WebGL and the Visual Web Ecosystem

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1000x Lower Power Changes the World

The next 10 billion Computers will be deeply integrated into the fabric of our lives.
Can HTML5 become a true cross platform application programming environment?
A New Era in Personal Computing

PC

Internet

Mobile Computing

1990’s

2000’s

2010’s
20 Years Faster to 100M Per Year

Cumulative Shipments

- iOS & Android
- MacOS & Windows

Source: Gartner, Apple, NVIDIA
Mobile Silicon Experiential Processing

- Cortex A9 Processor
- HD Video Decode Processor
- Image Processor
- ARM 7
- Audio Processor
- HD Video Encode Processor
- 2D/3D Graphics Processor

- Firefox
- Chrome
- Safari

- HD Video Decode Processor
- Audio Processor
- HD Video Encode Processor
- 2D/3D Graphics Processor
A Lot More than Just “More HTML”

Rich Experiential Processing
- Multi-core CPUs
- Rich 2D and 3D GPU
- GPU Computing
- Multiple HD cameras
- Image and vision processing
- Video encode/decode
- Audio encode/decode
- Inertial and positional sensors

How can the Browser rapidly assimilate such diverse functionality?
Connecting Software to Silicon

Khronos is an open industry consortium creating royalty-free acceleration API standards to enable software developers to turn silicon functionality into rich end user experiences.
3D Evolution on PCs

‘Doom’ on a PC – 1993
*id Software*

‘Samaritan’ Real-time Demo on a PC – 2011
*Epic Unreal Engine*

http://www.youtube.com/watch?v=RSXyztq_0uM
OpenGL Ecosystem – 3D Everywhere

Leading-edge functionality developed first on desktop

WebGL driving new-generation security features into OpenGL family

Mobile functionality subset that is deployed on billions of devices

Pervasive OpenGL ES 2.0 availability enables Browser vendors to build 3D directly into HTML5
WebGL – 3D on the Web – No Plug-in!

- Historic opportunity to bring accelerated 3D graphics to the Web
  - WebGL defines JavaScript binding to OpenGL ES 2.0
- Leveraging HTML5 and uses <canvas> element
  - Enables a 3D context for the canvas
- JavaScript is easily fast enough now for visual computing
  - Plus OpenGL ES 2.0 enables local geometry caching and GPGPU computation

Being defined by major browsers and GPU vendors working together

Availability of OpenGL and OpenGL ES 2.0 on almost every web-capable device

JavaScript binding to OpenGL ES 2.0

HTML5 Canvas Tag and increasing JavaScript performance
WebGL Implementation Anatomy

Content downloaded from the Web. Middleware can make WebGL accessible to non-expert 3D programmers.

Browser provides WebGL functionality alongside other HTML5 specs - no plug-in required.

OS Provided Drivers. WebGL on Windows can use Google Angle to create conformant OpenGL ES 2.0 over DX9.
WebGL and HTML Interaction

- **3D is not trapped in a rectangular window**
  - 3D can overlay and underlay HTML content
  - Easy to make 2D HTML HUDs or 3D user interfaces

- **Strong ties with other advanced HTML5**
  - WebGL can use HTML5 `<video>` or canvas as a texture

- **Can use 3D for core Web UI – as well as content**
  - Advanced transforms and special effects

- **Render HTML DOM sub-tree as texture**
  - Mozilla and Google prototyping as extension
  - Support user interaction when in 3D
Leveraging Native API Investment into HTML5

• HTML5 evolving into cross-platform programming platform
  - Gradually exposing complete system capabilities

• Opportunity to synergize Web and native APIs development
  - Leverage native API investments, reduce developer learning cycles

• Khronos and W3C creating close liaison

![HTML5 Diagram]

- WebCL
- WebGL
- WebMAX?
- WebAudio
- HTML and Browser Composition
- Device and Sensor APIs

Native APIs shipping or working group underway
JavaScript API shipping or working group underway
Possible future JavaScript APIs
WebCL – Parallel Computing for the Web

- **Khronos launching new WebCL initiative**
  - First announced in March 2011
  - API definition already underway

- **JavaScript binding to OpenCL**
  - Security is top priority

- **Many use cases**
  - Physics engines to complement WebGL
  - Image and video editing in browser

- **Stay close to the OpenCL standard**
  - Maximum flexibility
  - Foundation for higher-level middleware
Web Apps versus Native Apps

• Mobile Apps have functional and aesthetic appeal
  - Beautiful, responsive, focused

• HTML5 with accelerated APIs can provide the same level of “App Appeal”
  - Highly interactive, rich visual design

• Using HTML5 to create ‘Web Apps’ has many advantages
  - Portable to any browser enabled system
  - Same code can run as app or as web page
  - Web app is searchable and discoverable through the web
  - Not a closed app store – no app store ‘tax’
Web Apps - Wider Ecosystem

• **OS capability access before in HTML5**
  - Execution with no browser UI
  - Packaging standalone apps

• **OS Independent App stores**
  - Discovery and payment

• **Language and JavaScript Tools**
  - Native code compilation to JavaScript
  - JavaScript libraries

• **Authoring Tools**
  - Bringing Flash-grade authoring to HTML5
Industry Cooperation

Browser

OS

Tools

Silicon