



SIGGRAPH 2018 WebGL BOF

WebGL Working Group
August 15, 2018

Recent Focus of Working Group

- Continuing to fix corner cases in WebGL 2.0
 - Most of these were reported by customers!
 - [Longstanding OpenGL](#) and GLSL spec issues
 - Bugs and missing cases in conformance tests
 - Bugs in WebGL implementation and graphics drivers
 - All focusing on improving portability and consistency
- Since last year, worked on:
 - [57 Github issues](#), [~220 pull requests](#), [~660 Chromium issues](#), [160 Firefox issues](#), ...

Recent Focus of Working Group

- ANGLE team subsumed all WebGL 2.0 validation
 - WebGL 2.0 is as easy as binding ANGLE to JavaScript
- Microsoft Edge's WebGL implementation now runs on top of ANGLE!
 - Should be easy to support WebGL 2.0
- Progress on integrating ANGLE into Apple's WebKit
- Significant ANGLE performance optimizations

Non-Blocking Readback from GPU

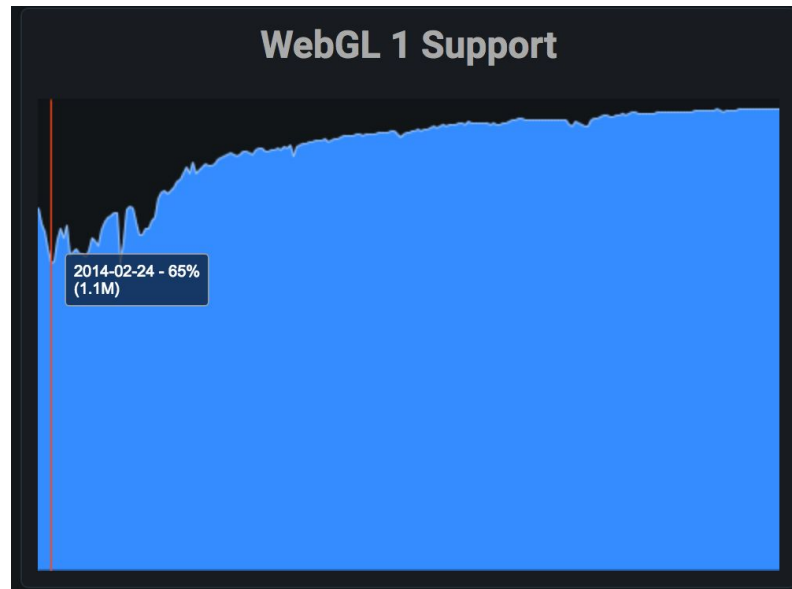
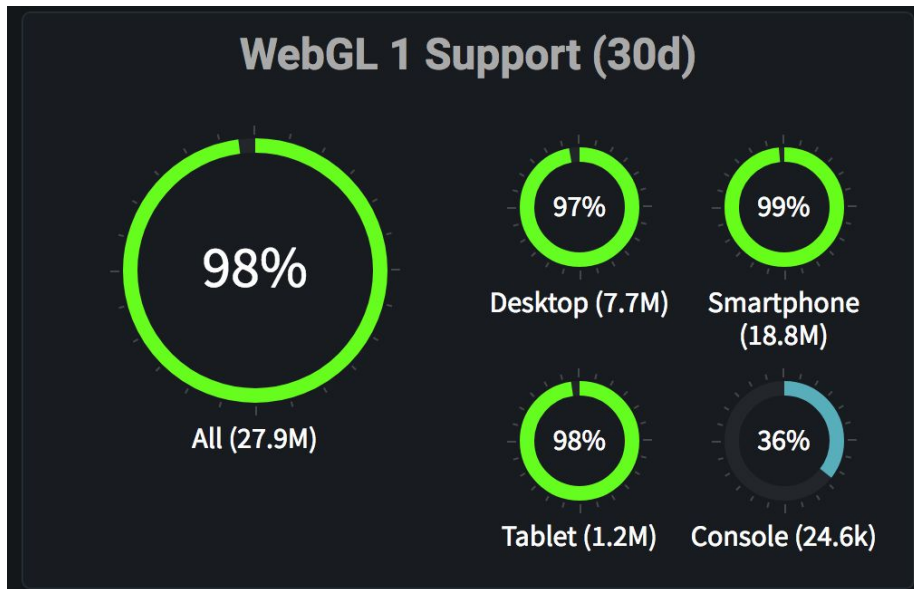
- Collaboration between Mozilla and Google
- Helps with readPixels and GPGPU computations
- Synchronous GPU readbacks now async in WebGL 2.0 via `getBufferSubData` and fences
- Documented in `getBufferSubData` [section of spec](#)
- [Benchmark](#) shows improvements

WEBGL_multiview extension

- Major contribution by NVIDIA
- Significantly reduces CPU overhead for WebVR/XR
- Can test in Chromium today
 - Enable WebGL draft extensions in about:flags
 - Make sure passthrough GPU command buffer is enabled
(--use-cmd-decoder=passthrough)
- See [WebGL Aquarium](#) and [VR version](#) in [WebGLSamples repository \(Aquarium link with demo settings\)](#)
- Preliminary [integration into Three.js](#) too!

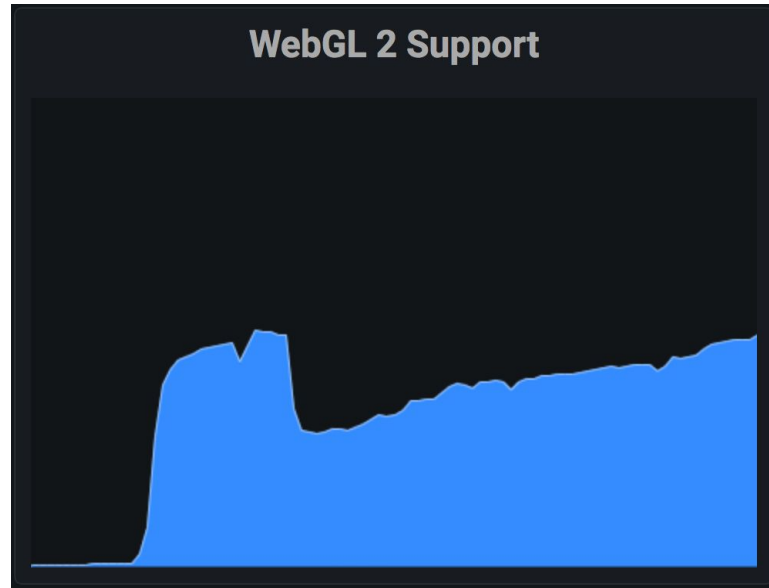
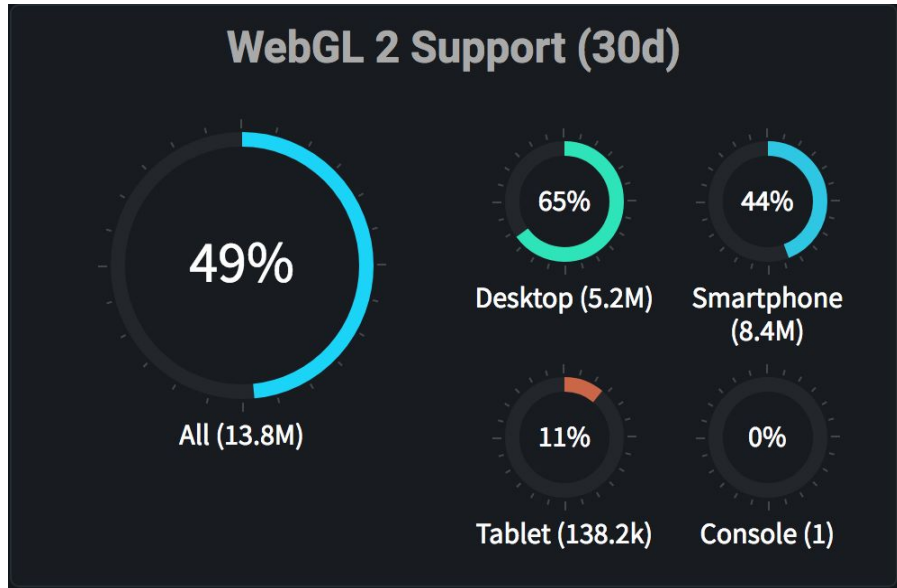
WebGL 1.0 Universally Available

Thanks to Florian Bösch, creator of webglstats.com



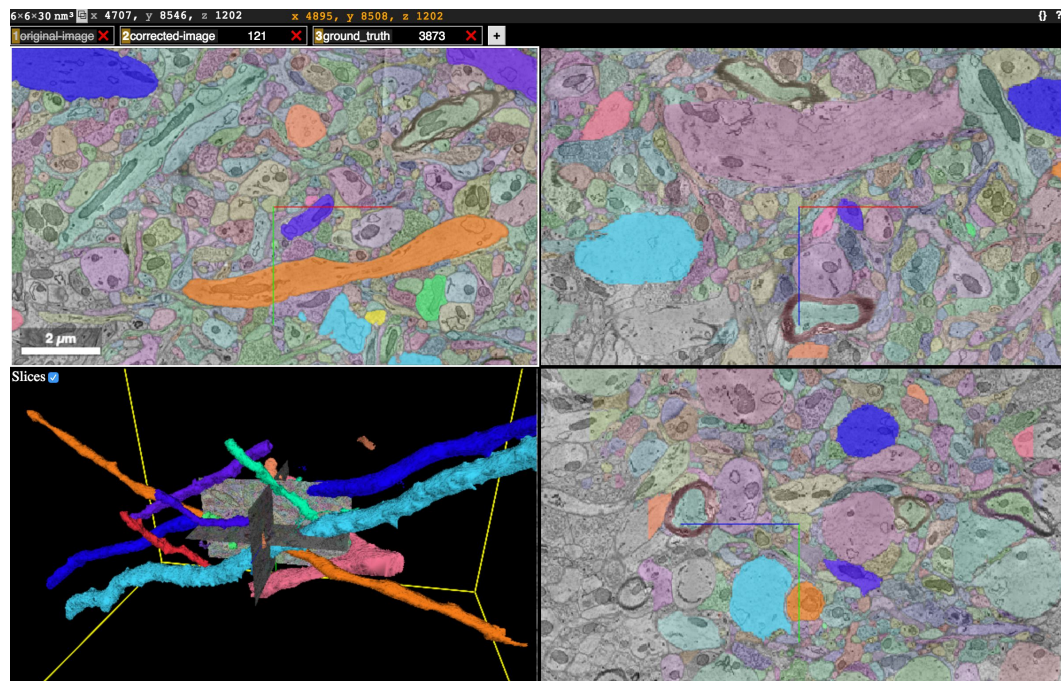
WebGL 2.0 Becoming Universally Available

Thanks to Florian Bösch, creator of webglstats.com



WebGL Used in Surprising New Fields

Neuroglancer: visualizing neurons' connectivity (demo)



Many contributions from Intel

- Intel's Advanced Web Technology Team has made many contributions to the WebGL ecosystem



Intel's Efforts on Web Graphics

Presenter: Yang Gu (Software Engineering Manager)
Intel Advanced Web Technology Team
August 15, 2018



Why Does Intel Focus on Graphics?

- Graphics has been growing very fast
- Intel has about 70% market share on desktop GPU
- Intel has a good plan on discrete GPU

Team History

- Nov 2011: Began to focus on web
- Nov 2012: Began to work on Chrome, mostly on performance tuning
- Nov 2014 - Jan 2017: Implemented WebGL 2.0 in Chrome
- Jan 2017 - present: WebGL 2.0 Compute
- July 2018: Began to contribute to WebGPU
- Contributed 1400+ patches to Chrome and related projects

Standards Participation

- Intel rep on Khronos WebGL Working Group
- Intel rep on W3C WebGPU Community Group

WebGL 2.0 Compute

- Desc
 - [Bring OpenGL ES 3.1](#) (mostly Compute Shaders) to the web
- Status
 - Compute Shaders are almost ready for both OpenGL and D3D backends in Chrome behind command line flag “enable-webgl2-compute-context”
 - TF.js can almost run
- Plan
 - Implement all compute shader features by end of this year
 - Support WebGL 2.0 Compute in Emscripten
 - Port native dEQP ES 3.1 cases to web
 - Implement the rest of ES 3.1 features according to requirements

Parallel Shader Compilation

- Desc
 - Implement [KHR_parallel_shader_compile](#) extension so that shaders can be compiled in the background
- Status
 - All the work has been [accepted by ANGLE](#)

Case	Time w/o extension (ms)	Time w/ Extension (ms)
After the Flood (PlayCanvas)	6223.5	2074.6

- Plan
 - Parallelize shader translation (GLSL to HLSL) in ANGLE

WEBGL_video_to_texture

- Desc
 - Implement WEBGL_video_texture extension to optimize video uploads to WebGL (for 360 degree VR videos in particular)
- Status
 - Patches in progress for Skia and Chromium
 - First performance improvements (>33%) have been shown
 - Still work-in-progress
- Plan
 - Land initial patches and continue analyzing performance

WebGL Geometry Shader Extension

- Desc
 - Bring Geometry Shader to the web
- Status
 - Geometry Shader OpenGL backend has been implemented in ANGLE
- Plan
 - Finish the D3D backend
 - Enable it in Chrome if there is any requirement
 - Add WebGL CTS

WebGPU

- Desc
 - Collaborate with W3C WebGPU CG to bring Metal, D3D12 and Vulkan to web
- Status
 - Warm up
- Plan
 - Contribute to Dawn
 - Port Aquarium to Dawn

Web Machine Learning

- Desc
 - Bring Machine Learning to web
- Status
 - Compute Shader solution
 - TensorFlow.js can be accelerated with both OpenGL and D3D backends
 - WebML API
 - Discussed with some OS vendors on how to define the APIs
 - Lots of prototypes and experimental data based on machine learning APIs provided by OS
- Plan
 - Compute Shader solution
 - Optimize TF.js to show its power
 - WebML API
 - Work with OS vendors and browser vendors to define the APIs
 - Create a W3C CG to move things forward

Native vs. Web Performance comparison

- Desc
 - Understand the performance gap between WebGL and native in a quantitative approach
 - Understand the overhead of web platform in depth, like JS engine, security including validation, D3D conversion on the fly
- Status
 - OpenGL backend can run on Windows, macOS and Linux
 - Some performance optimizations at native side
- Plan
 - Port to other backends
 - Web: WebGL 2.0, WebGPU
 - Native: D3D11, D3D12, Vulkan, Metal, Dawn
 - Explore other workloads

Fish Number	Optimized OpenGL Aquarium (FPS)	OpenGL Aquarium (FPS)	Chrome (FPS)
100000	18	14	8
50000	30	26	16
30000	36	36	25
10000	60	60	45

Quality Gate Keeper on Intel Platforms

- Google helped to integrate Intel platforms into Chrome buildbots
- Intel driver team integrated WebGL CTS into CI system
- Monthly conformance test (WebGL CTS) with latest hardware, OSes, Chrome and WebGL CTS
- Monthly performance test with various hardware, OSes, browsers and selected benchmarks

Call for Feedback

- We need your feedback to see if some features are important on web
 - Compute Shader
 - Geometry Shader
 - All the ES 3.1 features
 - Machine Learning
 -

Today's Presenters

Gary Li, AGI

Ib Green and Georgios Karnas, Uber

Mauricio Vives, MerchLogix

Paul Chambers, Sketchfab

Ricardo Cabello, Google

Simon Kallweit and Adrian Blumer, Esri
R&D Center Zurich

Tarek Sherif, Biodigital

Trevor Baron, Microsoft

Will Eastcott, PlayCanvas



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