

WebGL + WebGPU

GDC 2024 Meetup

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WebGL & WebGPU Updates

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Agenda

WebGL Updates

- Extension Promotions
- ANGLE/Metal Progress
- Shader Pixel Local Storage Extension

WebGPU Updates

- Standardization
- Implementations
- Compatibility Mode
- Partnerships, Resources and Contributions

Call to Action: Join WebGL & WebGPU Communities

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Extension Promotions

Several extensions promoted to community approved since the last Meetup:

- Supported by default since Chromium 122
 - Depth Testing Optimization: [EXT conservative depth](#)
 - Screen-space Interpolation: [NV shader noperspective interpolation](#)
 - Dual-Source Blending: [WEBGL blend func extended](#) (formerly EXT_)
- Supported by default since Chromium 124 ([expected to reach stable](#) on Apr 16, 2024)
 - RGB9E5 Renderability: [WEBGL render shared exponent](#)
 - Stencil Texturing: [WEBGL stencil texturing](#)
 - Extra Texture Wrapping Mode: [EXT texture mirror clamp to edge](#)
- All of these are also supported by default in Safari Technology Preview 190

Thanks especially to Alexey Knyazev for driving these extensions!

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ANGLE/Metal Progress

- Work is still ongoing in ANGLE's Metal backend
 - Used by WebKit's WebGL implementation on macOS/iOS, and soon, Chromium's on macOS
- Significant bug fixes contributed by Alexey Knyazev; ANGLE/Metal now passes dEQP for OpenGL ES 2.0 and 3.0 on Apple GPUs!
- Improvements to runtime, shader translator and other areas
 - Special thanks to Kimmo Kinnunen (Apple) and Geoff Lang (Google)
- Shipping on Apple Silicon Macs in Chrome today
- Planned to ship on Intel CPU Macs in Chrome 124
 - Recent regression caused schedule slip

Shader Pixel Local Storage Extension

- Chris Dalton (Rive) is developing a [shader pixel local storage extension for WebGL](#); provides generalized programmable blending
 - [Online demo](#) showing all advanced blend functions
- Thanks to Alexey Knyazev for several recent key bug fixes
- Getting very close to shippable state; more updates later in this Meetup
- Follow [ANGLE bug 7279](#) if you're interested in progress on this extension

WebGPU

A "modern" graphics API for the Web:

- A successor to WebGL, not a replacement.
- Compute shaders on the Web!
- Lower overhead API
- Foundation for future features (bindless, ray tracing, multithreading ...)

Development happens [on GitHub](#) and [at the W3C](#)

- Anybody can join and participate in the development!

WebGPU Standardization Updates

Current [API](#) and [WGSL](#) specifications are essentially considered v1.0!

Steady progress on core spec. Major progress on [Compatibility Mode](#) - see the following slides.

Continued progress on WebGPU Shading Language primitives for faster AI models on the web - 8-bit dot product just landed, thanks to Intel's Web Graphics Team in Shanghai!

WGSL pointer improvements through “unrestricted_pointer_parameters” and “pointer_composite_access” language features.

WebGPU Implementation Status

Safari

- Enabled in Safari Technology Preview - please test!

Firefox

- Enabled in Nightly on Windows and Linux, for testing and experimentation!
- Mac is in progress.
- Aiming to ship to Release by end of year!

Chromium

- Currently shipping on Windows, ChromeOS, Mac and Android!
- Tracks the top-of-tree [WebGPU](#) and [WGSL](#) specifications
- web.dev/gpu for higher level details
- Looking forward to your feedback, and applications built using WebGPU!

Implementations are mostly interoperable already!

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WebGPU Compatibility Mode

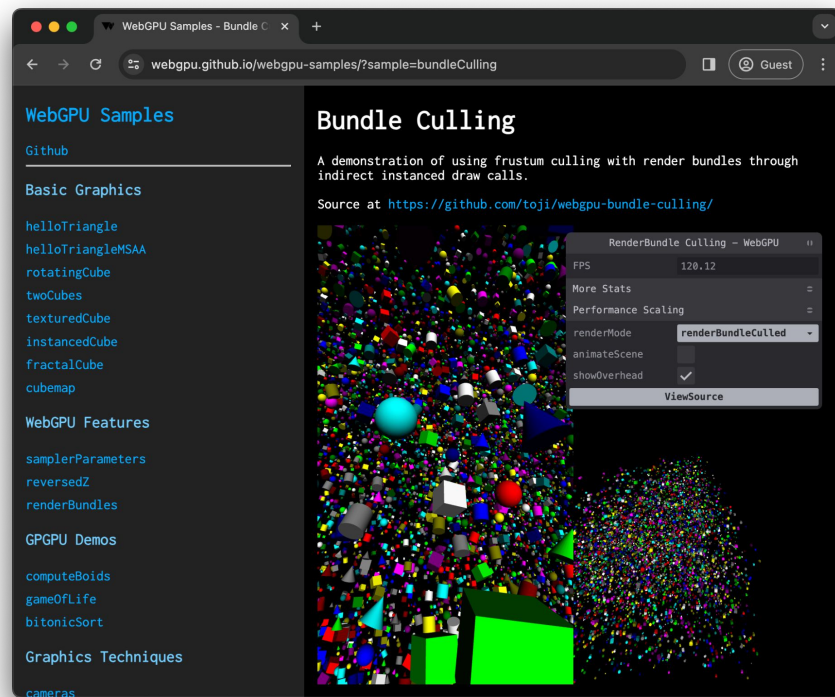
Allows WebGPU on OpenGL ES 3.1 devices (Android, ChromeOS)

- WebGL2-level capabilities + Compute Shaders
- Forward Compatible
 - (all compatibility mode programs are valid WebGPU programs)
- A few lower limits
 - min 128 compute shader invocations per workgroup (vs 256)
 - 4 color attachments (vs 8)
 - 4 storage buffers per shader stage (vs 8)
- No texture re-interpretation
 - must declare 2d vs 2d-array vs cube at creation time
- Goal is to expand the reach of WebGPU

WebGPU Samples

<https://webgpu.github.io/webgpu-samples>

- Refactored for easier participation
- Can add external examples too!
- Several new samples
 - [MSDF text](#)
 - [skinned mesh](#)
 - [render bundle culling](#)
 - [points](#)
 - [multiple canvases](#)
- [Submit yours!!!](#)



WebGPU Partnerships

Steady progress on WebGPU backends for popular web 3D libraries

[Three.js](#), [Babylon.js](#)

Ongoing partnerships with teams including Intel, [TensorFlow.js](#), [Google Meet](#), [MediaPipe](#), and more

[PlayCanvas](#) has been undertaking a major refactor of their engine in support of WebGPU

Tracking bug: <https://github.com/playcanvas/engine/issues/3986>

Fantastic feedback and collaboration with Unity, as they investigate porting existing shaders to WGSL and our new Uniformity Analysis requirements!

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WebGPU Resources

Tutorials:

- [WebGPU Fundamentals](#) by Gregg
- [WebGPU Best Practices](#) by Brandon

WebGPU Contributions!

Many ways to engage!

- Try the API and provide feedback (see later slides for channels)
- Try publishing sites using WebGPU
 - Can use WebGPU support in popular frameworks like Three.js, Babylon.js and TF.js
- Help with [conformance testing](#)
- Contribute samples / demos / articles using WebGPU

Join WebGL & WebGPU Communities

- The WebGL and WebGPU APIs are supported by vibrant online communities!
- If you're developing with these APIs, we would like to hear from you!
- On the WebGL side:
 - Please join the [WebGL Dev List](#): announcements of products, demos, new tools, job postings, questions, discussions - all are welcome!
 - Khronos' [public webgl](#) mailing list hosts lower-traffic spec announcements
 - The [WebGL Matrix chat room](#) offers a way to talk with browser implementers and other developers
 - You can find a lot of cool stuff by searching [#webgl on Twitter](#), [Mastodon](#) 🕶️

Join WebGL & WebGPU Communities

- On the WebGPU side:
 - Have API feedback ? See the [main WebGPU “gpuweb” repository](#) for options to communicate it to the community group
 - The [WebGPU Matrix chat room \(#WebGPU:matrix.org\)](#) also offers a great way to talk directly with browser implementers and other developers
 - There's an increasing amount of cool stuff showing up on [#webgpu on Twitter](#), [Mastodon](#) 🕶️
- We all look forward to hearing from you!

A recording of this presentation will be available at
<https://www.khronos.org/events/webgl-webgpu-meetup-GDC-2024>

For more information on WebGL, please visit
<https://www.khronos.org/webgl>

For more information on WebGPU, please visit
<https://github.com/gpuweb/gpuweb>



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