Overview of VR rendering techniques

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The Display

Vertically, then horizontally
The Display - Tearing
The Display – Multi buffering = latency!

16 ms latency!
The Display – Revisiting front buffered rendering

Display

GPU

Reading

Writing

Writing

KHRmutable_render_buffer
The Compositor – Timing

Display
- Reading
- Reading

GPU
- Writing
- Reading
- Writing
- Writing
The Compositor – Asynchronous

Display: Reading → Reading → Reading → Reading
Compositor (GPU): Read → Write → Read → Write
Application (GPU): Write → Write

OES_EGL_image_external
The Compositor – Pre-emption

Display
- Reading
- Window to write

Compositor (GPU)
- Read
- Write

Application (GPU)
- Idle

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