

Video Compression for Flash, Apple Devices and HTML5

By Jan Ozer

Doceo
Publishing, Inc.

Video Compression for Flash, Apple Devices and HTML5

Jan Ozer

Doceo Publishing
412 West Stuart Drive
Galax, VA 24333

www.doceo.com
www.streaminglearningcenter.com

Copyright © 2011 by Jan Ozer

Notice of Rights:

ALL RIGHTS RESERVED. This book contains material protected under International and Federal Copyright Laws and Treaties. Any unauthorized reprint or use of this material is prohibited. No part of this book may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system without express written permission from the author / publisher.

Limit of Liability and Disclaimer of Warranty:

The publisher has used its best efforts in preparing this book, and the information provided herein is provided "as is." Neither the author or publisher make any representation or warranties with respect to the accuracy or completeness of the contents of this book and both specifically disclaim any implied warranties of merchantability or fitness for any particular purpose. In no event shall either the author or publisher be liable for any loss of profit or any other commercial damage, including but not limited to special, incidental, consequential, or other damages.

Trademarks:

All brand names and product names mentioned in this book are trademarks or registered trademarks of their respective companies, and are used in an editorial fashion only, and to the benefit of respective owners, with no intention of trademark infringement. This use is not intended to convey affiliation with this book or any product endorsement except as expressly stated herein.

ISBN 978-0-9762595-0-3

Printed in the United States of America

For Mom

Acknowledgements

This book started out as the written manifestation of the H.264-related seminars that I've been holding at various StreamingMedia conventions over the last few years, then expanded to include live event production and producing for HTML5, as well as other codecs like VP6 and WMV. I couldn't have written this book without the backing of the StreamingMedia team, both for the aforementioned seminars and for various writing assignments that helped me become familiar with the products and technologies discussed herein. So to Eric Schumacher-Rasmussen, Stephen Nathans-Kelly, Dan Rayburn, Dick Kaser and Tom Hogan Jr. and Sr., thank you, thank you, thank you.

I also want to express my appreciation to the vendors who have provided hardware, software and bountiful assistance, including Adobe, Accordent, Apple, BlackMagic Design, Digital Rapids, Google, Inlet Technologies, HP, Kulabyte, MainConcept, Matrox, MediaPlatform, Microsoft, NVIDIA, Rhozet, Telestream, Seawell Networks, Sorenson Media, ViewCast, Wowza Media Systems and I'm sure some that I've forgotten.

This book is the first published by my company, Doceo Publishing. I'm sure there are many rookie rough edges when it comes to presentation, but you should have seen it before my copy editor/proofreader Lucy Sutton got a hold of it. Lucy was my editor at Millimeter Magazine, and her contribution is immeasurable.

Contents At A Glance

Acknowledgements	4
Chapter 1: Introduction to Streaming Production	11
Chapter 2: Universal Encoding Parameters	31
Chapter 3: Introduction to H.264	41
Chapter 4: H.264 Encoding Parameters	53
Chapter 5: Producing H.264 for Computer Playback	73
Chapter 6: Producing for Apple (and Other) Devices	95
Chapter 7: Adaptive Streaming	113
Chapter 8: Choosing an H.264 Encoding Tool	143
Chapter 9: Producing WebM,VP6 and WMV Files	167
Chapter 10: Distributing Your Video	183
Chapter 11: Streaming Live Events	203
Chapter 12: Accelerating Encoding on Multi-Core Workstations	231
Chapter 13: File Analysis Tools	243

Contents

Acknowledgements	4
Chapter 1: Introduction to Streaming Production	13
Compression and Codecs	13
<i>Compression</i>	13
<i>Codecs</i>	14
<i>Ensuring Playback</i>	14
Streaming Fundamentals	15
<i>Bandwidth</i>	15
<i>Data Rate</i>	16
<i>Frame Rate</i>	16
<i>Resolution</i>	17
Distribution Alternatives	18
<i>Streaming</i>	18
<i>Progressive Download</i>	18
<i>Adaptive Streaming</i>	19
Streaming Production	20
<i>Deinterlacing</i>	20
<i>Aspect Ratio Issues</i>	23
<i>Resolving SD Aspect Ratio Issues</i>	24
<i>Resolving HD Aspect Ratio Issues</i>	26
Choosing Your Delivery Environments	26
<i>A Brief History of Streaming Video</i>	27
<i>Flash Rules</i>	27
<i>Silverlight Leaves the Gate Slowly</i>	27
<i>The iPad Rocks Adobe's World</i>	28
<i>About HTML5</i>	28
<i>Mobile Rises</i>	30
<i>Prioritizing Your Delivery Targets</i>	30
Producing for Your Delivery Targets	30
<i>Producing for Flash</i>	31
<i>Producing for Windows Media and Silverlight</i>	31
<i>Producing for HTML5</i>	31
<i>Producing for Apple Devices</i>	31
DIY or OVP	31
Conclusion	32
Chapter 2: Universal Encoding Parameters	33
Constant vs. Variable Bit Rate Encoding	33
<i>Producing Optimal-Quality CBR Files</i>	34
<i>Producing Optimal-Quality VBR Files</i>	35
<i>Choosing Between VBR and CBR</i>	38
I-, B-, and P-frames	38
<i>Working With I-frames</i>	40

<i>Working With B-frames</i>	40
Conclusion	41
Chapter 3: Introduction to H.264	43
What Is H.264?	43
<i>H.264 Wrappers</i>	44
<i>Other H.264 Details</i>	45
<i>H.264 Royalties</i>	45
Comparing H.264 With Other Codecs	47
<i>Looking Backward: VC-1 and VP6</i>	47
<i>Which Codec Is Hardest to Play Back?</i>	48
<i>What About Silverlight?</i>	49
<i>Google's WebM</i>	50
<i>WebM vs. H.264: Playback CPU</i>	51
<i>WebM vs. H.264: Video Quality</i>	52
Summary	54
Chapter 4: H.264 Encoding Parameters	55
Basic H.264 Encoding Parameters	55
<i>Profiles and Levels</i>	55
<i>H.264 Levels</i>	58
<i>Apple Compressor and Adobe Media Encoder</i>	60
<i>Entropy Coding</i>	61
<i>What Would YouTube Do?</i>	62
<i>Squeeze and Episode</i>	63
I-, B- and P-frame Controls	63
<i>IDR Frames</i>	64
<i>Working with B-frames</i>	65
<i>Adaptive B-frames</i>	68
Search-Related Settings	69
Working with Rhozet Carbon Coder	71
Conclusion	73
Chapter 5: Producing H.264 for Computer Playback	75
<i>Preliminaries: What We Already Know</i>	76
Producing H.264 for Specific Environments	77
Where Dat Moov Atom?	79
<i>Avoiding the Problem</i>	80
<i>Moving the Moov Atom</i>	80
Producing for QuickTime Playback	81
Producing for Flash Playback	82
Producing for Silverlight Playback	83
Producing for HTML5 Playback	83

Changing the File Extension on an H.264 File	84
Configuring Your H.264 Streams	84
<i>Flash Playback Statistics</i>	84
<i>Windows Tests</i>	85
<i>Mac Test Beds</i>	86
Choosing Resolution and Data Rate	86
<i>European Media Sites</i>	87
<i>US Business to Consumer (B2C) Sites</i>	88
<i>US Business to Business (B2B) Sites</i>	88
<i>European Commercial Sites</i>	89
<i>Resolution Synthesis and Recommendations</i>	89
<i>What About Mod-16?</i>	90
What Data Rate	91
<i>Understanding Bits per Pixel</i>	91
<i>Computing Bits per Pixel</i>	92
<i>Using Bits per Pixel</i>	93
<i>Bits per Pixel Should Decrease as Resolutions Increase</i>	94
<i>Applying Bits per Pixel</i>	94
Conclusion	96
Chapter 6: Producing for Apple (and Other) Devices	97
Producing for iTunes Delivery	97
<i>Should You Abandon Older iPods?</i>	99
<i>Should You Support Post-5G Devices with a Single Stream?</i>	99
<i>Should You Distribute Multiple Files?</i>	100
<i>Choosing the Optimal Resolution</i>	100
<i>Working With 16:9 Footage on iPods with a 4:3 Display</i>	101
Recommended Encoding Parameters	102
<i>Encoding 320x240 Podcasts</i>	103
<i>Encoding 640x360 Podcasts</i>	103
<i>Encoding 720p Podcasts</i>	104
<i>Encoding Music Videos</i>	105
<i>Encoding TV Episodes</i>	105
Producing for Wi-Fi or Cellular Delivery	109
Producing for Other Mobile Platforms	110
<i>Android</i>	110
<i>BlackBerry</i>	111
<i>HP webOS</i>	112
<i>Microsoft Windows Phone 7</i>	113
Conclusion	114
Chapter 7: Adaptive Streaming	115
Technology Overview	115
Technology Alternatives	118
<i>Move Networks</i>	118
<i>Adobe: RTMP-Based Dynamic Streaming</i>	119

<i>Microsoft's Smooth Streaming for Silverlight</i>	120
<i>Apple's HTTP Live Streaming</i>	120
<i>Akamai HD Network</i>	120
<i>Adobe HTTP Dynamic Streaming</i>	120
<i>Scalable Video Coding (SVC)</i>	120
Choosing a Technology	121
<i>Supported Platforms</i>	121
<i>Protocol (HTTP vs RTMP)</i>	122
<i>Supporting Multiple Adaptive Streaming Technologies</i>	124
Implementing Adaptive Streaming	126
<i>Adobe Flash Dynamic Streaming: RTMP</i>	126
<i>How Many Streams?</i>	127
<i>Video Resolution</i>	128
<i>Video Data Rates</i>	130
<i>Profile and Level</i>	131
<i>VBR or CBR</i>	131
<i>Key Frame Interval</i>	132
<i>Audio Parameters</i>	133
Adobe Flash Dynamic Streaming: HTTP	134
Apple's HTTP Live Streaming	135
<i>Resolution</i>	137
<i>Profile/Level</i>	138
<i>VBR/CBR</i>	138
<i>Key Frame Interval/Segment Duration</i>	138
Smooth Streaming with Silverlight	139
Multiple Format Distribution	140
Scalable Video Coding	141
<i>Available When?</i>	142
Chapter 8: Choosing an H.264 Encoding Tool	145
Mac Encoders	146
<i>Apple Compressor</i>	146
<i>Sorenson Squeeze 7.0.0.126</i>	148
<i>Telestream Episode Pro 6.1.1.2</i>	151
<i>Adobe Media Encoder Version 5.0.1.0</i>	152
<i>Quality Results: Mac Encoders</i>	152
<i>Encoding Speed: Mac Encoders</i>	156
<i>Other Features: Mac Encoders</i>	157
<i>Automation and Input/Output</i>	158
<i>Other Features</i>	159
Windows Encoders	160
<i>Quality Results: Windows Encoders</i>	161
<i>Encoding Speed: Windows Encoders</i>	164
<i>Encoding Features: Windows Encoders</i>	164
<i>Automation and Input/Output</i>	165
<i>Other Features</i>	166
Conclusion	167

Chapter 9: Producing WebM,VP6 and WMV Files	169
Producing WebM	169
<i>Firefogg</i>	170
<i>Sorenson Squeeze</i>	173
Producing VP6	177
<i>On2, VP6 and VP8</i>	177
<i>VP6-S/VP6-E</i>	177
Producing Windows Media Video (WMV)	179
<i>VC-1, WMV and Royalties</i>	180
Ogg Theora	183
Chapter 10: Distributing Your Video	185
Understanding the Roles	186
Distributing Your Own Videos	188
<i>Adding Video to Your Website</i>	189
<i>Linking and Embedding</i>	190
<i>Embedding Flash Video</i>	190
Distributing via UGC Sites	191
<i>Choosing a UGC Site</i>	193
<i>Chasing Eyeballs</i>	193
<i>Choosing a UGC Host for Your Videos</i>	194
Online Video Platforms	195
<i>Basic OVP Capabilities</i>	196
<i>Other considerations</i>	200
<i>Choosing an OVP: A Six-Step Process</i>	202
<i>Encoding for Upload</i>	202
<i>Basic Considerations</i>	203
Conclusion	204
Chapter 11: Streaming Live Events	205
Introduction	205
<i>Choosing an Encoder</i>	206
Webcasting Software	208
<i>Software Encoder Performance</i>	210
Choosing a Capture Card/Encoder	211
Portable Streaming Appliances	212
<i>Driving a Portable Streaming Appliance</i>	213
<i>Choosing a Portable Streaming Appliance</i>	215
Choosing a Rack-Mounted System	217
Server/Distribution Options	218
<i>Choosing an LSSP</i>	219
<i>Formats Supported</i>	220
<i>Supported Input Formats</i>	221

<i>Player Details</i>	222
<i>Monetization and Security Concerns</i>	222
<i>Service Aspects</i>	223
Rich Media Communications	223
My First Live Webcast	225
<i>Choosing a Webcast Provider</i>	226
<i>Choosing a Real Time Encoder</i>	226
<i>Getting Connected</i>	227
<i>Embedding the Player</i>	228
<i>Choosing Encoding Parameters</i>	228
<i>At the Show</i>	230
Conclusion	231
Chapter 12: Accelerating Encoding on Multi-Core Workstations	233
Working With Qmaster	233
<i>Qmaster and Multiple Workstations</i>	236
<i>Qmaster Caveats</i>	238
Multiple Instances	238
<i>Opening Multiple Instances: Expression Encoder</i>	240
<i>Opening Multiple Instances: Squeeze Windows</i>	240
Hardware Acceleration	242
Chapter 13: File Analysis Tools	245
MediaInfo	245
Bitrate Viewer	247
GSpot	249
FLV Player	250
Inlet Semaphore QC	251
QuickTime Player 7	255
WMSnoop	256
Conclusion	258

