



# Imagination

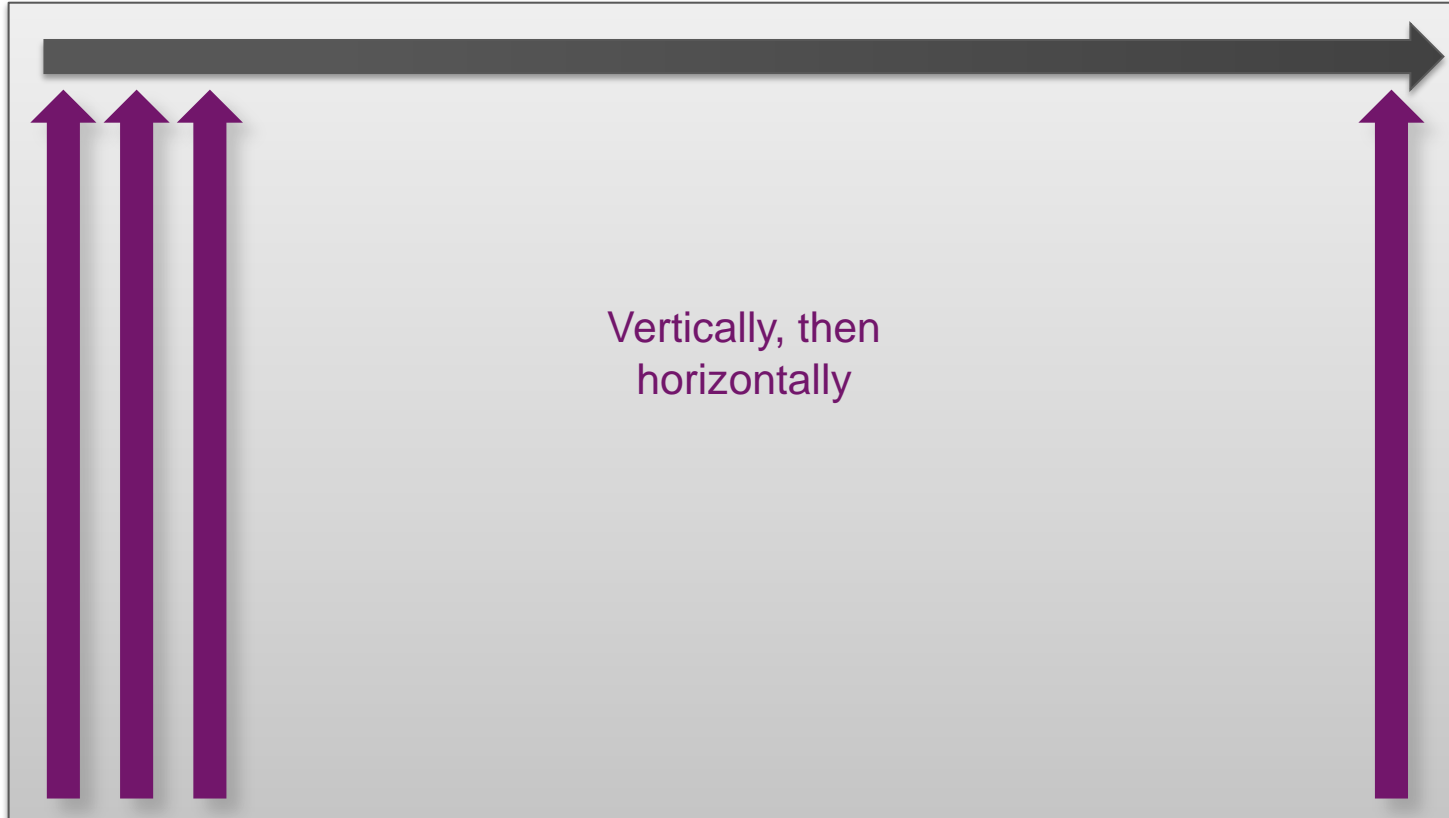
## Overview of VR rendering techniques

Michael Worcester – Driver Engineer  
([michael.worcester@imgtec.com](mailto:michael.worcester@imgtec.com))

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[www.imgtec.com](http://www.imgtec.com)

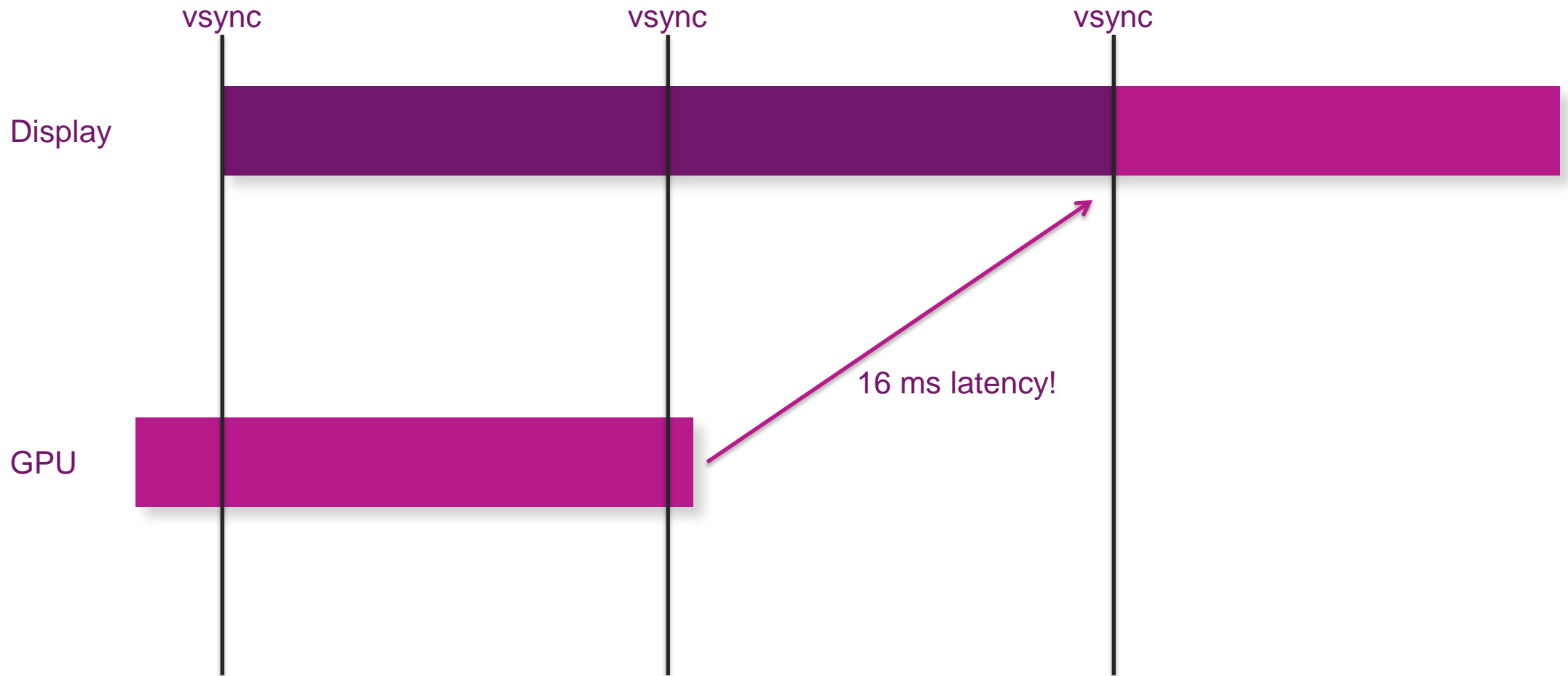
# The Display



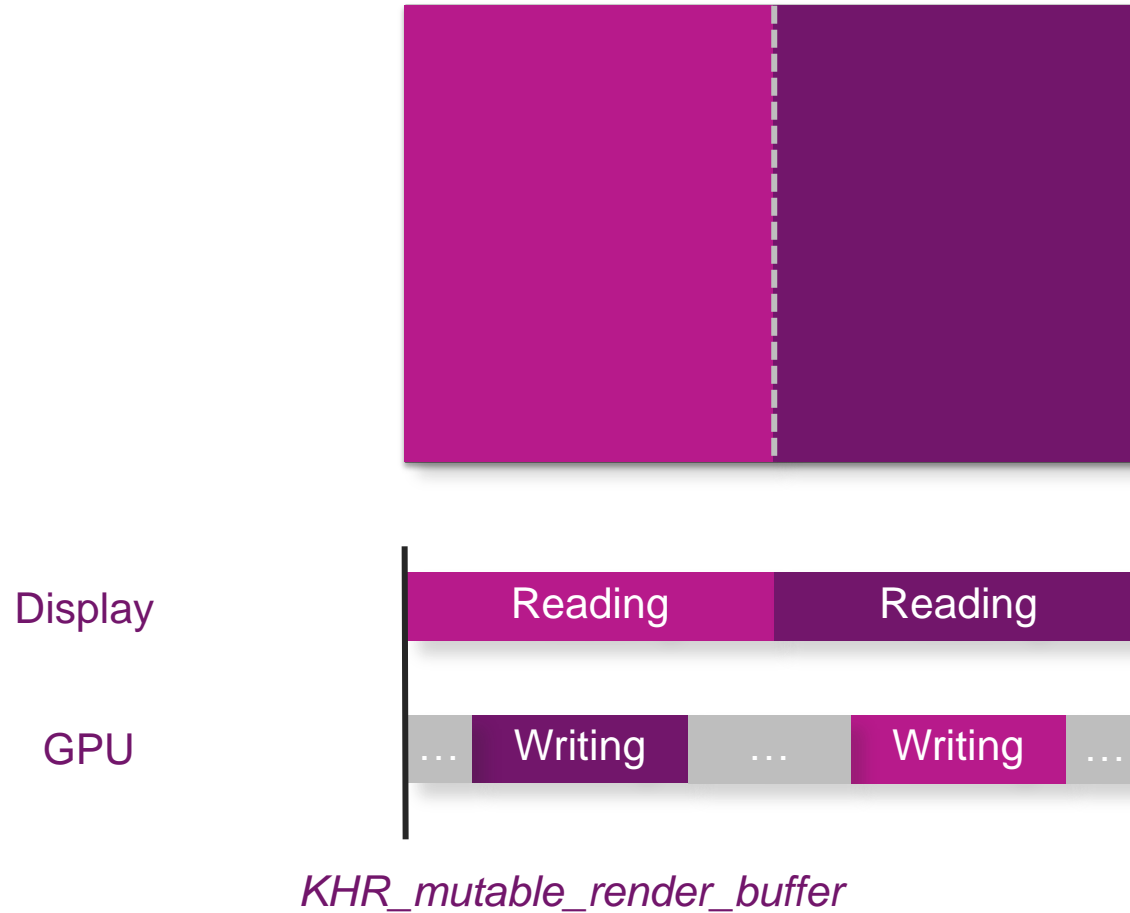
# The Display - Tearing



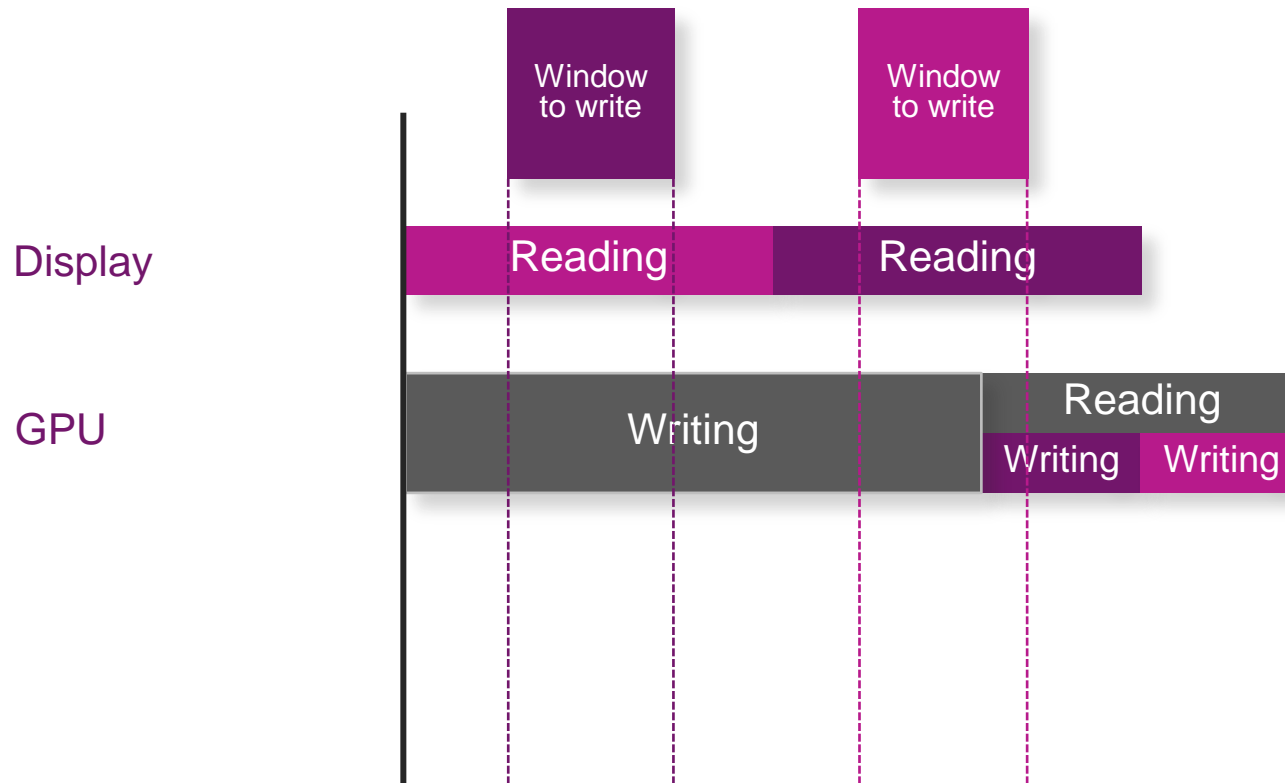
# The Display – Multi buffering = latency!



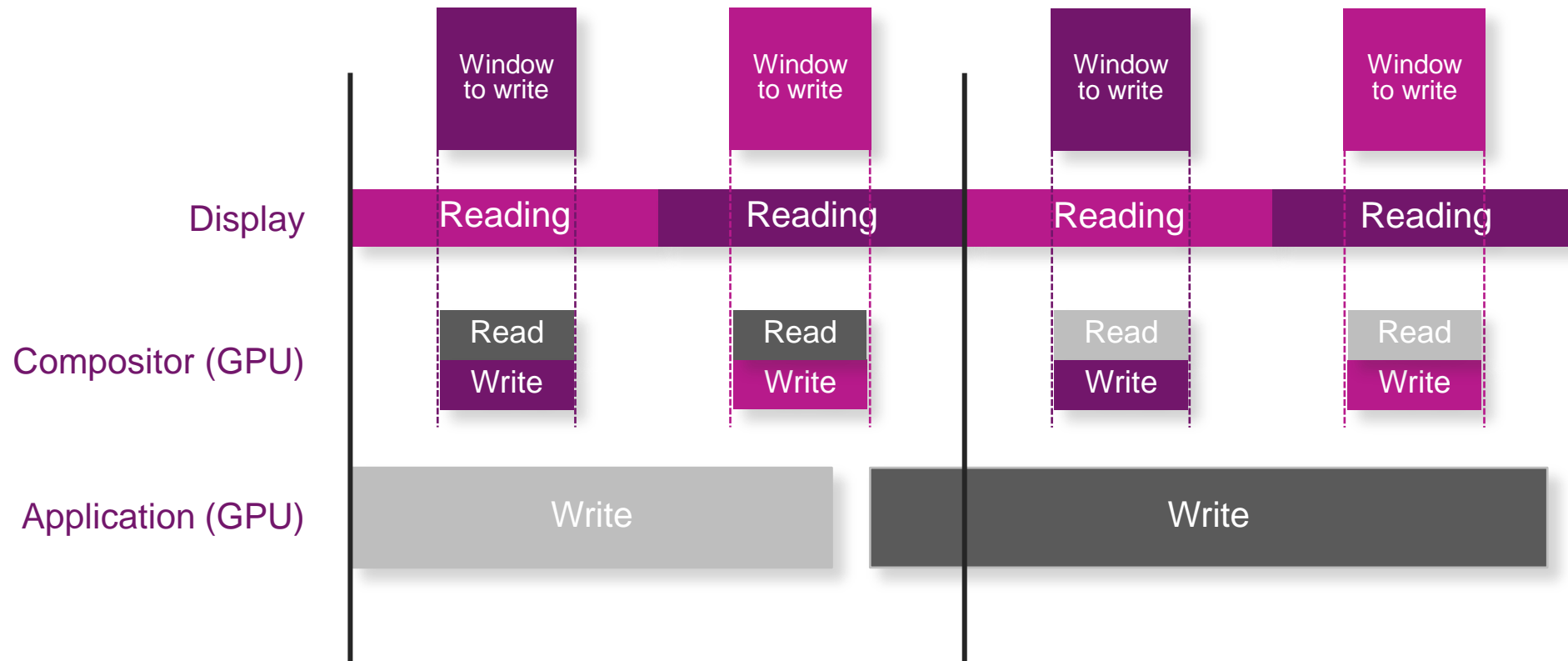
# The Display – Revisiting front buffered rendering



# The Compositor – Timing

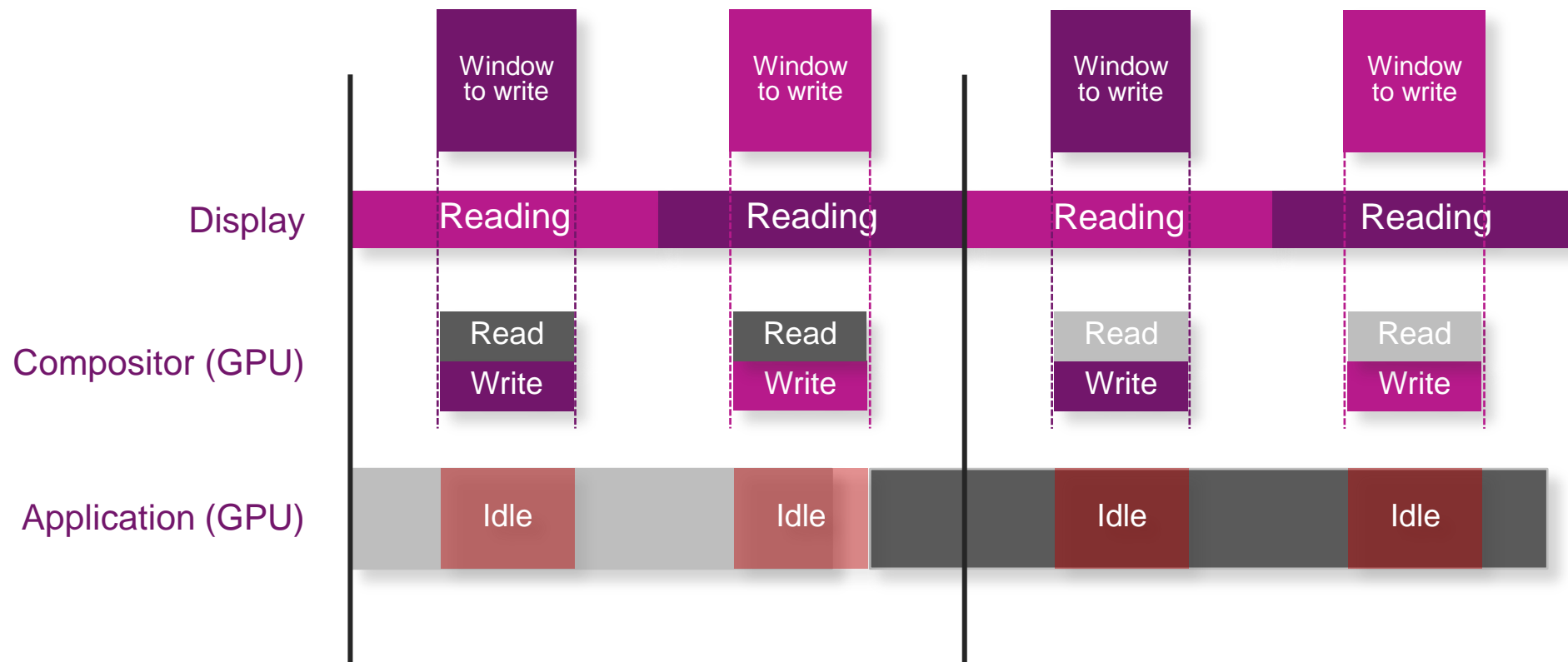


# The Compositor – Asynchronous



*OES\_EGL\_image\_external*

# The Compositor – Pre-emption



*EGL\_IMG\_context\_priority*



# The Compositor – Not just a copy

- Distortion
- Chromatic Aberration
- Time Warp
- Space Warp



# The Application – Do more with less

- VR applications require very high framerates at high resolution
- The rest of the VR pipeline also takes up GPU time
- You have to squeeze every last drop of performance out!
  - Multiple render targets
  - Compute
  - Immutable textures and buffers (*EXT\_buffer\_storage*, *tex storage is core in ES3.0*)
  - Better use of UBO and SSBO
  - Pixel Local Storage (*GL\_EXT\_shader\_pixel\_local\_storage*)
- **Vulkan!**
  - Lower CPU overhead also implies less CPU latency
  - Multithreading!
  - More predictable