HEVC Optimization Checklist

HEVC (X265) tuning checklist for adaptive streaming using x265 or hardware encoders

Per-Title Encoding

- Top ROI adjustment—essential for efficiency
- Reduces average ladder bitrates without hurting visual quality

GOP Structure

Overall - HEVC	.5 sec	1 sec	2 sec	3 sec	4 sec	5 sec	10 sec	20 sec
All Animation	92.79	94.46	95.24	95.48	95.56	95.61	95.75	95.81
All Entertainment	92.15	93.30	93.85	94.03	94.12	94.15	94.28	94.33
All Sports	93.46	95.41	96.36	96.61	96.80	96.88	97.06	97.12
All Office	87.34	93.43	95.39	95.85	96.03	96.10	96.23	96.32
Overall	**91.44**	**94.04**	**95.06**	**95.34**	**95.46**	**95.52**	**95.66**	**95.73**
Delta from Max	**4.29**	**1.68**	**0.66**	**0.39**	**0.26**	**0.21**	**0.06**	**0.00**

Table 1: Quality improves with longer GOPs, though it's diminishing returns after 5 seconds.

- Use 8–10 second GOPs if segment duration allows
- Enable scene-change aware GOP logic (`--scenecut` in x265)
- Use closed GOPs for compatibility unless targeting high-end platforms only

Rate Control

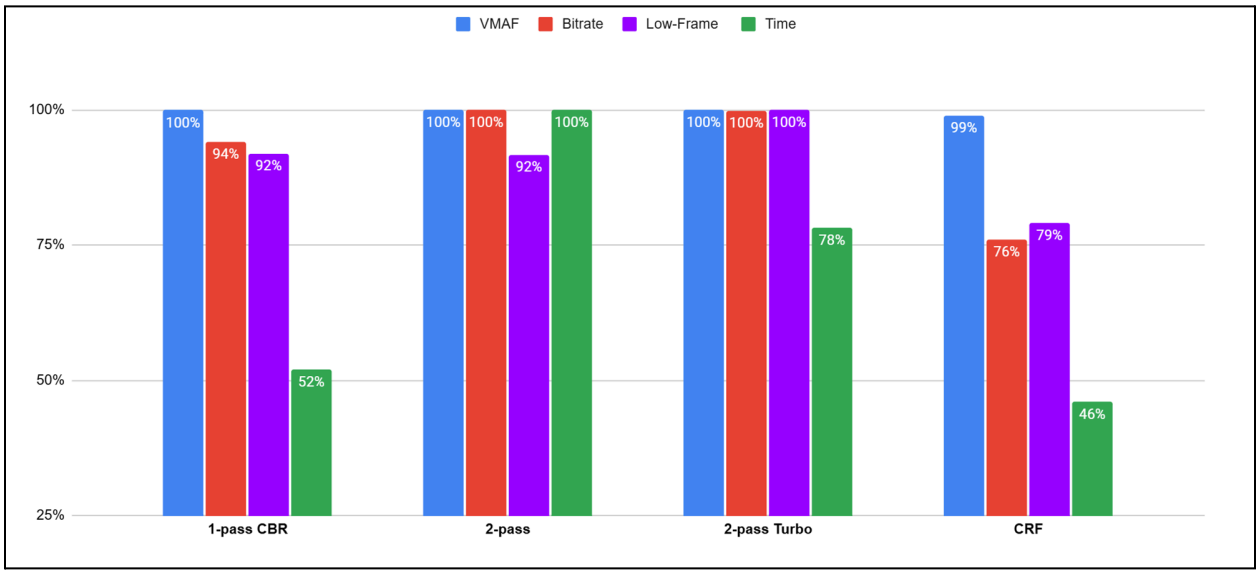

Figure 1. The chart shows 25 - 100%. Single-pass techniques deliver substantial time savings but impact low-frame quality. Two-pass turbo appears best for VOD.

- For VOD: 2-pass VBR with VBV constraints
- For flexible workflows: capped CRF (e.g., CRF 28–32 with VBV caps)
- For live: use CBR with tight buffer tuning

Presets

Preset	Bitrate	Encoding time
Ultrafast	175%	1%
Superfast	143%	1%
Veryfast	169%	2%
faster	152%	2%
Fast	145%	3%
Medium	137%	4%
Slow	104%	8%
Slower	100%	30%
Veryslow	100%	49%
Placebo	100%	100%

Table 2: Presets trade encoding time for bitrate. Be sure to factor both into the preset selection decision.

- HEVC encoding time scales up quickly—test your breakeven points
- Use slow or slower for bandwidth efficiency
  Ultrafast/fast only when encoding cost is the gating factor

Threading

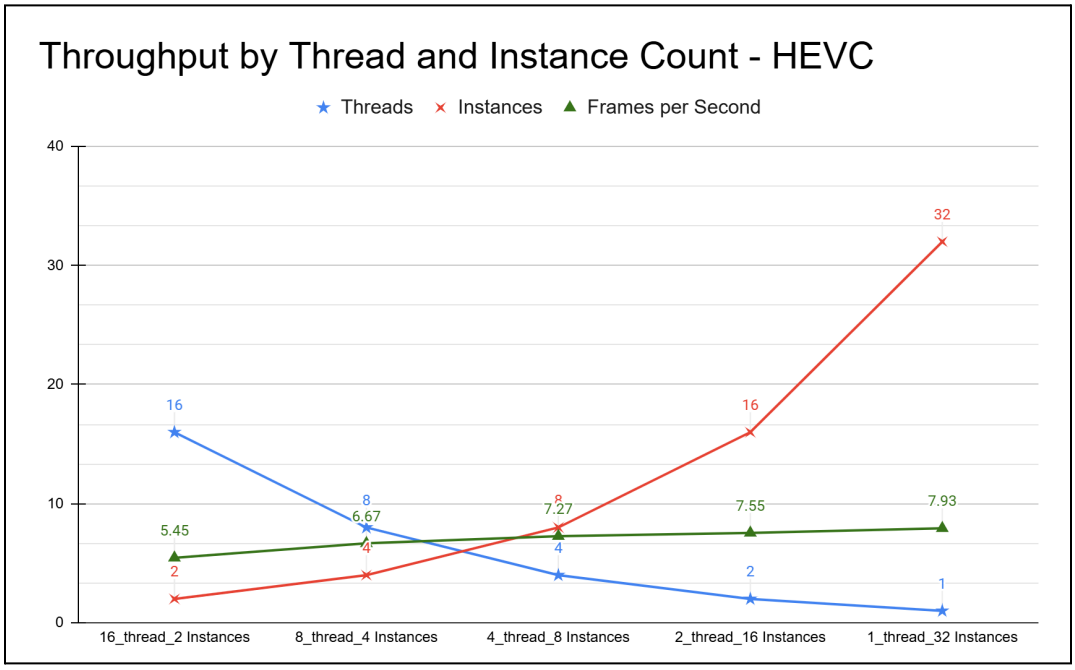

Figure 2. Single thread delivers the highest quality (see handout) and highest throughput when encoding with multiple instances.

- Match thread count to physical cores for consistency
- For max quality: 1 thread per encode
- For live workflows: test preset+thread tradeoffs under load

Wavefront Parallel Processing (WPP)

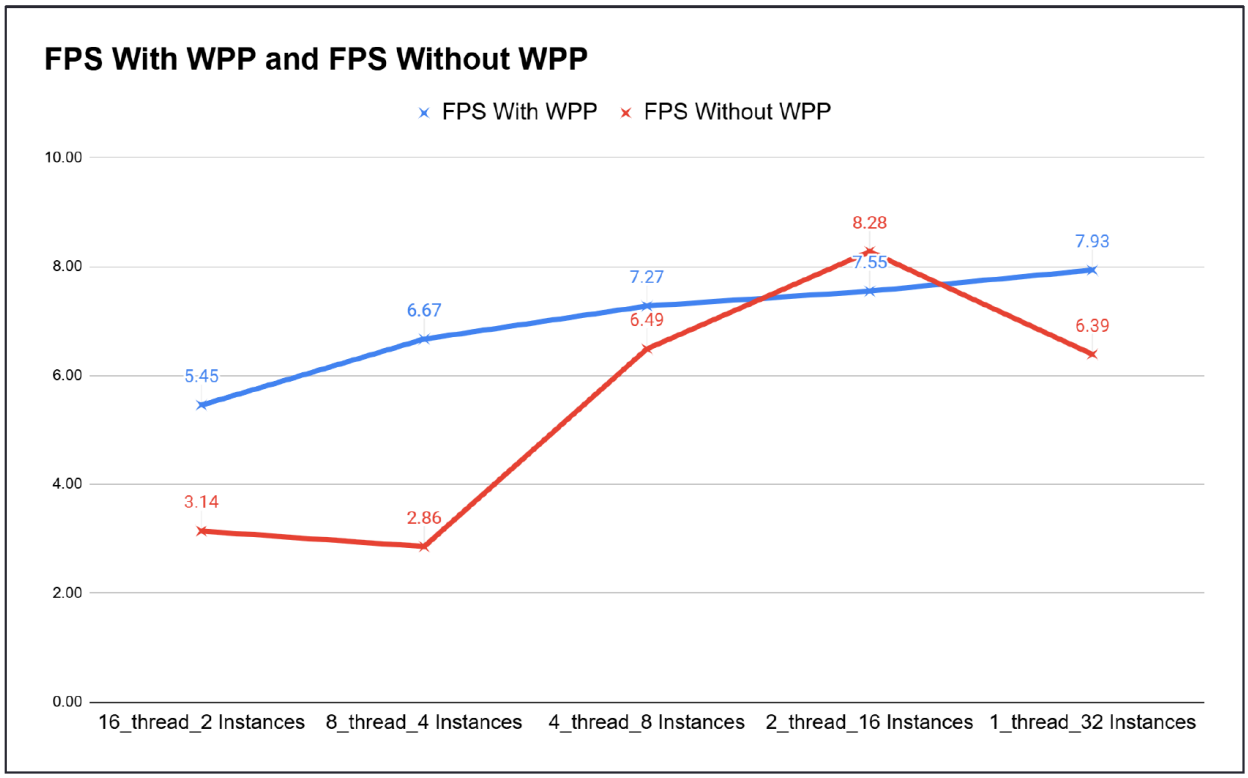

Figure 3. Disabling WPP delivers faster encoding when producing multiple instances on a high-core-count computer.

- Enabling significantly boosts single-file encoding, at a slight quality cost
- If encoding multiple instances on large-core count computer, disabling will deliver slightly higher quality and throughput.

Scaling and Filters

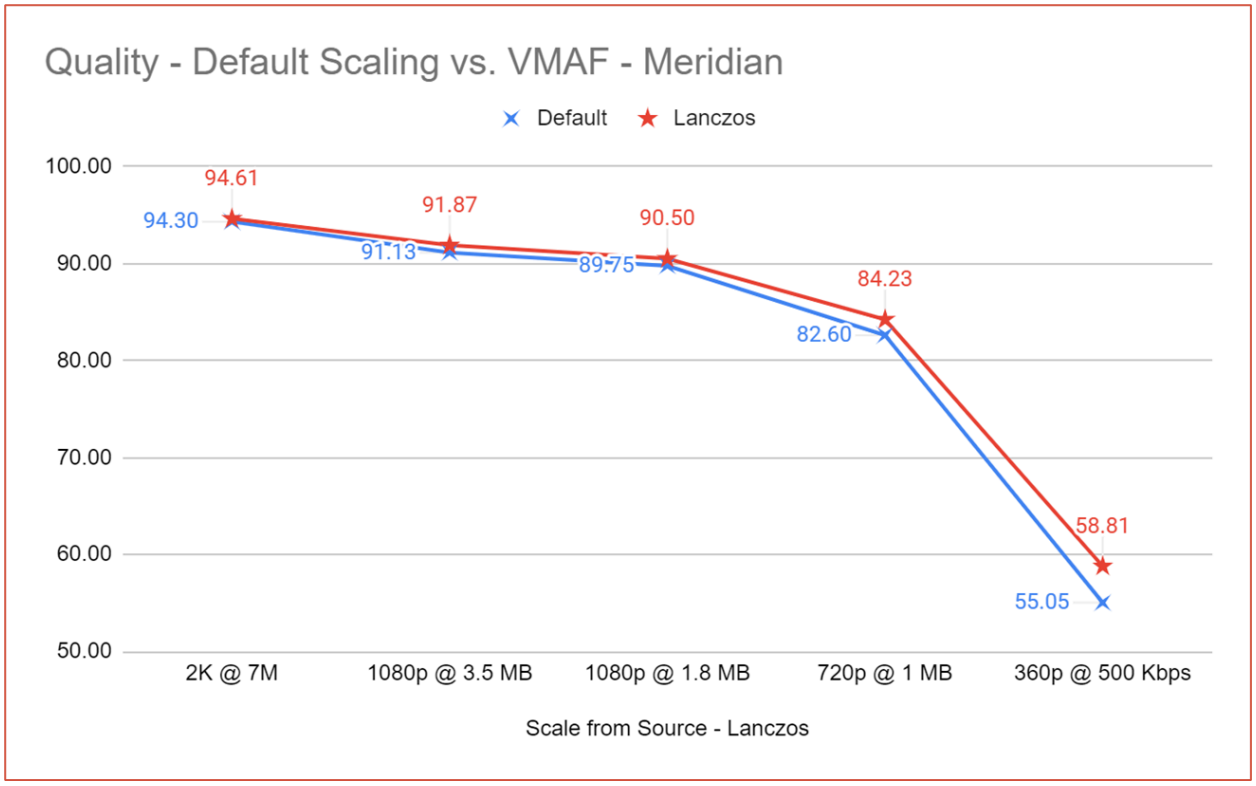

Figure 4. Lanczos delivers better quality in the lower rungs at no cost.

- Same rule: replace bilinear with Lanczos
  `-vf scale=640x360 -sws_flags lanczos`
- Especially important in constrained bitrate environments

Deployment Cautions

- Confirm hardware decode support on key platforms (especially Android)
- Revisit royalty obligations; pools are active and broadening coverage
- Validate decoder behavior across firmware versions and apps

Ready to Optimize Your Encoding Workflow?

I consult to help teams improve their H.264 and HEVC encoding configurations. This can range from a quick review of existing settings to a more in-depth, testing-based optimization.

Not sure what kind of help you need? Start with a free 30-minute discovery call to review your current approach and identify the most valuable areas to tune.

Send a note to **jan.ozer@streaminglearningcenter.com** to get started.