

Advanced Video Encoding

Lisa Larson-Kelley

Technical Director

go:toGroup, Inc.



Goals of this session



- » Understand Flash video formats and codecs **NEW!**
- » Improve quality and playback performance
- » Learn best practices for shooting video for Flash
- » Gain familiarity with technology behind the settings
- » Learn how to produce optimized/HD-quality Flash video



ADOBE® FLASH® PLAYER

Flash Player 9 Update beta

(Aug 21) Preview the new H.264 video

MOVIESTAR

Moviestar / FP9 Update 3 Beta 2



» **VIDEO: H.264**

Base, Mainline, High and High-10 profiles
(ISO 14496-10 standard)

Also referred to as AVC (Squeeze encoding profiles)

- » NOT supported: MPEG-4 Part 2 (i.e. Xvid, DivX), H.263, and Sorenson Video (Sorenson 3) codec, Fairplay protected

Moviestar / FP9 Update 3 Beta 2



» **VIDEO: VP6-S:** On2 VP6 Simplified

Simplified version of the original VP6 codec (VP6-E) supported in FP8 and above

- » Alpha channel support
- » Recommended for high-bitrate video playback (500Kbps+) on slower processors/no hardware acceleration

Moviestar / FP9 Update 3 Beta 2



- » **AUDIO: HE-AAC v2:** High-Efficiency-AAC
AAC Main, AAC LC and Spectral Band Replication (SBR)
(ISO 14496-3 standard)
 - » Default audio format of the iPod and PlayStation 3

Moviestar / FP9 Update 3 Beta 2



- » Hardware accelerated, multi-core full screen video playback
 - » Frees up the CPU to allow for greater fidelity
 - » New API to allow for specifying rectangular area to scale
 - » On2 decoder is further optimized to improve decode performance and reduce blockiness

Macintosh

1 GHz G4 processor or better
256MB RAM
16MB video RAM
Mac OS X 10.2 or later

Windows

2.0 GHz Pentium-class processor or better
512MB of RAM
32MB video RAM
Windows 2000 Service Pack 4, XP Service Pack 2;
Vista

» *Remarkably, less than 100kb added to the player*

Caveat: Codecs vs. Containers



» Codecs:

Sorenson Spark

On2 VP6-E

On2 VP6-S

H.264

MP3, **AAC** (audio)

» Container formats:

FLV

MOV

MP4V, M4V

3GP, 3G2 (mobile)

MP3, **M4A, MP4** (audio)

Choosing a format:

- » Complexity of the content
- » The desired reach
- » Ability to archive
- » Licensing considerations

Footage Fundamentals



- » Always some amount of compromise
- » Image quality / small file size / smooth playback
- » Codec compression / frame size / frame rate
- » Goal is to minimize encoding artifacts
- » Start with a profile, then tweak

Receiving Source from Client



- » Highest quality, uncompressed source
- » Compress once
- » About DVDs
 - » rip (demux)
MacTheRipper, Handbrake, DVDxDV, MPEGstream, Cinematize2, DVDSHrink
 - » convert
MPEG (highest settings) or MOV
 - » encode
FLV (Spark/VP6) or H.264 container format

Producing Video Yourself



- » Use 3-CCD camera
- » Progressive mode
- » Always use tripod
- » Avoid fast pans and zooms
 - » Cut from medium shots to close ups instead of zooming
- » Avoid fades and dissolves
- » Avoid using camera's autofocus and autoexposure
- » Use proper lighting
- » Audio is crucial
 - » Use boom or wireless clip-on mic
 - » Decrease ambient noise

Codecs that can be converted to Spark/VP6 FLVs



- » Active Streaming Format (.asf)
- » AVI (.avi)
- » DV (.dv)
- » QuickTime (.mov)
- » MPEG-4 (.mp4)
- » MPEG (.mpg .mpeg)
- » Windows Media Video (.wmv)

Encoding Tools for Spark/VP6



- » Flash Video Import Wizard
- » Flash CS3 Video Encoder
- » FLV QuickTime Export Plugin
- » Sorenson Squeeze
- » On2 Flix Pro
- » VisualHub Video Converter (Mac)
- » RIVA Encoder (PC)
- » FFmpeg
- » FFmpegX

VP6-S

- » On2 Flix Pro

Encoding Tools for H.264



- » Adobe Premier Pro
- » Adobe After Effects
- » Sorenson Squeeze
- » On2 Flix Pro
- » Elecard Converter Studio (\$239.70)
- » Mainconcept H.264 Encoder v2 (\$559.00)

- » Transmuxing (Mencoder, DVision, Real7ime Converter?)

» Sorenson Squeeze

- » Pre-processing filters
- » Batch encoding
- » Auto-keyframe placement
- » FTP uploading from within software

» On2 Flix Pro

- » Vector video
- » Watermark overlays
- » Lower cost

Progressive H.264 issues



moov atom needs to be at the beginning of the file to play before full download (*currently, Premier and AfterEffects place it at the end*).

» **qt-faststart.c** utility available to move the moov

QTIndexSwapper [AIR app]: <http://tinyurl.com/2rl6kl>

» Quicktime Pro: Prepare for Internet Streaming/Fast Start

Won't be an issue with streaming (FMS3)

FLV issues



» Utility for checking FLV format

<http://labs.adobe.com/downloads/flvcheck.html>

» Burak's Metadata Injector (FLVMIDI)

<http://www.buraks.com/flvmidi>

Where the rubber hits the road: Let's encode



- 1** Watch the video
- 2** Determine bandwidth target
- 3** Choose target data rate
- 4** Choose video dimensions
- 5** Choose optimal frame rate
- 6** Set keyframe interval
- 7** Set audio compression
- 8** Alpha channel video settings (if needed, VP6 only)

Where the Rubber Hits the Road: Let's Encode



Step 1: Watch the video

- » Analyze content
- » Note dimensions and framerate

Where the Rubber Hits the Road: Let's Encode



Step 2: Determine Bandwidth Target

- » Bandwidth detection (manual or FMS scripting)
- » Delivery plan (lower quality video, more buffer)

Where the Rubber Hits the Road: Let's Encode



Step 3: Choose Target Data Rate

Connection Speed	Datarate
1024kbps	850kbps
768kbps	620kbps
512kbps (DSL)	410kbps
310kbps	248kbps
256kbps	205kbps
128kbps	80kbps
56kbps	47kbps

- » Don't try to use all available bandwidth (70-80%)
- » Low-quality/low-light source will require higher data rate

Where the Rubber Hits the Road: Let's Encode



Step 4: Choose Frame Size

» Use same dimensions as source, or smaller

4:3

- » 160 x 120
- » 320 x 240
- » 400 x 300
- » 440 x 330
- » 480 x 360
- » 640 x 480

16:9

- » 240 x 135
- » 480 x 270
- » 640 x 360
- » 1280 x 720
- » 1920 x 1080

Where the Rubber Hits the Road: Let's Encode



Step 4: Choose Frame Size

» Use same

4:

»

»

»

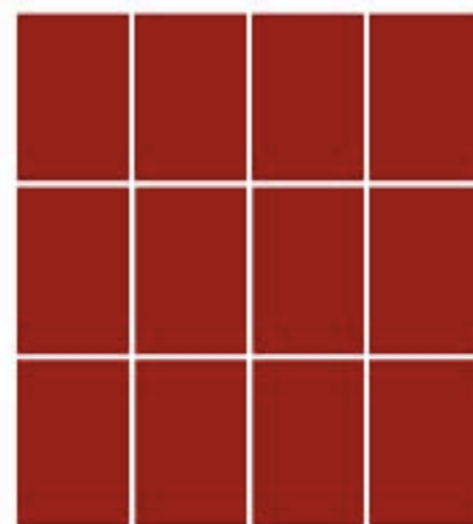
»

» 480 x 360

» 640 x 480



square pixels



rectangular pixels

» 1920 x 1080

Where the Rubber Hits the Road: Let's Encode



Step 4: Choose Frame Size

» Use same

4:

»

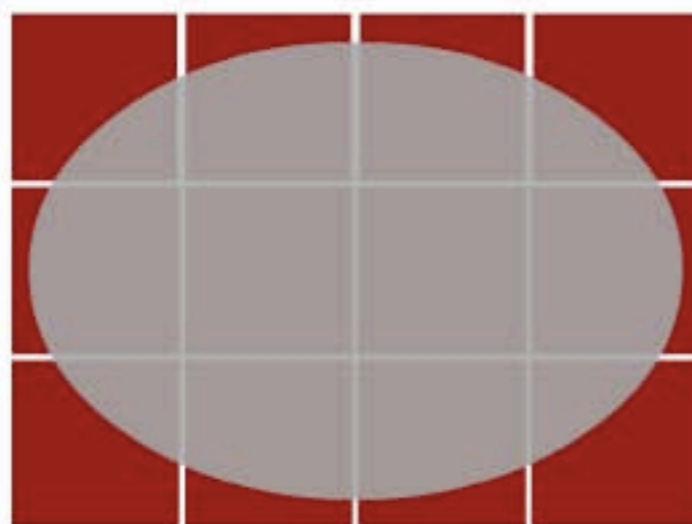
»

»

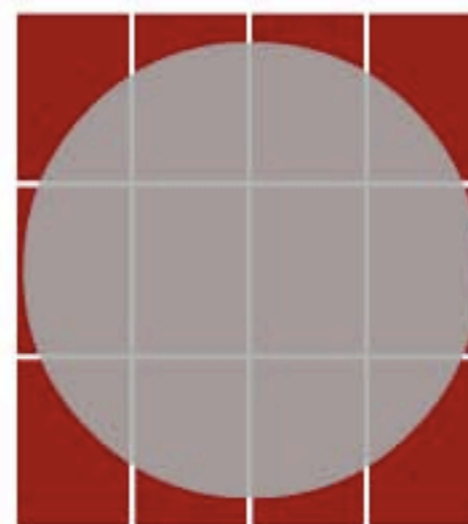
»

» 480 x 360

» 640 x 480



square pixels



rectangular pixels

» 1920 x 1080

Where the Rubber Hits the Road: Let's Encode



Step 5: Choose Optimal Frame Rate

» Use an even divisor of the source frame rate

30fps (29.97fps)

$1/2 = 15\text{fps}$

$1/3 = 10\text{fps}$

Where the Rubber Hits the Road: Let's Encode



Step 6: Set Keyframe Interval

- » Choose "automatic" if available
- » Generally, the fewer keyframes you can get away with, the better
- » Progressive video with seek, may want to use more keyframes

[NOTE: Keyframe number is number of frames between keyframes (NOT keyframes per second)
Higher number= fewer keyframes/lower quality. Lower number=more keyframes/higher quality]

Where the Rubber Hits the Road: Let's Encode



Step 6: Set Keyframe Interval

- » Choose "Keyframe Interval"
- » Generally, a higher number means you're getting away with, the better quality.
- » Progressively encode with a keyframe interval of 2.



5



2

[NOTE: Keyframe interval is measured in frames per second. Higher number = better quality]

[NOTE: Keyframe interval is measured in frames per second. Higher number = better quality]

Where the Rubber Hits the Road: Let's Encode



Step 6: Set Keyframe Interval

- » Choose "Keyframe Interval"
- » Generally, a higher number is better, but the better the video quality, the lower the number.
- » Progressively encode with a keyframe interval of 2.



5



2

HIGHER QUALITY

[NOTE: Keyframe interval is the number of frames between keyframes. Higher number = more frames/second, lower number = fewer frames/higher quality]

away with,

e more

/frames per second)
ames/higher quality]

Where the Rubber Hits the Road: Let's Encode



Step 7: Set Audio Compression

- » Listen to the audio
- » Use lowest bitrate you can get away with
- » Always use MP3 audio encoding (AAC with H.264)
- » Always have an audio track! (needs it for syncing framerate)

Bitrate	Comparative Quality
24kbps	AM quality
64kbps	FM quality
96-160kbps	Typical "acceptable"
192kbps	Typical "good"
224-320kbps	Near Audio-CD

Where the Rubber Hits the Road: Let's Encode



Step 8: Determine Alpha Channel Video Settings (if required)

- » Crop video down to masked area
- » *Wait.* Alpha channel video takes longer to encode

Streaming or Progressive?



- » Differences in encoding for each
 - » Constant Bitrate (CBR)
vs.
 - » Variable Bitrate (VBR)
- » Keyframe/seek issues
- » (Use 2-pass encoding)

Encoding Best Practices



- » Try first to encode/export directly from video editor
 - » On2 Flix Exporter plugin (Spark/VP6) (H.264 t/c)
 - » Sorenson Squeeze plugin (Spark/VP6) (H.264 t/c)
 - » FLV QuickTime Export plugin (H.264 update t/c?)

- » If not, save as:
 - » QuickTime, Video codec (Mac)
 - » Uncompressed AVI (PC)

Encoding Best Practices



- » Always deinterlace, if not shot in Progressive mode!
 - » Apply deinterlace filter, "upper field"
- » Apply Pre-Processing Filters
 - » White/Black Restore [Sorenson Squeeze]
- » No two videos are exactly alike
 - » Allow time/budget for tests
- » Encode different quality videos for various connection speeds

Encoding for HD Flash Video



» Start with HD source

» 720P

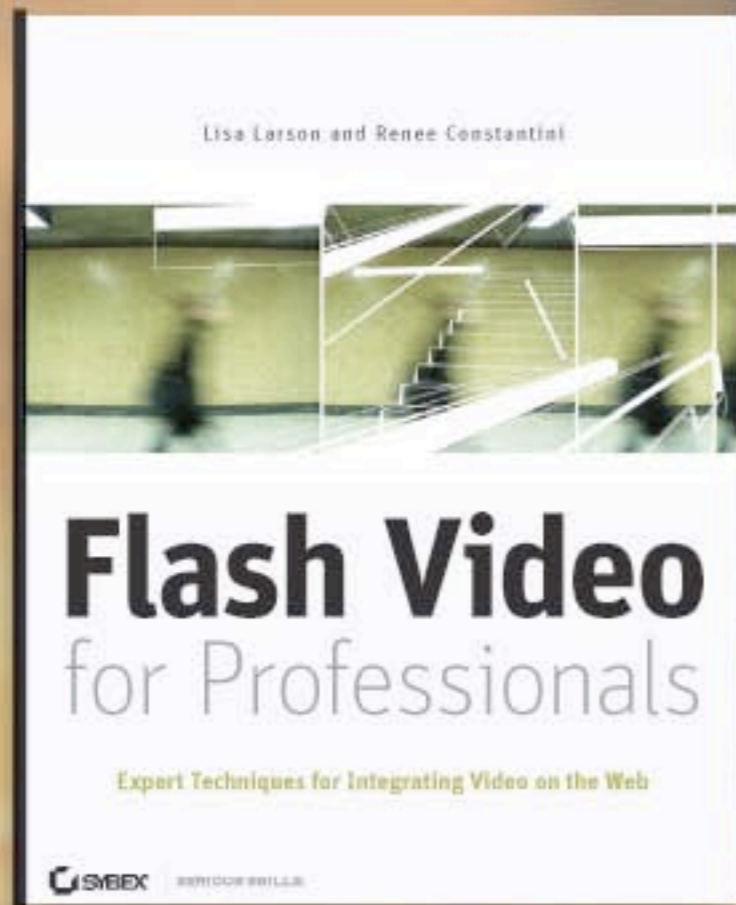
- » The highest standard used for HDTV broadcast today
- » 1280x720 (16:9 aspect ratio)
- » 1.5GHz PC recommended

» 1080P

- » Considered HD video mode
- » 1920x1080 (16:9 aspect ratio)
- » Currently the highest resolution available for consumer video (ultra-HD is in research phase)
- » 2.5GHz PC recommended

recommended bitrate
700-800Kbps

Wrap-up



Thank you!

Resources, news and tips:
www.flashconnections.com

Flash Video for Professionals
Wiley Publishing (Sybex)