

<b>Acknowledgments</b>	<b>4</b>
<b>Chapter 1: Formulating a Multi-Screen Strategy</b>	<b>16</b>
<b>Compression and Codecs</b>	<b>17</b>
<i>Ensuring Playback</i>	18
<b>Distribution Alternatives</b>	<b>19</b>
<i>Progressive Download</i>	19
<i>Streaming</i>	20
<i>Adaptive Streaming</i>	21
<b>Distributing to Desktops</b>	<b>22</b>
<i>The RealNetworks Era: 1996-2001</i>	22
<i>The Microsoft Era: 2001-2006</i>	22
<i>The Flash Era: 2006-</i>	22
<i>Silverlight Stalls</i>	23
<i>The Rise of HTML5</i>	23
<i>About HTML5</i>	24
<i>HTML5 and the Dual Codec Requirement</i>	25
<b>Distributing to Mobile</b>	<b>26</b>
<i>Single-File Streaming</i>	26
<i>Adaptive Streaming</i>	26
<b>Distributing to Over-the-Top Devices</b>	<b>27</b>
<b>Choosing Your Technologies</b>	<b>27</b>
<i>Single-File Streaming</i>	28
<i>Adaptive Streaming</i>	28
<i>Live Streaming</i>	29
<i>Digital Rights Management (DRM)</i>	29
<i>Closed Captions</i>	29
<i>Multicast</i>	29
<i>Peer-to-Peer</i>	30
<b>Desktop Markets</b>	<b>30</b>
<i>Legacy browsers, no HTML5 support</i>	30
<i>HTML5-Compatible Browsers with Flash Player</i>	31
<i>HTML5-Compatible Browser with No Flash Player installed</i>	31
<i>Mobile Markets</i>	32
<b>OTT Markets</b>	<b>33</b>
<b>Where to Go From Here</b>	<b>34</b>
<i>On Demand Videos</i>	34
<i>Live Videos</i>	34
<b>In this Book</b>	<b>35</b>
<b>Conclusion</b>	<b>36</b>
<b>Chapter 2: Technology Fundamentals</b>	<b>37</b>
<b>Basic File Parameters</b>	<b>37</b>
<i>Dimensions (or Resolution, or Frame Size)</i>	39

<i>Frame Rate</i>	39
<i>Bit Rate (or Data Rate)</i>	40
<i>Bandwidth</i>	41
<b>Constant vs. Variable Bit Rate Encoding</b>	<b>42</b>
<i>Producing Optimal-Quality CBR Files</i>	43
<i>Producing Optimal-Quality VBR Files</i>	45
<i>Setting the Number of Passes</i>	46
<i>Choosing Between VBR and CBR</i>	47
<b>I-, B- and P-frames</b>	<b>48</b>
<i>Working with I-frames</i>	49
<i>I-Frames and Adaptive Streaming</i>	50
<i>Working with B-frames</i>	50
<b>Configuring Your Audio</b>	<b>51</b>
<i>Choosing the Audio Data Rate</i>	52
<i>Mono or Stereo? Consider the Source</i>	52
<b>Putting it All Together</b>	<b>54</b>
<i>Media Sites</i>	54
<i>Corporate Sites</i>	55
<i>Resolution Synthesis and Recommendations</i>	55
<i>What About Mod-16?</i>	56
<b>Choosing the Data Rate</b>	<b>57</b>
<i>Understanding Bits per Pixel</i>	57
<i>Computing Bits per Pixel</i>	57
<i>Using Bits per Pixel</i>	58
<i>Avoiding Wasted Bandwidth</i>	59
<i>Bits per Pixel Should Decrease as Resolutions Increase</i>	59
<i>Applying Bits per Pixel</i>	60
<b>Other Production Issues</b>	<b>62</b>
<i>Aspect Ratio Issues</i>	62
<i>Resolving SD Aspect Ratio Issues</i>	63
<i>Resolving HD Aspect Ratio Issues</i>	64
<b>Deinterlacing</b>	<b>65</b>
<b>Chapter 3: H.264 Encoding Parameters</b>	<b>69</b>
<b>What Is H.264?</b>	<b>70</b>
<i>Container Formats</i>	71
<i>Transport Streams and Program Streams</i>	72
<i>Other H.264 Details</i>	73
<i>H.264 Royalties</i>	73
<b>Comparing H.264 with Other Codecs</b>	<b>75</b>
<b>Basic H.264 Encoding Parameters</b>	<b>75</b>
<i>Profiles and Levels</i>	75
<i>H.264 Levels</i>	79
<i>Entropy Coding</i>	80
<i>What Would YouTube Do?</i>	81
<b>I-, B- and P-frame Controls</b>	<b>82</b>

<i>Instantaneous Decode Refresh (IDR) Frames</i>	82
<i>Working with B-frames</i>	83
<i>B-Frames While Standing on One Leg</i>	85
<i>B-frames: What's the Right Number?</i>	86
<i>Going too High Can Cause Problems</i>	88
<i>Adaptive B-frames Sets the Limit</i>	88
<b>More On Reference Frames</b>	<b>89</b>
<i>What's the Right Number?</i>	89
<i>B-Frames as Reference Frames/Pyramid Coding</i>	91
<i>Encoding Slices</i>	91
<b>H.264 Quality Varies by Codec</b>	<b>92</b>
<b>Audio Encoding Options</b>	<b>94</b>
<b>Conclusion</b>	<b>96</b>
<b>Chapter 4: Configuring H.264 for Desktop, Mobile and OTT Viewers</b>	<b>97</b>
<b>Producing H.264 for Specific Environments</b>	<b>98</b>
<b>Where Dat Moov Atom?</b>	<b>99</b>
<i>Moving the Moov Atom</i>	100
<b>Producing for QuickTime Playback</b>	<b>100</b>
<b>Producing Flash Playback</b>	<b>101</b>
<b>Producing for Silverlight Playback</b>	<b>102</b>
<b>Producing for HTML5 Playback</b>	<b>103</b>
<i>Changing the File Extension on an H.264 File</i>	103
<b>Configuring Your H.264 Streams</b>	<b>103</b>
<i>Flash Playback Statistics</i>	103
<i>Windows Tests</i>	104
<i>Mac Tests</i>	105
<b>Generalizing These Results</b>	<b>106</b>
<b>Distributing to Mobile Platforms</b>	<b>108</b>
<i>Distributing to iOS Devices</i>	108
<i>Encoding for Android</i>	110
<b>Encoding for Windows Phone</b>	<b>111</b>
<b>Over-the-Top (OTT) Devices</b>	<b>113</b>
<i>Apple TV</i>	113
<i>Boxee</i>	113
<i>Google TV</i>	113
<i>Roku</i>	114
<i>Xbox 360</i>	115
<b>Conclusion</b>	<b>115</b>
<b>Chapter 5: Adaptive Streaming</b>	<b>117</b>

<b>Technology Overview</b>	<b>118</b>
<b>Technology Alternatives</b>	<b>120</b>
<i>Adobe RTMP-Based Dynamic Streaming</i>	121
<i>Microsoft's Smooth Streaming for Silverlight</i>	121
<i>Apple's HTTP Live Streaming</i>	121
<i>Akamai HD Network</i>	121
<i>Adobe HTTP Dynamic Streaming (HDS)</i>	122
<i>Scalable Video Coding (SVC)</i>	122
<i>DASH</i>	122
<i>Supporting Multiple Adaptive Streaming Technologies</i>	124
<b>Choosing a Technology</b>	<b>125</b>
<i>Supported Platforms</i>	126
<i>Protocol (HTTP vs. RTMP)</i>	127
<b>Implementing Adaptive Streaming</b>	<b>128</b>
<b>Recommended Procedure</b>	<b>130</b>
<i>Choose Mobile First</i>	130
<i>Then Browser-Based Streams</i>	130
<i>OTT and Full Screen Playback Last</i>	132
<i>Other Considerations</i>	133
<i>More on Choosing Data Rate</i>	135
<b>Other Configuration Items</b>	<b>136</b>
<i>Choosing The H.264 Profile</i>	136
<i>VBR or CBR</i>	137
<i>Key Frame Interval</i>	138
<i>Audio Parameters</i>	139
<b>HTTP-Based Flash Dynamic Streaming (HDS):</b>	<b>139</b>
<b>Smooth Streaming with Silverlight</b>	<b>141</b>
<b>Conclusion</b>	<b>141</b>
<b>Chapter Appendix: Resources</b>	<b>142</b>
<i>Adobe Flash Dynamic Streaming: RTMP</i>	142
<i>Apple HTTP Live Streaming (HLS)</i>	142
<i>Adobe Flash Dynamic Streaming: HTTP</i>	142
<i>Smooth Streaming</i>	142
<b>Chapter 6: Choosing an On-Demand Encoding Tool</b>	<b>143</b>
<b>What You Should Know Before You Go Shopping</b>	<b>144</b>
<b>Free Encoding Tools</b>	<b>144</b>
<i>Miro Video Converter</i>	145
<i>HandBrake</i>	145
<i>MPEG Streamclip</i>	145
<b>Bundled Encoders</b>	<b>146</b>
<i>Resources</i>	147
<b>Stepping Up to Desktop Encoders</b>	<b>147</b>
<i>Desktop Encoder Resources</i>	148

<i>Differentiating Enterprise from Desktop Encoders</i>	149
<i>Class 1: Swiss Army Knife Transcoders</i>	150
<i>Class 2: High-Volume Encoders</i>	150
<i>Class 3: Workflow Systems</i>	150
<b>Choosing an Enterprise System</b>	<b>153</b>
<i>Enterprise Encoder Resources</i>	154
<b>Cloud Encoding</b>	<b>155</b>
<b>Conclusion</b>	<b>157</b>
<b>Chapter 7: Encoder-Specific Instruction</b>	<b>159</b>
<b>Adobe Media Encoder</b>	<b>160</b>
<i>H.264 Output</i>	162
<i>Quirks, Tips and Tricks</i>	163
<i>Producing Audio</i>	163
<b>Apple Compressor</b>	<b>164</b>
<i>H.264 for Apple Devices Interface</i>	169
<i>MPEG-4 Encoding Interface</i>	170
<i>QuickTime Movie Encoding Interface</i>	171
<i>Downloading and Installing the x264 Component</i>	172
<i>Using the x264Encoder</i>	173
<i>x264 Presets and Tuning</i>	173
<b>Sorenson Squeeze Desktop</b>	<b>178</b>
<i>Squeeze and the x264 Codec</i>	184
<i>Tuning your x264 Encodes</i>	188
<i>Squeeze and the MainConcept Codec</i>	188
<i>MainConcept CUDA H.264 Codec</i>	192
<b>Telestream Episode</b>	<b>193</b>
<i>Episode and the x264 Codec</i>	196
<i>Choosing a Tuning Setting</i>	199
<i>Customizing your x264 Preset</i>	200
<i>Episode and the MainConcept Codec</i>	202
<b>Harmonic ProMedia Xpress</b>	<b>204</b>
<b>Telestream Vantage</b>	<b>209</b>
<i>Encoding Controls</i>	211
<i>Packaging the Elementary Streams</i>	212
<b>Elemental Server</b>	<b>213</b>
<i>H.264 Encoding Parameters</i>	213
<b>ProMedia Carbon</b>	<b>215</b>
<b>Conclusion</b>	<b>218</b>
<b>Chapter 8: Producing for iTunes</b>	<b>219</b>
<b>Producing for iTunes Delivery</b>	<b>220</b>
<i>Should You Abandon Older iPods?</i>	221
<i>Should You Support Post-5G Devices with a Single Stream?</i>	222
<i>Should You Distribute Multiple Files?</i>	222

<i>Should You Distribute 1080p to the new iPad?</i>	222
<b>Mistakes to Avoid</b>	<b>223</b>
<i>What About B-frames?</i>	223
<i>44.1 or 48 kHz Audio?</i>	223
<b>Recommended Encoding Parameters</b>	<b>224</b>
<i>Encoding 640x480/640x360 Podcasts</i>	224
<i>Encoding 720p Podcasts</i>	225
<i>Encoding Music Videos</i>	226
<i>Encoding TV Episodes</i>	228
<b>Conclusion</b>	<b>229</b>
<b>Chapter 9: Distributing Your Video</b>	<b>231</b>
<b>Understanding the Roles</b>	<b>232</b>
<b>Distributing Your Own Videos</b>	<b>234</b>
<i>Adding Video to Your Website</i>	235
<i>Linking and Embedding</i>	236
<i>Embedding Flash Video</i>	237
<b>Distributing via UGC Sites</b>	<b>237</b>
<i>Choosing a UGC Site</i>	239
<i>Chasing Eyeballs</i>	239
<b>Online Video Platforms</b>	<b>242</b>
<i>Comparing OVPs</i>	243
<i>Account Basics</i>	243
<i>Pricing</i>	243
<i>Upload-Related Features</i>	246
<i>Encode/Transcode</i>	246
<i>Supported Platforms</i>	247
<i>Content Types</i>	247
<i>Player Creation</i>	248
<i>Supported Playback Platforms</i>	249
<i>Content Management</i>	250
<i>Third-Party Integration</i>	250
<i>Support for Your Business Model</i>	251
<i>Security</i>	251
<i>Reporting and Analytics</i>	252
<i>Professional Services</i>	253
<i>Choosing an OVP: A Six-Step Process</i>	253
<i>Encoding for Upload</i>	254
<i>Encoding for Upload to YouTube</i>	256
<b>Synthesis</b>	<b>258</b>
<b>Conclusion</b>	<b>260</b>
<b>Chapter 10: Introduction to Live Streaming</b>	<b>261</b>
<b>Components of a Live Production</b>	<b>262</b>
<b>Video Signal</b>	<b>262</b>
<b>Live Encoder</b>	<b>263</b>

<b>Transmission to Streaming Server</b>	<b>263</b>
<i>Gee? No, 4G</i>	264
<b>Streaming Server</b>	<b>268</b>
<i>Know the Roles</i>	268
<i>Production Role</i>	269
<i>Player and Landing Page Creation</i>	269
<i>Platform Support</i>	270
<i>Distribution</i>	270
<b>Landing Page</b>	<b>271</b>
<b>Delivery to the Viewer</b>	<b>271</b>
<b>Conclusion</b>	<b>271</b>
<b>Chapter 11: Distributing Your Live Video</b>	<b>273</b>
<b>Choosing a Live Streaming Service Provider</b>	<b>274</b>
<i>Preliminary questions: SD or HD?</i>	275
<i>Single or Multiple Streams?</i>	276
<i>Eyeballs or Platform?</i>	276
<i>Does the Channel Page Support My Monetization Strategy?</i>	277
<i>Can I Protect my Content and Brand?</i>	279
<i>How Extensive are Social Media Links?</i>	279
<i>How Flexible are My Embedding Options?</i>	280
<i>Where does the Video Play?</i>	281
<i>Are Ancillary Services Available?</i>	282
<i>What's it all Going to Cost Me?</i>	283
<i>Try It—You'll Like It</i>	285
<b>A Live Event Walkthrough</b>	<b>285</b>
<b>Rich Media Communications</b>	<b>290</b>
<b>Choosing a Rich Media Presentation System</b>	<b>291</b>
<i>Where Does the System Live?</i>	292
<i>Internal or External Focus?</i>	292
<i>How Integrated is the System?</i>	292
<i>What's the Cost?</i>	293
<i>What are the Video Specs?</i>	293
<i>What Content Does the System Work With?</i>	293
<i>Which Player Technology and Where Does It Play?</i>	295
<i>Can the System Help Me Get Attendees?</i>	295
<i>Does the Reporting Meet Your Needs?</i>	295
<b>MediaPlatform WebCaster—Review and Webinar</b>	<b>297</b>
<i>Getting Started</i>	298
<i>System Overview</i>	300
<i>Getting Registrants</i>	301
<i>Team Building</i>	302
<i>Staging the Event</i>	303
<i>The Software Side of Things</i>	304
<i>Synchronizing and Archiving</i>	307
<i>Analytics</i>	309
<i>What's it Gonna Cost You?</i>	310

<b>Conclusion</b>	<b>311</b>
<b>Chapter 12: Choosing and Using a Live Encoder</b>	<b>313</b>
<b>The Key Functions of the Live Encoder</b>	<b>314</b>
<i>Connecting to Your Camera or Mixing Gear</i>	314
<i>Connecting to Your Streaming Server</i>	315
<i>Configuring Your Encoding Parameters</i>	317
<b>Before You Go Shopping</b>	<b>318</b>
<i>Transmux? Transcode?</i>	320
<b>Choosing a Software Encoder</b>	<b>322</b>
<i>Why not the LSSP Software?</i>	323
<i>Solo Encoder or Production Station?</i>	325
<i>What's Wrong with FMLE (and Free?)</i>	326
<i>KulaByte—High Volume Producers</i>	326
<i>Expression Encoder for Silverlight Producers</i>	327
<b>Capture Hardware for Your Software</b>	<b>327</b>
<i>Cards for Internal Installation</i>	327
<i>Leave Plenty of Time for Installation</i>	329
<b>External Capture Devices</b>	<b>330</b>
<i>FireWire (IEEE 1394) Capture Devices</i>	330
<i>USB 2.0 Capture Devices</i>	332
<i>USB 3.0 and Thunderbolt</i>	333
<i>Get a Lunch Pail Computer</i>	333
<b>Hardware Encoders</b>	<b>334</b>
<i>Portable Streaming Appliances</i>	334
<i>Driving a Portable Streaming Appliance</i>	335
<i>Choosing a Portable Streaming Appliance</i>	338
<b>Choosing a Rack-Mounted Live Encoder</b>	<b>339</b>
<b>On-Camera Encoders</b>	<b>340</b>
<i>How They Work</i>	340
<i>Choosing an On-Camera Encoder</i>	342
<b>Mixers with Encoders</b>	<b>344</b>
<b>Live Transcoding in the Cloud</b>	<b>344</b>
<b>Conclusion</b>	<b>345</b>
<b>Chapter 13: Producing Live Events</b>	<b>347</b>
<b>He Who Fails to Plan Is Planning to Fail</b>	<b>348</b>
<b>Long-Term Planning</b>	<b>348</b>
<i>Defining Your Streams</i>	349
<i>How Much Outbound Bandwidth?</i>	349
<i>Choosing Your Streaming Service Provider</i>	350
<i>Marketing: Getting Viewers</i>	351
<b>Production Planning</b>	<b>351</b>



<b>Background and Clothing</b>	<b>352</b>
<i>Don't use Overhead Lights for Small Webcasts</i>	356
<i>Don't Mix Lights with Different Temperatures</i>	357
<i>Use Flat Lighting for Live Events</i>	358
<b>Camera-Related Options</b>	<b>360</b>
<i>Progressive or Interlaced?</i>	362
<i>White Balance</i>	363
<i>Configuring Exposure</i>	363
<i>Configuring Focus</i>	363
<b>Taking Care of Audio</b>	<b>364</b>
<b>Audio Primer</b>	<b>364</b>
<i>Pickup Pattern</i>	365
<i>Condenser and Dynamic Microphones</i>	365
<i>Wired or Wireless</i>	366
<i>Microphone Connection</i>	367
<i>Choosing the Right Microphone</i>	367
<i>Other Webcast Options</i>	370
<b>Getting Audio Connected</b>	<b>371</b>
<i>Connecting a Microphone—XLR</i>	371
<b>XLR Input Into a 1/8-inch Microphone Port</b>	<b>375</b>
<b>Connecting to Sound Systems</b>	<b>375</b>
<b>Audio Outputs</b>	<b>377</b>
<b>Monitoring Audio During the Shoot</b>	<b>378</b>
<i>How Loud is Loud Enough?</i>	379
<i>Synthesis</i>	382
<i>At the Shoot—Framing Your Subjects</i>	383
<i>Framing a Panel</i>	383
<i>Basic Rule of Thirds</i>	384
<i>Managing the Speaker Transition</i>	386
<i>Tough Shots at the Table</i>	386
<b>Conclusion</b>	<b>388</b>
<b>Chapter 14: Introduction to Closed Captions</b>	<b>389</b>
<b>What Are Closed Captions?</b>	<b>389</b>
<b>Who Has to Provide Closed Captions?</b>	<b>390</b>
<i>Section 508 of the Rehabilitation Act</i>	390
<i>Twenty-First Century Communications and Video Accessibility Act of 2010</i>	390
<i>Other Closed Captioning Provisions</i>	391
<b>Voluntary Captioners</b>	<b>392</b>
<b>Creating Closed Captions for Streaming Video</b>	<b>393</b>
<i>Captioning Your Live Event</i>	393
<i>Captioning On-Demand Files</i>	394
<i>Captioning Your Streaming Video</i>	396

<i>Trans-Platform Captioning</i>	397
<b>Conclusion</b>	<b>398</b>
<b>Chapter 15: Essential Tools</b>	<b>399</b>
<b>MediaInfo</b>	<b>399</b>
<b>Bitrate Viewer</b>	<b>401</b>
<b>FLV Player</b>	<b>403</b>
<b>QuickTime Player 7</b>	<b>403</b>
<b>MPEG Streamclip</b>	<b>404</b>
<b>Conclusion</b>	<b>405</b>
<b>Chapter 16: Introduction to HEVC</b>	<b>407</b>
<i>Technology Background</i>	407
<i>How It Works</i>	408
<i>The Results Please</i>	409
<i>Where will it Play?</i>	410
<i>Royalties will Apply</i>	412
<i>Competition In Sight?</i>	412
<i>Going Forward</i>	413
<i>Conclusion</i>	413