WebGL + WebGPU
GDC 2024 Meetup
March 20, 2024
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
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!
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!
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!
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