CHOC	DSING AN x264 PRESET
	ax/min/avg: 0/0/0 buffer size: 0 vbv_delay: -1 : Audio: aac (LC) (mp4a / 0x6134706D), 48000 Hz. :

The x264 preset controls the quality and throughput for your encodings. Here's a quick analysis to determine if you're using the optimal preset.

This presentation is adopted from my upcoming Streaming Media West preconference session, Introduction to ABR Technologies (bit.ly/SMW_2019). It's an example of the topics covered in this and other sessions.

By Jan Ozer, janozer@gmail.com

1000

Overview

All codecs and encoding tools have a configuration option that controls the quality/encoding time tradeoff. With x264 (and x265) the preset controls that tradeoff.

When choosing a preset you should consider 3 criteria:

- Overall quality the overall quality produced by that preset
- Low frame quality the quality of the lowest frame produced by that preset, which indicates the potential for transient quality issues
- Encoding time this determines the throughput and cost of your encodings

The following analysis was compiled from eight test clips representing a range of content types, including:

- Big Buck Bunny simple animation
- Sintel more complex animation
- Talking head simple video clip
- Tears of Steel mixed real world and CG
- Freedom a music video
- Haunted a high motion promo for a haunted house
- Tutorial mixed PowerPoint and small talking head
- Screencam a Camtasia-based explainer

I encoded all clips using FFmpeg on an HP Z840 workstation

Average Results

											Total
Average Quality	Ultrafast	Superfast	Veryfast	Faster	Fast	Medium	Slow	Slower	Veryslow	Placebo	Delta
Tears of Steel	89.20	92.00	93.29	95.45	95.59	96.22	96.43	96.56	96.67	96.65	8.38%
Sintel	88.29	92.66	93.85	95.84	95.99	96.38	96.56	96.68	96.83	96.75	9.68%
Big Buck Bunny	87.26	91.26	92.68	95. <mark>0</mark> 3	95.29	95.53	95.75	95.87	96.05	96.01	10.08%
Talking Head	95.19	92.55	93.66	94.90	94.86	95.1 <mark>8</mark>	95.29	95.43	95.51	95.39	3.20%
Freedom	91.95	91.15	92.63	94.58	94.51	95.37	95.59	95.84	96.15	96.04	5.48%
Haunted	91.30	88.61	89.43	91.30	91.08	91.98	92.08	92.35	92.49	92.45	4.38%
Screencam	90.92	92.56	93 <mark>.</mark> 52	94.75	94.75	94.70	94.77	94.86	94.92	94.91	4.41%
Tutorial	93.42	94.66	95.55	96.16	96.17	96.17	96.26	96.28	96.29	96.10	3.07%
Average	90.53	91.37	92.59	94.52	94.56	95.11	95.28	95.46	95.62	95.55	6.08%

These are the average VMAF scores. Red backgrounds indicate the worst scores while green indicate the best.

As you would expect, the fastest presets produce the worst quality while the higher quality presets produce the best quality. It is somewhat surprising that the Placebo preset *never* produces the best quality.

It's also surprising that the total average difference between the highest and lowest quality files is only about 6% (total delta on the right). Since the difference is about 5 VMAF points, though, many viewers likely would notice the difference (6 VMAF points equals a just noticeable difference).

Low Frame Results

	Illtrafact	Superfact	Vorufact	Fastar	Fact	Madium	Clow	Clawor	Verseleur	Dissoho	Total
Low Frame Quality	Ultrafast	Superiast	veryfast	Faster	Fast	Mealum	510W	Slower	veryslow	Placebo	Deita
Tears of Steel	70.16	74.82	77.67	84.51	85.02	85.34	85.44	86.38	85.33	85.10	23.12%
Sintel	68.77	69.79	74.93	79.12	80.41	82.27	81.90	82.98	84.89	82.61	23.45%
Big Buck Bunny	55.42	65.11	62.50	79.33	79.57	82.70	79.18	83.22	80.24	79.08	50.15%
Talking Head	88.90	61.43	88.53	91.62	91.32	92.11	92.03	92.49	92.16	91.37	50.56%
Freedom	76.49	82.79	83.96	87.59	87.29	88.72	89.00	89.35	90.28	90.05	18.03%
Haunted	60.36	57.18	62.69	64.62	61.63	67.33	67.74	68.64	72.08	72.28	26.42%
Screencam	56.16	68.53	71.00	76.39	77.44	77.06	78.04	79.26	78.04	75.21	41.12%
Tutorial	85.68	90.99	91.95	94.11	94.24	94.68	94.50	94.21	94.02	70.58	34.15%
Average	70.02	68.52	75.05	81.13	80.88	83.08	82.55	83.84	84.16	83.41	33.37%

These are the low-frame VMAF scores which indicate the likelihood of transient issues. Again, red backgrounds indicate the worst scores while green indicate the best.

Again, the lowest quality presets produce the worst low frame results. However, here the difference between the lowest and highest scores are about 33%

Clearly, you want to look at both average quality and low frame quality when choosing a preset. The slide on the following page shows why.

Check Results Plot – Ultrafast (red) vs Medium

This is a plot of VMAF values over the duration of both clips, with the red plot representing the ultrafast preset and green the medium preset. This is a very aggressive encode of the test clip Zoolander shown in the Moscow State University Video Quality Measurement Tool.

The circled downward spikes represent short, very low-quality regions in the ultrafast clip that most viewers would notice. So, again, it's not just the average VMAF score that matters, it's the low-frame score.



Average and Low Frame Quality



This graph shows average quality (in blue) and low-frame quality (red) for all presets. Several points jump out.

First, for VOD encoding (as opposed to live), faster is likely the lowest-quality preset that you should deploy. Lower quality presets drop quickly in average and lowframe quality. Second, it makes little sense to encode using a preset higher than medium. At most, you improve quality by about .5 VMAF points, which is unperceivable. As you'll see on the next slide, this comes at a significant cost in encoding speed/throughput.

Quality and Encoding Time



This graph adds the time component (yellow) and represents all data points on a scale from 0 - 100% (as opposed to VMAF scores as shown previously). Some points.

Those seeking to increase capacity should consider changing from medium to faster, which doesn't affect average quality, delivers slightly higher low-frame quality and improves throughput by 43%. If you're using the slow, slower, or very slow presets, you're reducing capacity by 47%, 70%, and 133% respectively to produce imperceptible quality differences.

Finally, if you're using the Placebo preset, even for academic testing, you're tripling encoding time over veryslow for a slight drop in quality, which makes no sense irrespective of your application.

Bottom Line

If you're using the x264 codec, we hope you found the preceding useful.

If you're considering coming to Streaming Media West (bit.ly/SMW_2019), you'll learn this and a whole lot more in the Introduction to ABR Technologies pre-conference workshop.

You should run your own tests on your own test footage before changing your configuration. If you're interested in learning how to produce an analysis like this for your own codec or encoder, check out the course show on the right. You'll find this data invaluable when making the critical quality/encoding time tradeoff for your unique practice.



http://bit.ly/SLC_VM