WebM and the New VP9 Open Video Codec

Building a Next-Generation, Open Source Video Codec

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A Quick Introductory Video
Why Do We Care About Open Video?
History of Video Technology at Google

- **2004**: Google Video (labs)
- **2006**: Flash/H.263, User Uploads, Paid Downloads, Content Analysis, YouTube acquisition
- **2007**: Initial H.264 support, Edge serving infrastructure
- **2008**: Video platform project start, Chrome v1 launches
- **2009**: On2 acquisition, Video tag in Chrome
- **2010**: YouTube HTML5 beta
- **2011**: WebM launch,
- **2012**: GIPS acquisition

What is WebM?

- High quality, open alternative for web video
  - VP8 video or VP9 video
  - Vorbis audio or Opus audio
  - Matroska-based container
Web Video Continues To Grow
YouTube Video Growth

A global-scale video platform:

• 1B+ monthly users
• 4B+ video views per day
• 6B+ hours watched per month
• 72+ hours of video uploaded each minute
  • HD becoming dominant
• 25% mobile consumption
“The sum of all forms of video…will be approximately 86 percent of global consumer traffic by 2016.”

Cisco Systems, Inc.
Video Compression is Key

• We can effectively:
  • Significantly increase the size of the Internet;
  • Significantly increase the speed of the Internet;
• And then we have to do it again and again...and again...
VP9 Development
Developing a Cutting-Edge Codec
Assessing video quality

- Assess visually, and use metrics
  - Typical metric for video quality is PSNR (although others exist, e.g. SSIM and VQM)
- How does visual quality correspond to typical metric (PSNR) values?
  - PSNR is a metric - it can be cheated, so always primarily trust visual results
  - Metrics don't tell you what the quality of the source material was, just how well it was represented

Typical HD datarate (1-2mbps, ~40dB)
VP9 quality/bitrate comparisons
VP9 quality/bitrate comparisons

http://youtube.com/watch?v=gF58IoLxjRk

- 328 kbps (37.1dB)
- 794 kbps (37.1dB)
VP9 quality/bitrate comparisons

VP9 - 200kbps

H264 - 200kbps
VP9 quality/bitrate comparisons

http://youtube.com/watch?v=Y6OhVwxEFHI

- 204 kbps (38.6dB)
- 413 kbps (37.0dB)
- 612 kbps (39.1dB)
Save ~50% bandwidth

by distributing your videos using VP9 instead of H.264
A Look Under the Hood
VP9 techniques

- recursive variable block size support (64x64 to 4x4, square and rectangular)
- finer motion vector precision (16th-pel) and adaptive motion filters (sharp, lowpass, regular)
  - multi-level past and future reference (alt-ref) frames
- larger dct transforms (32x32, 16x16, 8x8, 4x4) and adst transforms (16x16, 8x8, 4x4)
Quick Recap……..
Advantages of VP9

• ~50% better than the very best H.264;
• Currently available in Chrome/libvpx for testing;
• Open source;
• Royalty-free;
Putting VP9 in Your Hands
Finalizing VP9

- Bitstream in beta (semi-freeze) since May 3
- 45-day period "Call for Comments"
- Bitstream final on June 17
VP9 in Chrome

- Beta VP9
  - Chrome 28 Dev: behind flag (May 5)

- Final VP9 (flag removed)
  - Chrome 29 Dev: June 24
  - Chrome 29 Beta: July 11
  - Chrome 29 Stable: August 20
VP9 in YouTube

• VP9 already available on YouTube
• See for yourself at www.youtube.com/user/WebMVP9/videos
What Should I Be Doing?
What Should I Be Doing?

- Contribute

Information for Contributors

Regardless of your expertise, there are many ways that you can contribute to the WebM Project. You don’t have to be a codec expert, and some tasks don’t even involve writing code.

Contribute Code
What Should I Be Doing?

- Contribute
- Advocate
What Should I Be Doing?

- Contribute
- Advocate
- But most of all...use it!!!

Sorenson embraces Web video with Squeeze 9

A new version of the video compression software is designed to ease use of Web video, producing HTML code for both H.264 and VP8.

by Stephen Shankland | April 8, 2013 5:02 AM PDT

Sorenson Squeeze 9 makes life easier for high-end video producers.
(Credit: Sorenson Media)

Higher-end video producers anxious to adapt to the new realities of online video will be pleased.
Other I/O Sessions About Open Video

• Tools -- see Demystifying Video Encoding: WebM/VP8 for the Rest of Us
• Real-Time Communication – see Real-time communication with WebRTC
<Thank You!>

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www.webmproject.org
http://www.webmproject.org/code/
Extra Slides – Not Going to Be Displayed
Color Palette

Flat Color
- 67 135 253
- 244 74 63
- 255 209 77
- 13 168 97

Secondary

Gradient

Grays
- Dark Gray
- Medium Gray
- Light Gray
Graphic Element Styles and Arrows

Rounded Boxes

Code Boxes

Arrows

Box Title
Body Copy
Goes Here

Box Title
Body Copy
Goes Here

Content Container Boxes
Pie Chart Example

Subtitle Placeholder

Chart Title

source: place source info here
Column Chart Example
Subtitle Placeholder

source: place source info here
Line Chart Example
Subtitle Placeholder
## Table Option A

Subtitle Placeholder

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<thead>
<tr>
<th></th>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
<th>Column 4</th>
</tr>
</thead>
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# Table Option B

Subtitle Placeholder

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</tr>
<tr>
<td>Header 5</td>
<td>placeholder</td>
<td>placeholder</td>
<td>placeholder</td>
</tr>
</tbody>
</table>
Segue Slide
Subtitle Placeholder
“This is an example of quote text. ”

Name
Company
<Thank You!>

Lorem ipsum dolor sit amet, consectetur adipiscing elit. In eget pretium augue.

Jon@website.com
#Jon
+Jon
Code Slide With Subtitle Placeholder

Subtitle Placeholder

```html
<script type='text/javascript'> // Say hello world until the user starts questioning
  // the meaningfulness of their existence.
  function helloWorld(world) {
    for (var i = 42;--i >= 0;) {
      alert ('Hello' + String(world));
    }
  }
</script>

<style>
p { color: pink }
p { color: blue }
u { color: 'umber' }
</style>
```
What Tools Are Available?

• Widely-deployed player in Chrome;
• Source code;
• Bitstream specification;
• Hardware reference designs (RTL)