Rate-control mode picker — cheat sheet

CBR, VBR, CRF, ABR, capped CRF — one page. Companion to article 4.13 of Block 4. Print on A4.

1. The five modes at a glance

Mode	Holds fixed	Lets vary	Use when
CBR	bitrate	quality	live ingest, conferencing, narrow pipe
VBR (2-pass)	average bitrate	instantaneous bitrate	VOD where target avg matters most
CRF	perceptual quality	bitrate	archival, mastering, no bandwidth cap
ABR (rate-control)	running avg bitrate	instantaneous bitrate	single-pass VOD when you skip 2-pass
Capped CRF	quality + ceiling	bitrate below ceiling	modern streaming, ABR rungs, default

2. FFmpeg recipes (one line each, x264/x265/AV1)

```
CBR x264 (live ingest): -c:v libx264 -preset veryfast -b:v 4M -maxrate 4M -minrate 4M -bufsize 4M -g 60
2-pass VBR x264 (VOD): -c:v libx264 -b:v 4M -pass 1/2 -an -f mp4 /dev/null   then  -pass 2 ... out.mp4
Plain CRF x264 (archive): -c:v libx264 -preset slow -crf 22
Capped CRF x264 (streaming): -c:v libx264 -preset medium -crf 22 -maxrate 5M -bufsize 10M
Capped CRF x265 (streaming): -c:v libx265 -preset medium -crf 26 -x265-params vbv-maxrate=5000:vbv-bufsize=10000
Capped CRF SVT-AV1 (streaming): -c:v libsvtav1 -preset 6 -crf 30 -maxrate 5M -bufsize 10M
```

3. VBV buffer sizing rules

Application	bufsize / maxrate ratio	Why
WebRTC / conferencing	0.25–0.5	any buffering shows as audio lag / echo
Live broadcast (Twitch / YouTube)	1.0	low latency, predictable ingest
VOD streaming (HLS / DASH)	2.0	comfortable headroom across scene boundaries
Broadcast contribution (DVB / ATSC)	4.0–8.0	high quality, encoder reorders aggressively
Archive / mastering	infinite (no -maxrate)	buffer is irrelevant; CRF dominates

4. Decision tree — which mode

- **Is it live?** yes → latency budget? under 500 ms → CBR + tiny VBV (WebRTC). 1–3 s → CBR @ ingest (Twitch / YouTube).
- **Is it VOD?** yes → ABR ladder? yes → Netflix scale? yes → per-shot capped CRF. no → per-title capped CRF.
- **Single VOD file (not ABR)?** yes → CRF (no cap). Archive grade → x264 CRF 18 / x265 CRF 22 / SVT-AV1 CRF 26.
- **Surveillance recorder?** yes → capped CRF with low cap, tuned to disk-day budget.

5. Common mistakes (and the fix)

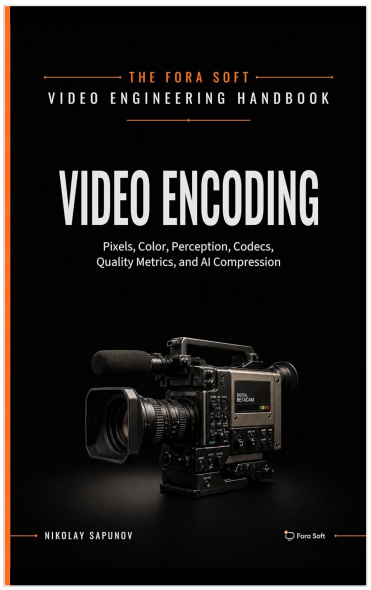
- **bufsize == maxrate** → use 2× for VOD, 1× for live; never less unless you have a latency reason.
- **CRF for an ABR rung with no cap** → use capped CRF with maxrate = rung nameplate.
- **Two-pass on a live stream** → impossible; use capped CRF or CBR for live.
- **Comparing presets at iso-CRF** → always compare at iso-bitrate or iso-VMAF.
- **Setting -b:v and -crf together** → they compete; -crf wins. Pick one or the other.

6. What the big players run (2026 snapshot)

- **Netflix** — per-shot capped CRF, VMAF-tuned, ~30% savings vs per-title (Dynamic Optimizer).
- **YouTube** — per-title capped CRF for VOD; CBR for live, 2-second keyframes.
- **Twitch** — CBR end-to-end, 2-second keyframes, no per-title.
- **Disney+ / Hulu / HBO** — per-title capped CRF on AWS Elemental / Bitmovin, x265 or AV1.
- **Zoom / Teams** — CBR over WebRTC, ~250–500 ms VBV, SVC layers on top.

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Companion to: 'Rate Control: CBR, VBR, CRF, ABR, Capped CRF'
www.forasoft.com/learn/video-encoding/articles/rate-control-cbr-vbr-crf



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This cheat sheet picks a rate-control mode, gives FFmpeg recipes, VBV sizing and the mistakes to avoid. Volume 1 covers the encoder side in depth: rate control and VBV, H.264, HEVC and AV1 encoder internals, per-title and per-shot encoding, and quality metrics such as VMAF.

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