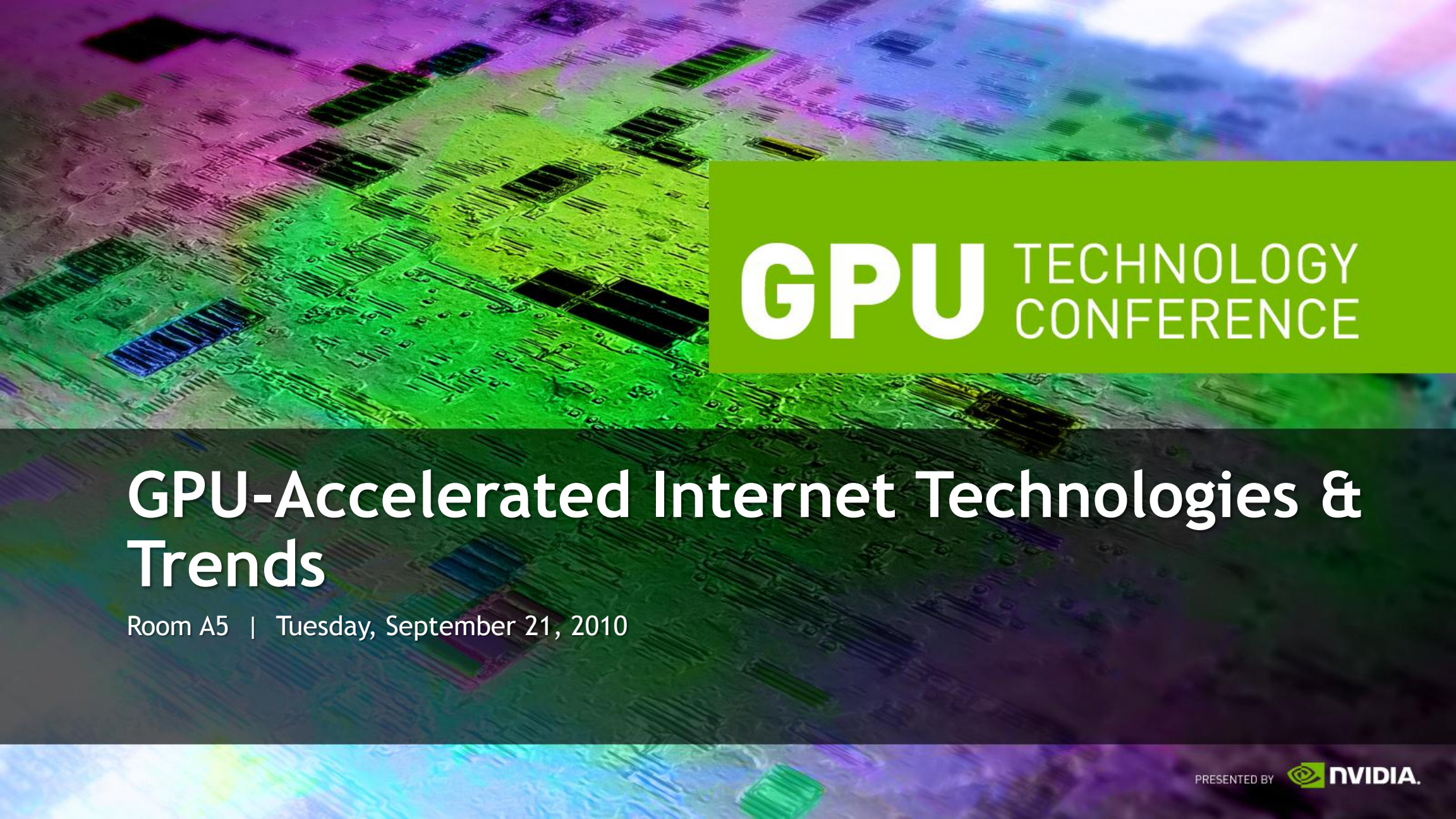




GPU TECHNOLOGY CONFERENCE

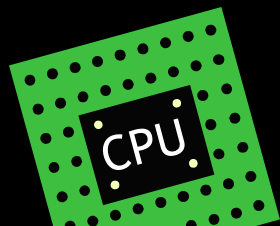
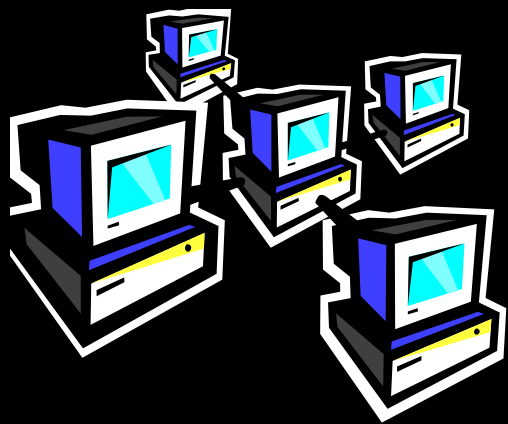
GPU-Accelerated Internet Technologies & Trends

Room A5 | Tuesday, September 21, 2010

Outline

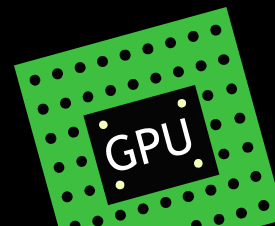
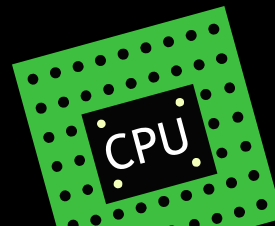
- The Internet, pre and post hardware acceleration
- Technologies, Standards & Demos
 - 2D Graphics
 - 3D Graphics
 - Video
- Future Possibilities
- Challenges
- Conclusions

The Internet, pre and post hardware acceleration



Performance

Pre-HW Acceleration



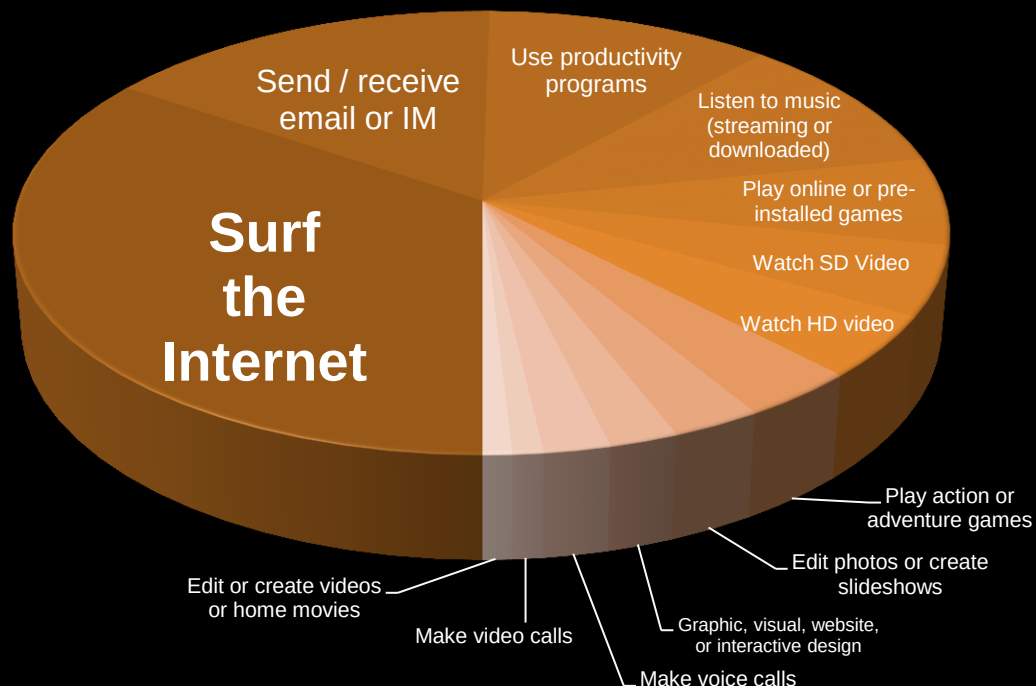
Performance

Post-HW Acceleration

Internet Hardware Acceleration Benefits

- Performance
- +
- Battery Life
- +
- Client Device Variety
- =
- New Experiences

Time Spent on PC Activities



Technologies & Standards

Browsers



Video



Microsoft
Silverlight



HTML 5 Video Tags



webm

Example Apps



hulu

3D Graphics



WebGL



angleproject
OpenGL → DX



2D Graphics



HTML Canvas



Scalable Vector Graphics

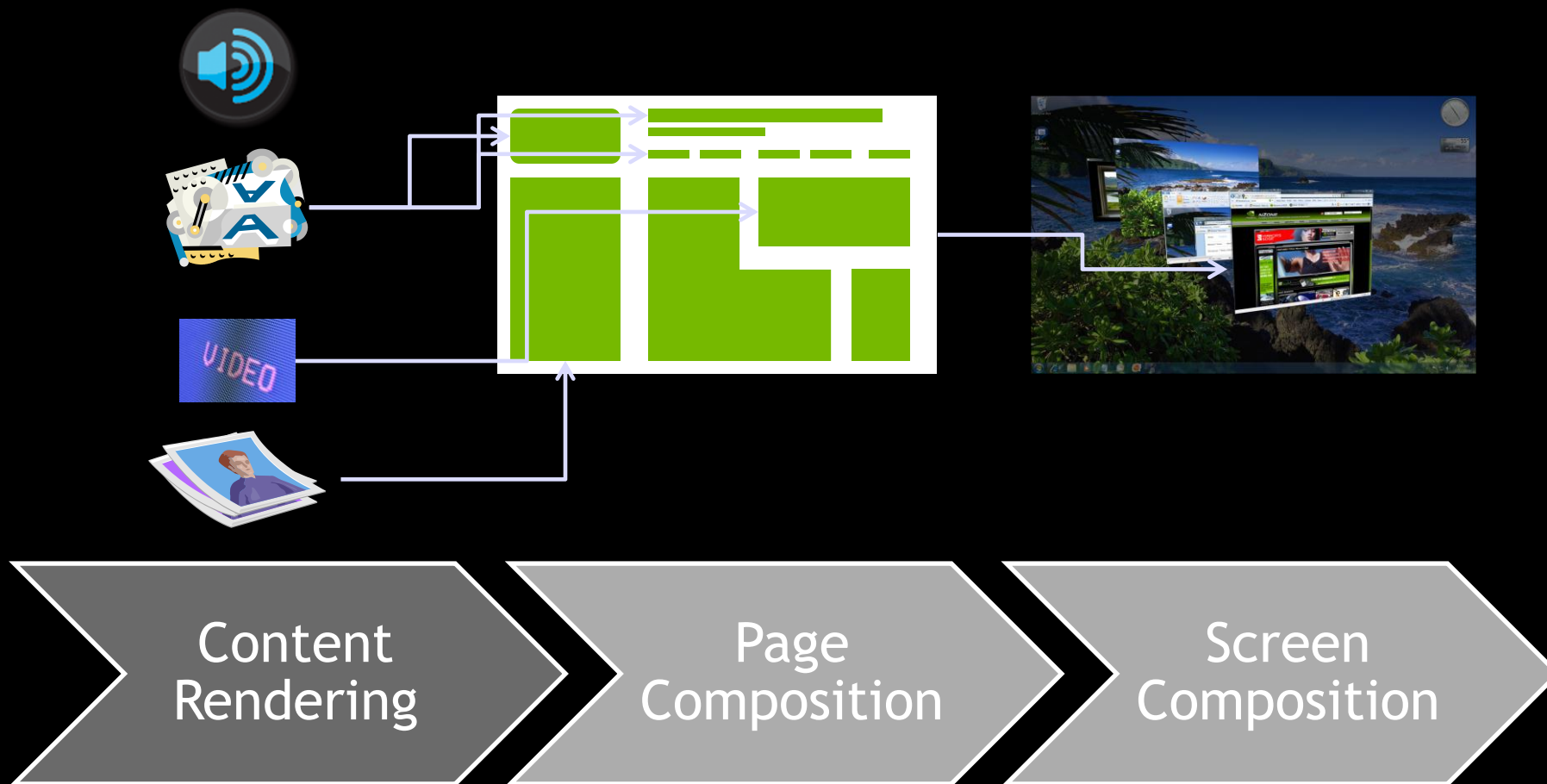


Microsoft
Silverlight

flickr



Browser Acceleration Stages



Flash Video Acceleration

- On 98% of PCs
- HW Acceleration Enabled Smooth HD Playback on Netbooks



+



=

Stuttery
(6 fps)



=

Smooth
(30 fps)

Next-Gen Browser Implementations Vary

- Microsoft IE9

- 2D Acceleration with D2D
- Video Decode Acceleration for H.264 HTML5
- No 3D acceleration



- Mozilla Minefield

- 2D content rendering and compositing
- Video scaling and color-space conversion
- 3D with WebGL (to OpenGL or Direct3D through ANGLE)



- Google Chromium

- Similar to Firefox, except for video



Implementations Vary by OS and HW

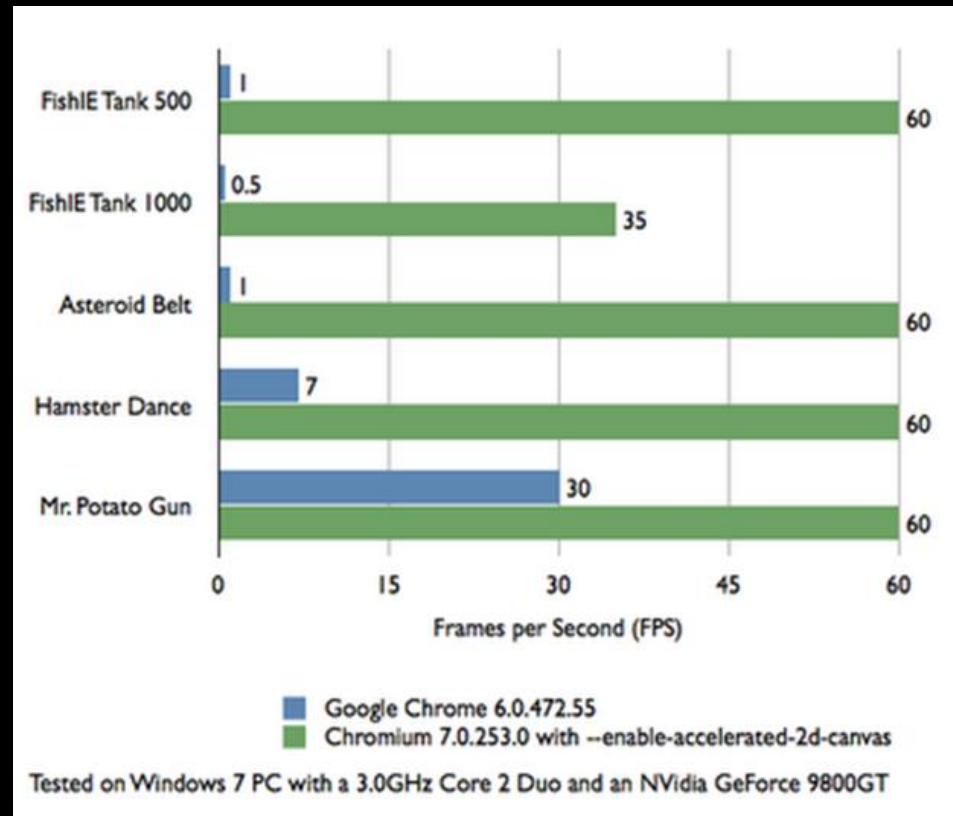
Mozilla Firefox HW Acceleration

Operation	Linux	Windows XP	Windows Vista/7	Mac OS X
Content	XRender	None	Direct2D	Quartz ^(CPU)
Compositing	OpenGL	Direct 3D	Direct 3D	OpenGL

Sources: <http://hacks.mozilla.org/2010/09/hardware-acceleration/>

GPU vs. CPU Speedups in Chrome

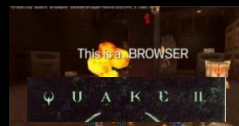
- Up to 60X speedup
 - 2D Canvas acceleration
 - in trunk and the canary build
 - `--enable-accelerated-2d-canvas` command-line switch
 - Adapts graphics API by OS



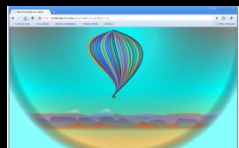
GPU Performance Scaling



D2D Flickr



WebGL Quake

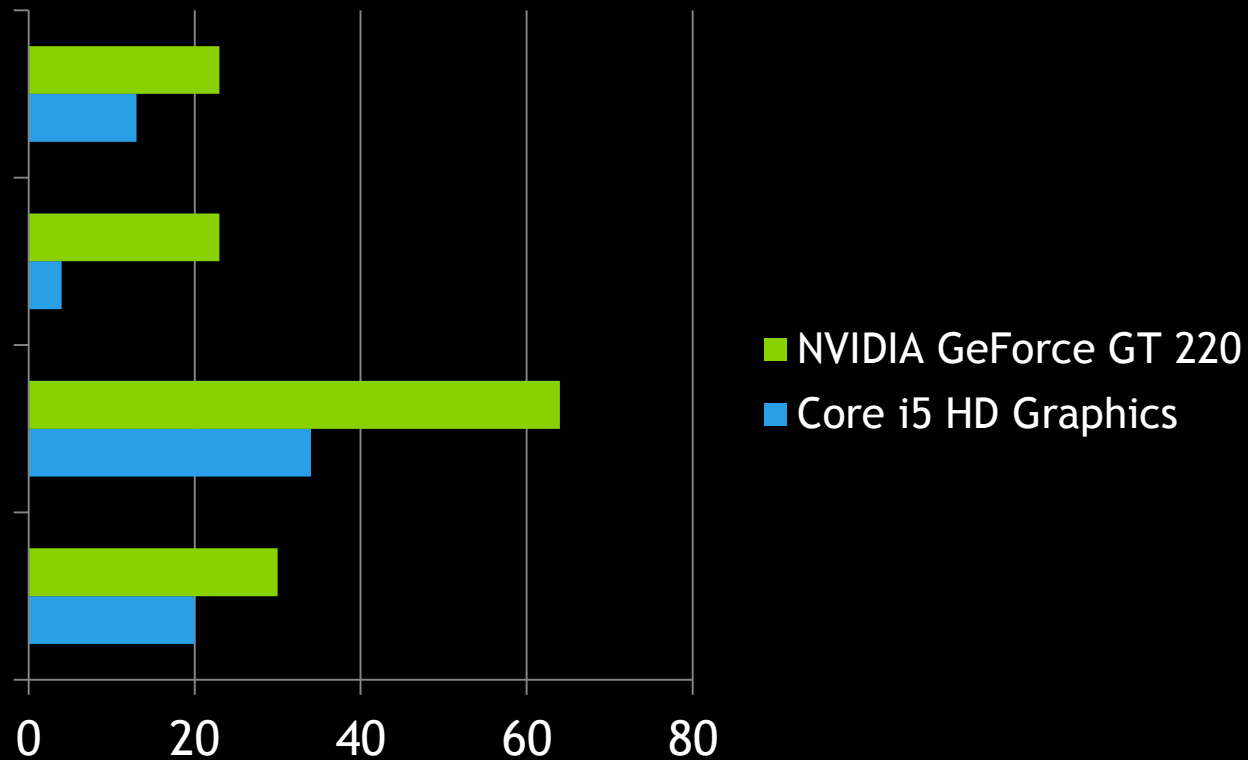


SVG Balloons



O3D Beach

Average Frames Per Second



Tested on nightly pre-release builds of Chrome (Chromium), Firefox (Minefield) and IE9 Platform
Preview week of May 17, 2010

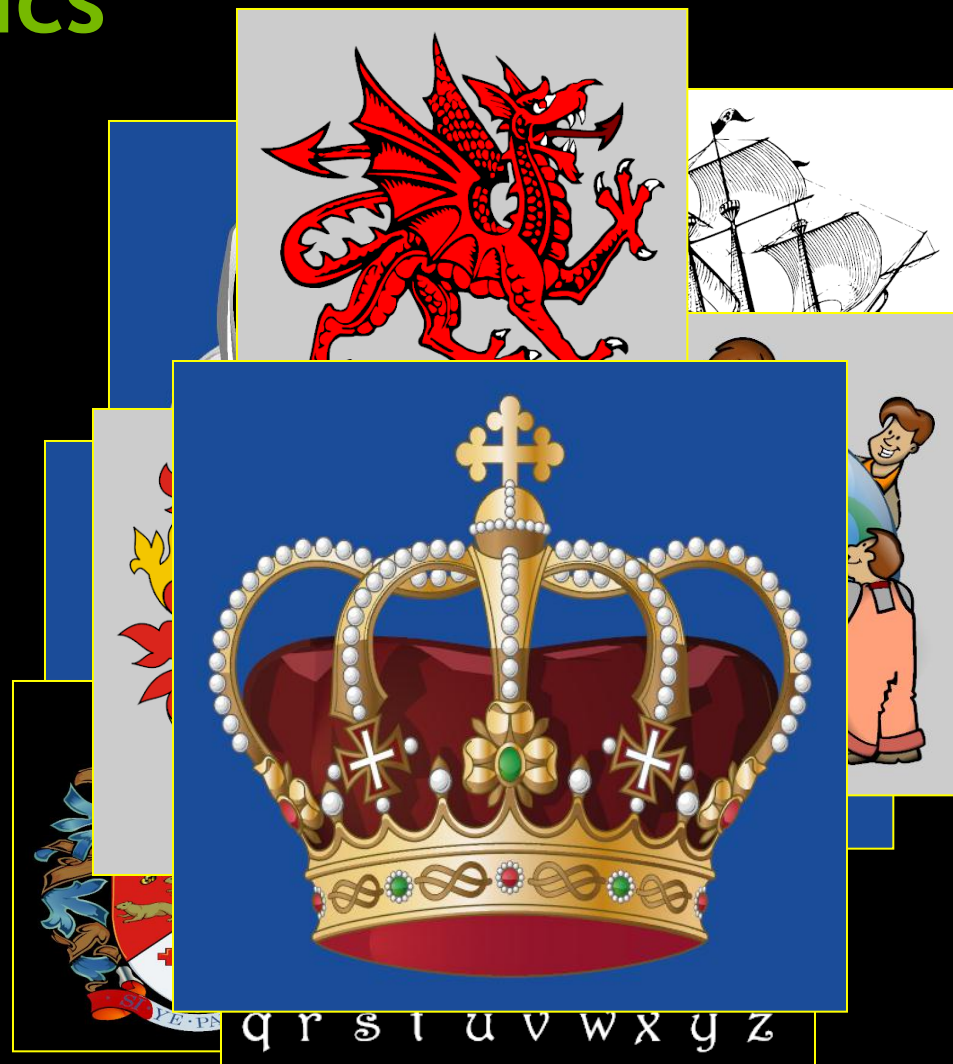
HTML5 - 2D Graphics Plus . . .

- **Tech** -- A new version of HTML4, XHTML1, and DOM Level 2 HTML - From W3C and WHATWG. Canvas tags enable SVG, WebGL, audio & video
- **Benefits** -- video, graphics, scalable fonts, audio . . . without plugins
- **Timing** - nowish, implementers beware



Scalable Vector Graphics

- Tech - SVG is an XML-based file format for describing two-dimensional static & dynamic vector graphics - from W3C - now supported by all major browsers
- Benefits - Scaling without pixelation
- Timing - nowish, compatibility varies
- Acceleration
 - Accelerated by Open VG today
 - 2x to 200x speedups possible
 - Improved quality & fidelity



2D Acceleration Demos on IE9

- <http://demos.hacks.mozilla.org/openweb/HWACCEL/>
 - Firefox graphics hardware acceleration benchmark
- <http://srufaculty.sru.edu/david.dailey/svg/balloons.svg>
 - Balloon Demo of SVG
- <http://ie.microsoft.com/testdrive>
 - Fishtank
 - Panorama
- <http://webvizbench.com/>
- Monitoring GPU Utilization with EVGA Precision GPU Monitor

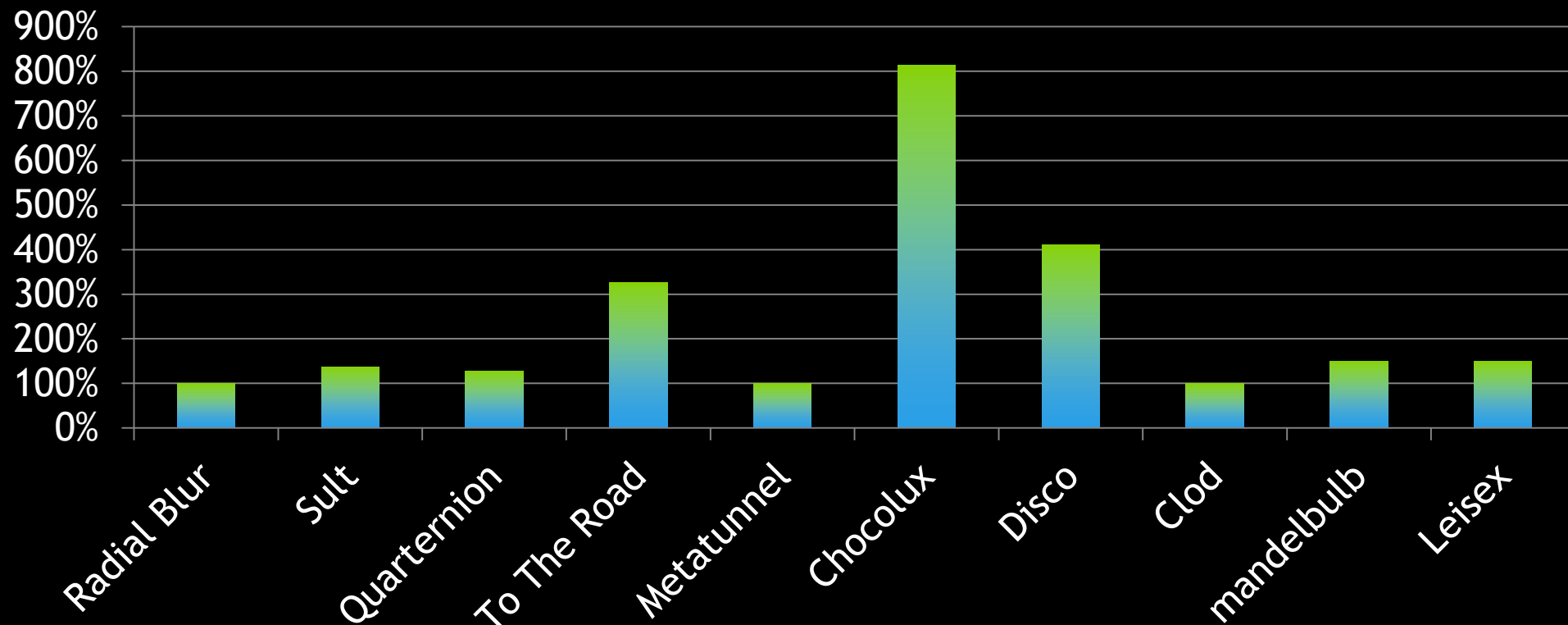
3D Graphics - WebGL

- Tech -- JavaScript binding to OpenGL ES 2.0 -- managed by the Khronos Group - leverages HTML5 canvas tag
- Benefits -- 3D graphics
- Timing - Spec finalizing end of 2010
- Acceleration --
 - Potentially dramatic
 - Via OpenGL drivers or
 - Via Direct3D drivers through Angle



WebGL Preliminary Perf Tests

NVIDIA GeForce GT240 Speedup over Intel Core i5 Graphics



<http://www.iquilezles.org/apps/shadertoy/>

3D Acceleration Demos on Firefox / Minefield and Chromium Canary

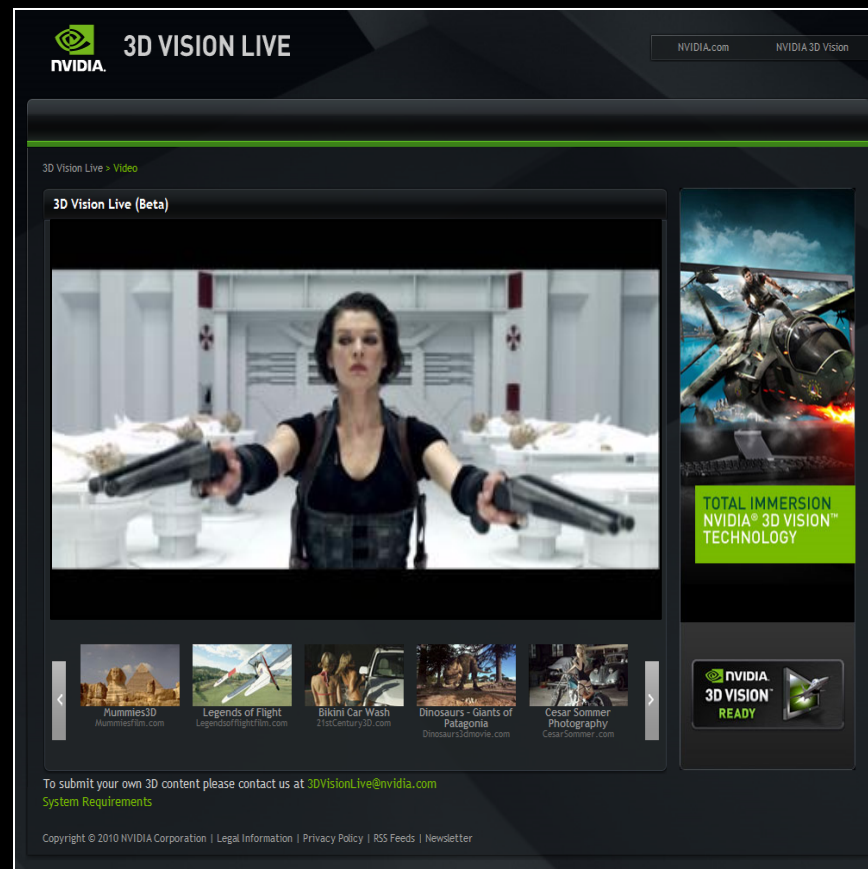
- http://www.khronos.org/webgl/wiki/Demo_Repository
 - Shiny Teapot (Google)
- <http://www.iquilezles.org/apps/shadertoy/>
 - Shader Toy by Inigo Quilez 2009 (iq/rgba)
- <https://sites.google.com/a/chromium.org/dev/developers/demos-gpu-acceleration-and-webgl>
 - Field on FF Minefield
 - *By Gregg Tavares*
 - Aquarium on Chrome Canary build
 - *By Human Engines and Gregg Tavares*

Tapping the GPU for Internet Video

- HTML5 Video Tags Enable
 - Image Scaling & Color-Space Conversion
 - Video decoding
 - Composition
 - Stereo 3D
- Examples of Current Accelerated Experiences
 - Youtube
 - Firefox
 - IE9
 - Silverlight

3D Vision Live (*Beta*)

- Interactive and rich online portal dedicated to delivering 3D content to 3D Vision users
- Initially, launching in Beta to encourage user feedback as we continue to improve content and features



3D Vision Live Requirements

1

3D Vision PC with
the latest driver



2

Silverlight 4
Browser Plug-
in



3

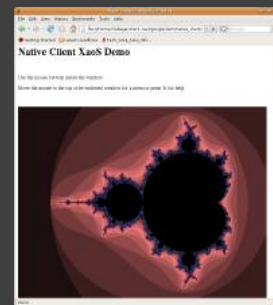
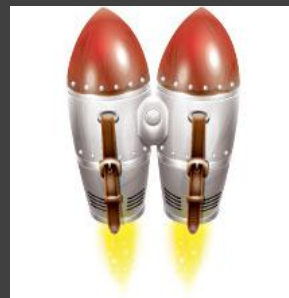
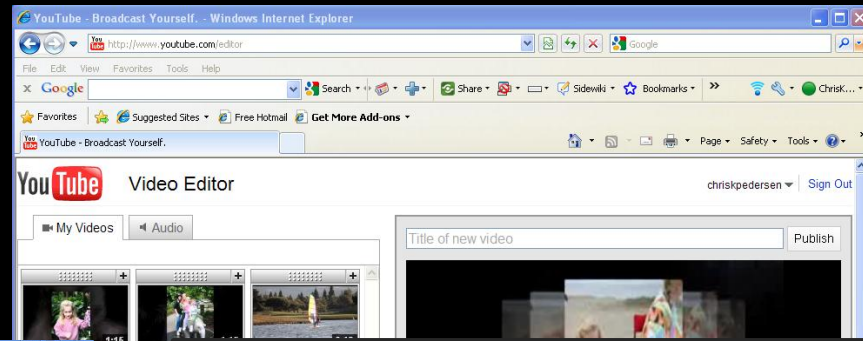
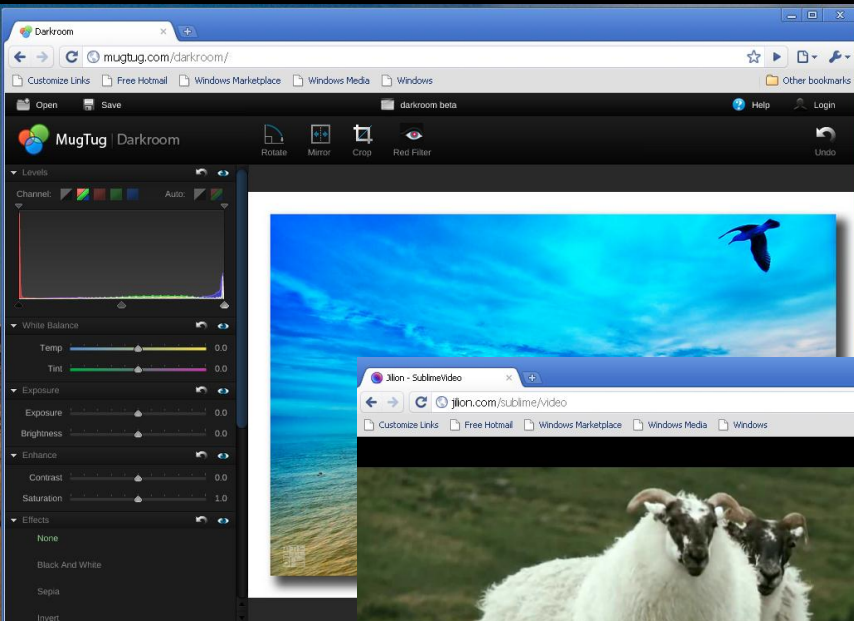
Visit 3D Vision Live
www.3DVisionLive.com



Video Demos

- <http://sublimevideo.net/demo> on Firefox 4 Beta
 - Sublime HTML5 video player
- <http://ie.microsoft.com/testdrive> on IE9 Beta
 - Imdb demo
- http://www.3dvisionlive.com/content/3dvision_channel/showcase3dv.html
 - 3D Vision Live Beta website

Future Possibilities



Mozilla Jetpack – to CUDA

What about phones and tablets?

- Flash & Air on Android
 - Accelerated on NVIDIA Tegra
- Fennec = Mobile Firefox



Challenges

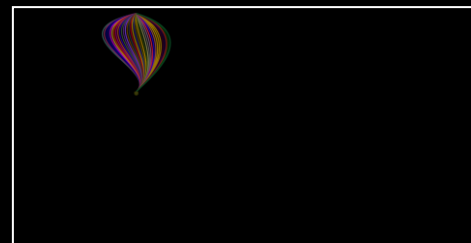
- Finalizing Standards
- Ensuring Cross-Platform Consistent Experiences inconsistencies
 - Browsers
 - Operating Systems
 - Hardware
 - Cross-Platform Authoring
- Content Development
 - Who will lead, and what will be most compelling?



IE9
Beta



FF4
Beta

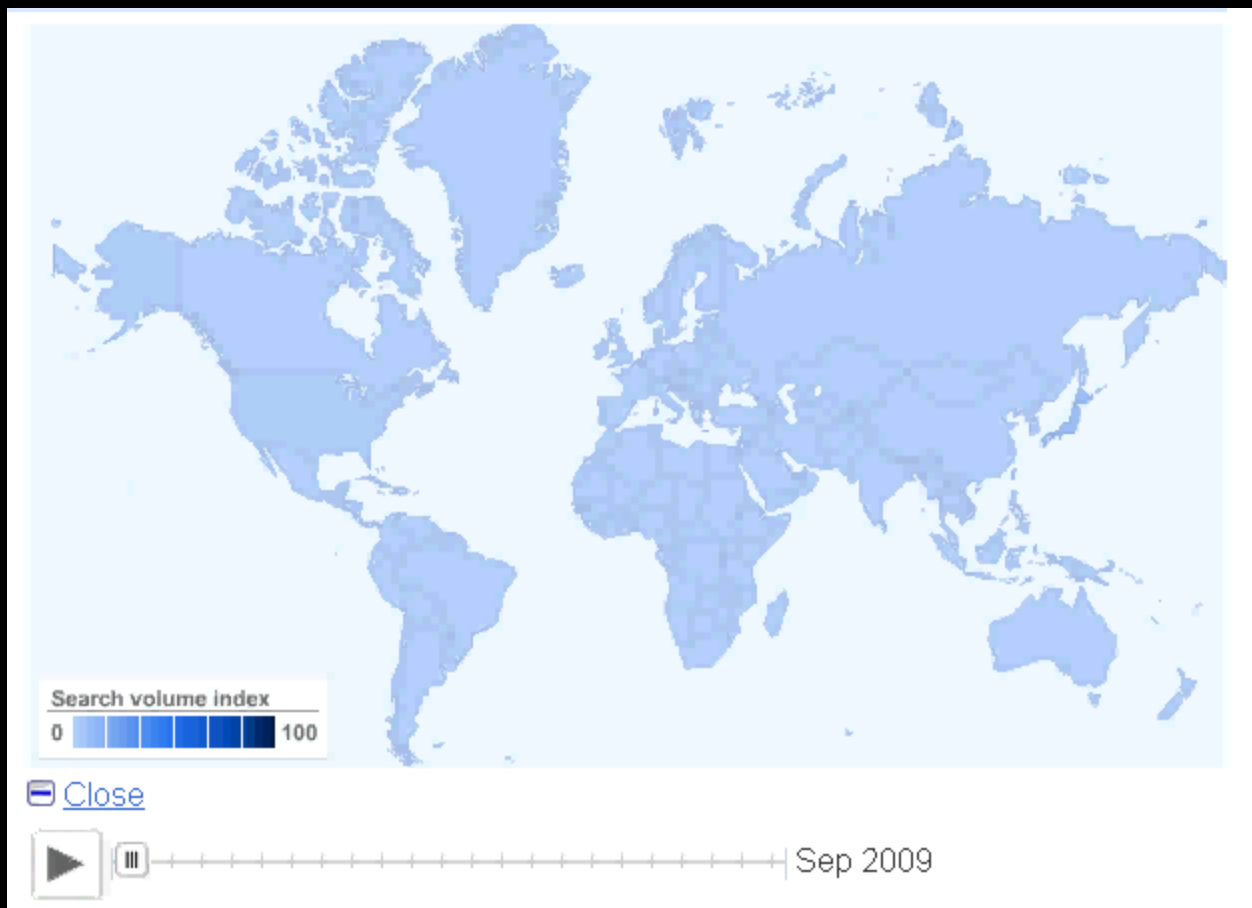


Chrome

<http://srufaculty.sru.edu/david.dailey/svg/balloons.svg>

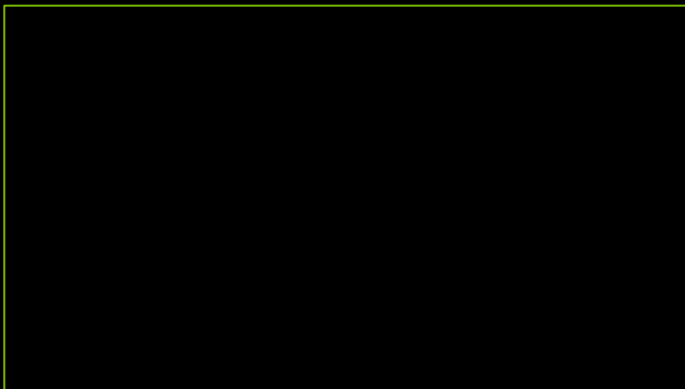
What's the Buzz?

Source: Google Insights for Search, HTML5 Search volume for last 12 months

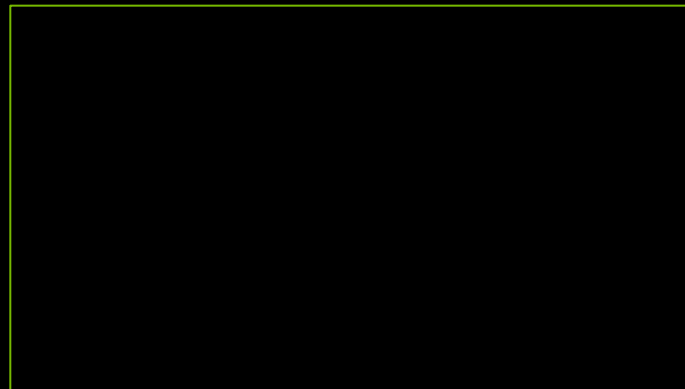


GPU-Accelerated - Summary Videos

ION



GeForce



Conclusions

- GPU Acceleration is coming to the Web
 - 2D & 3D Graphics
 - Video
- Cross-industry support
- Transformational
- A lot of work still to be done



Thank You!

Now, let's create some great experiences!

- Speaker contact info
 - Chris Pedersen, cpedersen@nvidia.com
- Demo hardware specifications
 - Windows 7 Ultimate OS
 - Intel Core i5 M540 CPU with 6 GB RAM
 - NVIDIA Optimus Graphics Switching Between
 - Intel HD Graphics (Core i5)
 - NVIDIA GeForce GT 425M with 1024 MB dedicated video memory