Gear VR Performance Tweaks and Pitfalls

Mobile VR is Hard
System Integration Issues

• Chrome IPC Performance is Crippled on Android vs PC
  – Use shared memory for transferring critical data like HMD poses
  – Saw 10ms delays on synchronous IPC

• Texture Mailboxes and Texture Copies Add Up
  – Necessary for separation of GPU and Compositor

• OVR Mobile SDK Scheduling Boosts
  – Bump CPU/GPU thread/process scheduling to meet frame rates
  – Downside, higher thermals, maybe thermal throttling, unpredictable

• Android Background Services, more unpredictability

• Chrome Rendering Pipeline Synchronization
  – Sporadic frame skip, offset by ATW, but not great
Fixing Aliasing – Until we All Get It

- Most Gear VR Devices have Fast, High Quality MSAA 2x/4x
- Bugs in Chromium Prevented us from Using Initially
  - Content too, make sure antialias: true when initializing WebGL
- Smaller Eye Buffers w/ MSAA > Larger Eye Buffers w/o MSAA
- Seminal Carmack Talk
  - https://news.ycombinator.com/item?id=12183340

- WebGL Developers rarely forget mip maps (yay for Copy/Paste?)
WebVR Content

- Oversized Textures – More on this in the WebVR Content Pipeline talk
  - Three.js warns & resizes, at a cost
- `glBufferData/glBufferSubData` overuse
  - Favor more `GL_STATIC_DRAW` buffers
  - Avoid uploading to a buffer in use by the GPU
  - Use `glBufferSubData` when just changing values
- Turn on anti-aliasing and reduce eye buffer sizes as necessary
- Turn OFF `preserveDrawingBuffer` when initializing WebGL
  - Requires more copying, not swap chain friendly
  - Causes some GPUs to fail (Samsung S6 on Android M)
  - See more in `DrawingBuffer::finishPrepareTextureMailboxGpu`
Development Tools

• Mobile Debugging on Android is Challenging (more so for Web Devs)

• Lack of USB Debugging through the Gear VR is More Challenging
  – Enabling the Gear VR Service Developer Mode requires OSIGs

• Chrome Debugger and Profiler over Wifi to the Rescue
  – Full power of the Chrome Tools
  – Refresh/Navigation Support
  – Screen Mirroring (not AS useful on mobile, but you can put buttons there)

• Snapdragon Profiler
  – Needs latest drivers, challenging if you are on a mobile carrier
  – Works best on the Snapdragon 821 on the ... Note 7