Block Partition - Cheat Sheet

Macroblocks, CTUs, superblocks - one page for VOD, live, and WebRTC tuning

Companion to article 4.5 of Block 4. Print on A4 or US Letter.

Top-level block size by codec generation

Codec	Year	Top block	Smallest	Partition tree	Relative encoder cost
H.264 / AVC	2003	16x16 MB	4x4	tree-structured MC (nested 4-way)	1x baseline
H.265 / HEVC	2013	64x64 CTU	8x8	pure quadtree (depth 0-3)	5-10x
VP9	2013	64x64 SB	8x8	quadtree + horz/vert binary	4-8x
AV1	2018	128x128 SB	4x4	10-way recursive tree (T + 4-slab)	15-40x
VVC / H.266	2020	128x128 CTU	4x4	QT + MTT (binary + 1:2:1 ternary)	30-80x
AV2 (draft)	2025	up to 256x256	4x4	QT + extended MTT, learned modes	40-100x est.

AV1 ten-way partition (PARTITION_*)

NONE	keep whole, recursable	**HORZ**	2 horizontal halves, terminal
VERT	2 vertical halves, terminal	**SPLIT**	4 squares, the only recursable outcome
HORZ_A	T-shape, 2 small top, terminal	**HORZ_B**	T-shape, 2 small bottom, terminal
VERT_A	T-shape, 2 small left, terminal	**VERT_B**	T-shape, 2 small right, terminal
HORZ_4	4 thin horizontal slabs (4:1)	**VERT_4**	4 thin vertical slabs (1:4)

VVC multi-type tree (MTT) options

No split	the quadtree leaf is the final coding unit
Binary H/V	two equal halves (binary horizontal or vertical)
Ternary H/V (1:2:1)	three slabs in 25% / 50% / 25% ratio
Dual tree (intra slices)	separate partition trees for luma and chroma

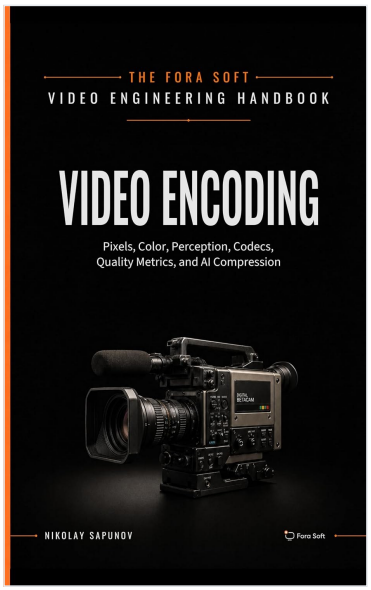
Preset recipes - VOD, live, WebRTC

Workload	x265 preset	libaom cpu-used	Max block size	Notes
Premium VOD	slower / placebo	0-2	default (64 / 128)	max quality, encode once
Standard VOD	medium	4	default	balanced
Live OTT	veryfast	6-8	default	real-time, 1080p60
WebRTC	ultrafast	8 (or RTC)	32x32 / 64x64	sub-100ms latency
Live 4K	fast (hardware)	n/a	default	use NVENC / VPU / ASIC

Legacy-config audit checklist

- [ ] Grep encode configs for '--ctu-size 16' or '--ctu-size 32' - both leave bits on the table on 1080p+.
- [ ] Confirm AV1 encoders use the default 128x128 superblock for 4K+ content (NETINT 2024: +4.8% bitrate vs 64x64).
- [ ] If 'tu-intra-depth' or 'tu-inter-depth' are pinned low for speed, validate with VMAF - may cost more than it saves.
- [ ] WebRTC SFUs: cap top block at 64x64 for predictable latency, not 32x32.
- [ ] Hardware encoder firmware: check the partition shape set is current; older NVENC silently limits to a HEVC subset.
- [ ] On 8K, allow 256x256 (AV2 draft) or fall back to AV1 128x128 - do not force smaller.

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This sheet compares block sizes and partition trees from H.264 to AV2 and gives preset recipes per workload. Volume 1 explains the compression underneath: pixels and color, block-based prediction, H.264, HEVC, AV1 and VVC encoder decisions, and the quality metrics that tell you whether a preset paid off.

WHAT YOU WILL FIND INSIDE

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