English version is derived from the x264 x265 Ultimate Tutorial by iAvoe/iiAvoe

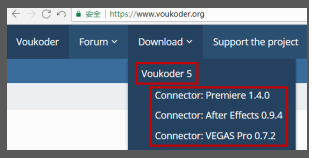
LigH	.hevc GCC10 [single .exe 8-10-12bit] w/ x86 w/ libx265.dll
Rigaya	.hevc GCC 9.3 [8-10-12bit] w/ x86
Patman	.hevc GCC 11+MSVC1925 [8-10-12bit]
ShortKatz	arm64~64e with x86 ? [?] macOS compiling needed
DJATOM-aMod	Intel, AMD zen1~2 [10bit], zen3 [10-12bit] GCC 10.2.1+GCC10.3
MeteorRain-yuuki	lsmash.mkv/mp4 或.hevc [lavf isn't as reliable as pipe acc. rumor] GCC 9.3+ICC 1900+MSVC 1916 [8][10][12bit]+[8-10-12bit]

ffmpeg all OS compatible. backup link: ottverse.com/ffmpeg-builds

mpv player a small sized opensource video player with no color issues afaik

x265GuiEx (Rigaya) 日本語, compiles by auto-setup, link for tutorial

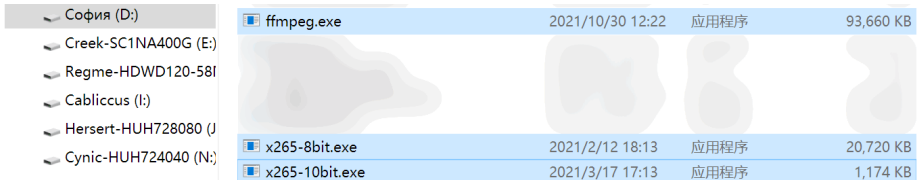
Voukoder; V-Connector free Premiere/Vegas/AE/Davinci Studio export plugin with ffmpeg's internal encoders, and good encoding presets to choose



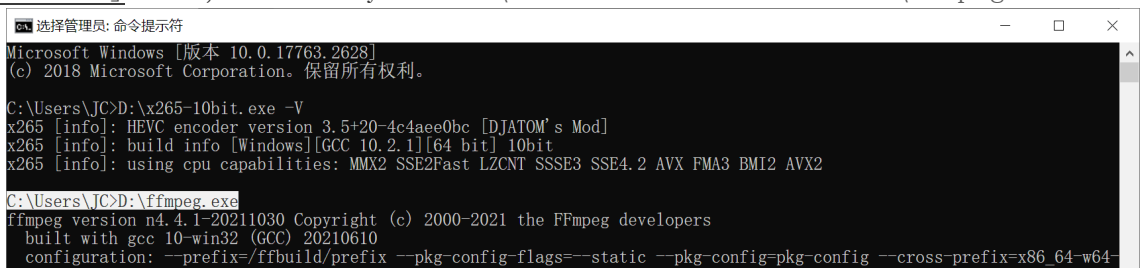
ffprobe metadata & media format reader in CLI from the same origin as ffmpeg (within the ffmpeg download zip file), see tutorial page (with webpage translate)

x265.exe command line for new users

[Download ffmpeg, ffprobe/MediaInfo & x265 to a memorable path] Here they are under D:\



[Open CMD/PowerShell or Linux/MacOS Bash/Terminal, input path\to\ffmpeg, ffprobe, x265, then press enter] i.e., here they are D:\x265-10bit.exe -V and D:\ffmpeg.exe



[Check ffmpeg build ver.] C:\folder\ffmpeg.exe; [x265 build ver.] C:\folder\x265.exe -V

[Auto-filling] Write PATH/filename partially, and hit [Tab]

Get source video metadata w/ ffprobe: `ffprobe.exe -i ".\video.mp4" -select_streams v:0 -v error -hide_banner -show_streams -show_frames -read_intervals "%+#1" -show_entries frame=top_field_first:stream=codec_long_name,width,coded_width,height,coded_height,pix_fmt,color_range,field_order,r_frame_rate,avg_frame_rate,nb_frames -of ini`

```
[frames.frame.0]
top_field_first=0          Check when source video is interlaced

[streams.stream.0]
codec_long_name=H.264      Source codec
width=1920
height=1080
coded_width=1920           if != width:  horizontal rect. pixel
coded_height=1088          if != height: vertical rect. pixel
pix_fmt=yuv420p            Colorspace
color_range=tv             Range (pc=full=0~255, tv-limited=16~235)
field_order=progressive    Field (progressive/interlaced/unknown)
r_frame_rate=24000/1001
avg_frame_rate=24000/1001 if != r_frame_rate: variable frame rate
nb_frames=20238            Total frame count
```

Variable framerate: Used on mobile devices to save battery, causing compatibility issues. Add ffmpeg option `-vsync cfr` to convert to cfr

Rectangular pixel: old & unsupported lossy compression. Swap src video if possible

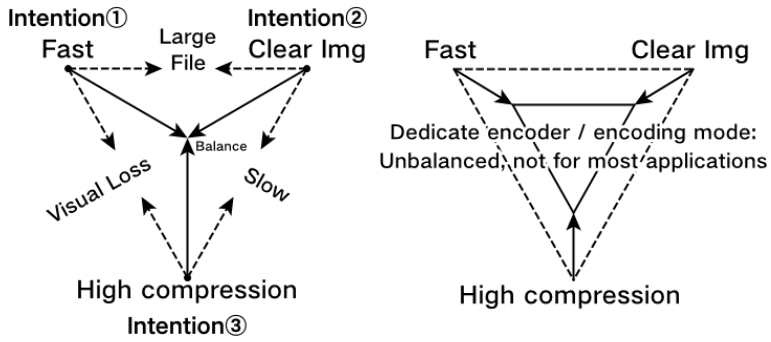
Encoding duration: number of frames÷encoding speed (fps)=required time(second)

ffmpeg-pipe-x265 example: `D:\ffmpeg.exe -i F:\video.mov -an -pix_fmt yuv420p10 -f yuv4mpegpipe -strict unofficial - | D:\x265-10bit.exe --preset slow --me umh --subme 5 --merange 48 --weightb --aq-mode 4 --bframes 5 --ref 3 --hash 2 --allow-non-conformance --qg-size 16 --rd 3 --limit-modes --limit-refs 1 --rskip 1 --splitrd-skip --no-sao --tskip --colorprim bt2020 --colormatrix bt2020nc --transfer smpte2084 --y4m - --output F:\done.hevc 2>D:\Desktop\ffmpeg_or_x265_error_logs.txt`

Get the correct -pix_fmt value: Get source video metadata with MediaInfo by dragging the file onto its program window (first-time use may require selecting [View]-[Tree]), find [Colorspace], [Color Sampling] & [Bit Depth]. (see ffprobe's method above). Usually they are [YUV], [4:2:0] & [8bit], which corresponds to yuv420p from the list below, x265 has a smaller set of supported formats than ffmpeg, they are: `yuv420p`, `yuv422p`, `yuv444p`, `yuv420p10le`, `yuv420p12le`, `yuv422p10le`, `yuv422p12le`, `yuv444p10le`, `yuv444p12le`, `yuv444p10le`, `yuv444p12le`, `gray`, `gray10le`, `gray12le`, `nv12`, `nv16`

Select bit depth for x264/5: One single x265.exe contain 8-10-12bit (Check with x265.exe -V) are set with option -D, such as -D 10 to encode in 10bit; or the downloaded zip contains separate x265-8bit.exe, x265-10bit.exe, simply call the corresponding executable

Triangle rule of encoding: The methodical way to develop encoding strategy & hardware choice. A dedicated solution delivers an unbalanced encoding result with heavy compromise, a general purposed solution in contrast provides a balanced solution that works for most applications. Faster hardware fits with general purposed, slower often fits dedicated solution



ffmpeg, VS, avs2yuv pipe

```
ffmpeg -i video_in.mp4 -an -f yuv4mpegpipe -strict unofficial - | x265 --y4m --input - --output

ffmpeg -i video_in.mp4 -an -f rawvideo - | x265.exe --input-res <WxH> --fps <int/flo/frac> --input - --output
```

-format, -an bypass audio, -strict unofficial lift std. restrictions, --y4m stands for "YUV for MPEG", both "-" passes stream through the pipeline

```
VSpipe.exe        [script].vpy --y4m - | x265.exe --y4m --input - --output

VSpipe/avs2yuv    [script].vpy - | x265.exe --input-res [WxH] --fps [] --input - --output

avs2yuv.exe       [script].avs -raw - | x265.exe --input-res [WxH] --fps [] --input - --output
```

ffmpeg built-in scaling: -sws_flags bicubic bitexact gauss neighbor bicublin lanczos spline +full_chroma_int +full_chroma_inp +accurate_rnd

Example: -sws_flags bitexact+full_chroma_int+full_chroma_inp+accurate_rnd)

ffmpeg multiplex all tracks (container format depends on output extension)

- `ffmpeg.exe -i ".\v_in.hevc" -an -c:v copy -i ".\audio_in.aac" -c:a copy -i ".\subtitle_in.srt" -c:s copy "mux_out.mkv"`
- `ffmpeg.exe -i ".\v_in.hevc" -an -c:v copy -i ".\audio1.aac" -c:a copy -i ".\aud2.aac" -c:a copy -i ".\sub1.ass" -c:s copy -i ".\sub2.ass" -c:s copy "mux_out.mkv"`

Subtitle support of different container formats: Wikipedia - Subtitle formats support

QAAC audio encoding tutorial or Github (use webpage translation)

ffmpeg replace audio track, itoffset±seconds to align:

- `ffmpeg.exe -i ".\mux_in.mov" -i ".\new_audio.aac" -c:v copy -map 0:v:0 -map 1:a:0 -c:a copy -itsoffset 0 ".\new_mux_out.mov"`

ffmpeg: small thread_queue_size warning:

- `-thread_queue_size<(avg src bitrate kbps+1000)/usable CPU core count>`

Batch: resume CMD prompt on finish: `cmd /k` **+ show windows build version:** `cmd -k`

x265 HDR settings:

HDR Tags --master-display <manually tagging for instruct video players or decoders to correctly play HDR sources

DCI-P3: G(13250,34500)B(7500,3000)R(34000,16000)WP(15635,16450)L(maxCLL×10000,1)

bt709: G(15000,30000)B(7500,3000)R(32000,16500)WP(15635,16450)L(maxCLL×10000,1)

bt2020: G(8500,39850)B(6550,2300)R(35400,14600)WP(15635,16450)L(maxCLL×10000,1)

- Check HDR source's metadata for color space，then copy the corresponding settings above as param value
- max for L has no standards，which means every video could be different, check your source stream

DCI-P3: G(x0.265, y0.690), B(x0.150, y0.060), R(x0.680, y0.320), WP(x0.3127, y0.329)

bt709: G(x0.30, y0.60), B(x0.150, y0.060), R(x0.640, y0.330), WP(x0.3127,y0.329)

bt2020: G(x0.170, y0.797), B(x0.131, y0.046), R(x0.708, y0.292), WP(x0.3127,y0.329)>

--max-cll <maxCLL,maxFALL>max, average pel intensity. Skip if MediaInfo doesn't get those values out

Color Primaries --colormatrix <as src, e.g.: gbr bt709 fcc bt470bg smpte170m YCgCo bt2020nc bt2020c smpte2084 ictcp>

--transfer <as source, e.g.: gbr bt709 fcc bt470bg smpte170m YCgCo bt2020nc bt2020c smpte2084 ictcp>

Dolby vision: DV-MEL (BL+RPU) & DV-FEL (BL+EL+RPU), x265 support 3 profiles of DV-MEL

Profile	Codec	BL:EL resolution	x265 supported	Gamma	Space
4	10bit hevc	1:1/4		SDR	YCbCr
5		BL only (DV-MEL)	✓		ICtCp
7		4K=1:1/4; 1920x1080=1:1		UHD BluRay	YCbCr
8.1		BL only (DV-MEL)	✓	HDR10	
8.2			✓	SDR	
8.4				HLG	
9	8bit avc	BL only (DV-MEL)		SDR	YCbCr

--dolby-vision-profile<select 5/8.1 (HDR10)/8.2>8.1 needs --master-display & --hdr10-opt

--dolby-vision-rpu<path>specify path to input RPU binary (.bin)

Target bit-depth

ffmpeg has yuv-for-mpeg pipe and raw pipe to send video frames to downstream x265 for encoding. The problem is that the raw pipe does not send video frame metadata, and not all x265.exe may read it, causing the loss of bit-depth information, and potentially miss the quality target this tutorial could offer.

For libx265, since output depth is a CLI-ONLY parameter, and ffmpeg is controlling this library,

simply setting the -pix-fmt option would do.

The process obtaining pixel bit depth is the same as pix-fmt. See procedures written above: Get the correct -pix_fmt value.

x265 pipe input parameter change

x265 v4.0 has introduced Multiview Encoding (multiple video streams from different angles), therefore it changed the pipe specifier from (old way since x264) "-" to "--input -". We are no longer skipping the --input option specifier now.

Note: Encoding speed reference content is temporarily removed due to change in settings

Gen-Purpose·Simple Minimal configurable options for simplicity

splt-trans	--preset slow
me-mc	--me umh --subme 5 --merange 48 --weightb
adpt quant	--aq-mode 4
rate control	--bframes 5 --ref 3
io	--hash 2 --allow-non-conformance
bit depth	-D 8/10/12 <Manual specifying required for x265.exe supporting multiple bit depths, default 8, do not cover low-to-high depth, covert high-to-low with --dither>
multi node	--pools ,,,, (e.g.: "-,+"states a 2-node computer & use node 2, don't use >1 node per encode)
others	crop: --display-window < integer "←, ↑ ,→, ↓ " pixels >, ⩾22 core cpu opt.: --pme, interlaced: --field, pixel depth reduction quality+: --dither, begin; ending frame: --seek; --frames, crf/abr resist noise factor: --rc-grain
color space	ffmpeg -pix_fmt yuv420p / yuv422p / yuv444p / yuv420p10 / yuv422p10 / yuv444p10...

α——(ffmpeg pipe) x265 CLI parameters

- ffmpeg.exe -loglevel 16 -hwaccel auto -y -hide_banner -i ".\导入.mp4" -an -f yuv4mpegpipe -strict unofficial -pix_fmt ◯ - | x265.exe -D ◯ --preset slow --me umh --subme 5 --merange 48 --weightb --aq-mode 4 --bframes 5 --ref 3 --hash 2 --allow-non-conformance --y4m --input - --output ".\v_out.hevc"

β——libx265 CLI, copy audio & multiplex to MP4

- ffmpeg.exe -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -c:v libx265 -pix_fmt ◯ -

x265−params "preset=slow:me=umh:subme=5:merange=48:weightb=1:bframes=5:ref=3:hash=2:allow−non−conformance=1" −fps_mode passthrough −c:a copy ".\v_out.mp4"

γ——Libkvazaar CLI (in dev, crf mode missing)

- ffmpeg.exe −loglevel 16 −hwaccel auto −y −hide_banner −i ".\v_in.mp4" −c:v libkvazaar −pix_fmt ◯ −kvazaar−params "limit−tu=1:tr−depth−intra=2:pu−depth−intra=4:pu−depth−inter=3:smp=1:amp=1:bipred=1:me=tz:subme=4:merange=48:me−early−termination=off:max−merge=2:ref=3:open−gop=0:period=360:gop=16:transform−skip=1:qp=16:fast−residual−cost=1:early−skip=1:max−merge=5:rd=3:mv−rdo=1:rdoq−skip=1:intra−rdo−et=1:sao=edge:hash=checksum" −fps_mode passthrough −c:a copy ".\v_out.mp4"

Standard.

Lots of custom options for optimizations

splt-trans --tu-intra-depth 3 --tu-inter-depth 3 --limit-tu 1 --rdpenalty 1 --rect

me-mc --me umh --subme <24fps=3, 48fps=4, 60fps=5, 100fps=6> --merange <1920:1080=48, 2560:1440=52, 3840:2160=56> --weightb

ref-rateol --ref 3 --max-merge <2fast, 3, 4slow> --early-skip --no-open-gop --min-keyint 5 --keyint <9×fps> --fades --bframes 8 --b-adapt 2 --radl 3 <sharp source: --pbratio 1.2>

intra coding <fast: --fast-intra / slow: --b-intra / very slow & may cause artifacts: --constrained-intra>

quantization --crf <18~20 HQ 19 ~22 HD> --crqpoffs -3 --cbqpoffs -1

rdoq --rdoq-level <1fast，2slow>

adapt quant <anime source: --hevc-aq, remove aq-mode> --aq-mode 4 --aq-strength <flat=0.8, edgy=1>

md decision --rd 3 --limit-modes --limit-refs 1 --rskip <2fast, 1mid, 0slow> --rc-lookahead <3×fps, greater than bframes> --tskip-fast --rect <veryslow: --amp>

rdo --psy-rd <film=1.6， anime=0.6, +0.6 if ctu=64, -0.6 if ctu=16> --splitrd-skip <EXP: --qp-adaptation-range 3>

deblock-sao --limit-sao --sao-non-deblock --deblock 0:-1

input output --hash 2 --allow-non-conformance <NAS streaming: --idr-recovery-sei>

bit depth -D 8/10/12 <Manual specifying required for x265.exe supporting multiple bit depths, default 8, do not cover low-to-high depth, covert high-to-low with --dither>

multi node --pools ,,,, (e.g.: "-,+"states a 2-node computer & use node 2, don't use >1 node per encode)

others ffmpeg -pix_fmt yuv420p / yuv422p / yuv444p / yuv420p10 / yuv422p10 / yuv444p10…

α——(ffmpeg pipe) x265 CLI parameters

- ffmpeg.exe -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -an -f yuv4mpegpipe -strict unofficial -pix_fmt ◯ - | x265.exe -D ◯ --ctu ◯ --min-cu-size 16 --tu-intra-depth 3 --tu-inter-depth 3 --limit-tu 1 --rdpenalty 1 --me umh --subme ◯ --merange ◯ --weightb --ref 3 --max-merge ◯ --early-skip --no-open-gop --min-keyint 5 --fades --bframes 8 --b-adapt 2 --radl 3 --pbratio 1.2 --fast-intra --b-intra --crf ◯ --crqpoffs -3 --cbqpoffs -1 --rdoq-level ◯ --aq-mode 4 --aq-strength ◯ --rd 3 --limit-modes --limit-refs 1 --rskip ◯ --rc-lookahead ◯ --tskip-fast --rect --amp --psy-rd ◯ --splitrd-skip --qp-adaptation-range 4 --limit-sao --sao-non-deblock --deblock 0:-1 --hash 2 --allow-non-conformance --y4m --input - --output ".\v_out.hevc"

β——libx265 CLI, copy audio & multiplex to MP4

- ffmpeg.exe -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -c:v libx265 -pix_fmt ◯ -x265-params "ctu=◯:min-cu-size=16:tu-intra-depth=3:tu-inter-depth=3:limit-tu=1:rdpenalty=1:me=umh:subme=◯:merange=◯:weightb=1:ref=3:max-merge=◯:early-skip=1:open-gop=0:min-keyint=5:fades=1:bframes=8:b-adapt=2:radl=3:pbratio=1.2:fast-intra=1:b-intra=1:crf=◯:crqpoffs=-3:cbqpoffs=-1:rdoq-level=◯:aq-mode=4:aq-strength=◯:rd=3:limit-modes=1:limit-refs=1:rskip=◯:rc-lookahead=◯:tskip-fast=1:rect=1:amp=1:psy-rd=◯:splitrd-skip=1:qp-adaptation-range=4:limit-sao=1:sao-non-deblock=1:deblock=0,-1:hash=2:allow-non-conformance=1" -fps_mode passthrough -c:a copy ".\v_out.mp4"

High Compression·Film

splt-trans --ctu 64 --tu-intra-depth 4 --tu-inter-depth 4 --limit-tu 1

me-mc --me star --subme <24fps=3, 48fps=4, 60fps=5, 100fps=6> --merange 56 --weightb

ref-rateol --ref 3 --max-merge 5 --no-open-gop --min-keyint 3 --keyint <9×fps> --fades --bframes 8 --b-adapt 2 --radl 3 --analyze-src-pics

intra coding --b-intra < very slow & may cause artifacts: --constrained-intra>

quantization --crf 21.8 --crqpoffs -3 --ipratio 1.2 --pbratio 1.5

rdoq --rdoq-level 2

adapt.quant --aq-mode 4 --aq-strength <clean source=0.8, film=1> --qg-size 8

md decision --rd 5 --limit-refs 0 --rskip 0 --rc-lookahead <1.8×fps, greater than bframes> --rect --amp

rdo --psy-rd <film=1.6, animation=0.6, +0.6 if ctu=64, -0.6 if ctu=16> <EXP: --qp-adaptation-range 3>

deblock --deblock 0:0

sao --limit-sao --sao-non-deblock --selective-sao 3

io --hash 2 --allow-non-conformance --nr-inter 8 <NAS streaming: --idr-recovery-sei>

bit depth -D 8/10/12 <Manual specifying required for x265.exe supporting multiple bit depths, default 8, do not cover low-to-high depth, covert high-to-low with --dither>

multi node --pools ,,,, (e.g.: "-,+"states a 2-node computer & use node 2, don't use >1 node per encode)

color space ffmpeg -pix_fmt yuv420p / yuv422p / yuv444p / yuv420p10 / yuv422p10 / yuv444p10…

α——(ffmpeg pipe) x265 CLI parameters

- ffmpeg.exe -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -an -f yuv4mpegpipe -strict unofficial -pix_fmt ◯ - | x265.exe -D ◯ --ctu 64 --tu-intra-depth 4 --tu-inter-depth 4 --limit-tu 1 --me star --subme ◯ --merange ◯ --weightb --ref 3 --max-merge 5 --no-open-gop --min-keyint 3 --keyint ◯ --fades --bframes 8 --b-adapt 2 --radl 3 --analyze-src-pics --b-intra --crf 21.8 --crqpoffs -3 --ipratio 1.2 --pbratio 1.5 --rdoq-level 2 --aq-mode 4 --aq-strength ◯ --qg-size 8 --rd 5 --limit-refs 0 --rskip 0 --rc-lookahead ◯ --rect --amp --psy-rd ◯ --qp-adaptation-range 3 --deblock 0:-1 --limit-sao --sao-non-deblock --selective-sao 3 --hash 2 --allow-non-conformance --y4m --input - --output ".\v_out.hevc"

β——libx265 CLI, copy audio & multiplex to MP4

- ffmpeg.exe -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -c:v libx265 -pix_fmt ◯ -x265-params "ctu=64:tu-intra-depth=4:tu-inter-depth=4:limit-tu=1:me=star:subme= ◯ :merange= ◯ :weightb=1:ref=3:max-merge=5:open-gop=0:min-keyint=3:keyint= ◯ :fades=1:bframes=8:b-adapt=2:radl=3:analyze-src-pics=1:b-intra=1:crf=21.8:crqpoffs=-3:ipratio=1.2:pbratio=1.5:rdoq-level=2:aq-mode=4:aq-strength= ◯ :qg-size=8:rd=5:limit-refs=0:rskip=0:rc-lookahead= ◯ :rect=1:amp=1:psy-rd= ◯ :qp-adaptation-range=3:deblock=0,-1:limit-sao=1:sao-non-deblock=1:selective-sao=3:hash=2:allow-non-conformance=1" -fps_mode passthrough -c:a copy ".\v_out.mp4"

Stock Footage·Render & Reuse

block/unit spitting--ctu 32

motion est.&cmp --me star --subme <24fps=3, 48fps=4, 60fps=5, 100fps=6> --merange <1920:1080=48, 2560:1440=52, 3840:2160=56> --analyze-src-pics

intraframe search --max-merge 5 --early-skip --b-intra

rate control --no-open-gop --min-keyint 1 --keyint <7×fps>--ref 3 --fades --bframes 7 --b-adapt 2

quantization --crf 17 --crqpoffs -3 --cbqpoffs -2

mode decision --rd 3 --limit-modes --limit-refs 1 --rskip 1 --rc-lookahead <4×fps, , greater than bframes>

R-D optimization --splitrd-skip

deblock --deblock -1:-1

input output --hash 2 --allow-non-conformance

tuning --tune grain

bit depth -D 8/10/12 <Manual specifying required for x265.exe supporting multiple bit depths, default 8, do not cover low-to-high depth, covert high-to-low with --dither>

color space ffmpeg -pix_fmt yuv420p / yuv422p / yuv444p / yuv420p10 / yuv422p10 / yuv444p10…

α——(ffmpeg pipe) x265 CLI parameters

- ffmpeg.exe -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -an -f yuv4mpegpipe -strict unofficial -pix_fmt ◯ - | x265.exe -D ◯ --ctu 32 --me star --subme ◯ --merange ◯ --analyze-src-pics --max-merge 5 --early-skip --b-intra --no-open-gop --min-keyint 1 --keyint ◯ --ref 3 --fades --bframes 7 --b-adapt 2 --crf 17 --crqpoffs -3 --cbqpoffs -2 --rd 3 --limit-modes --limit-refs 1 --rskip 1 --rc-lookahead ◯ --splitrd-skip --deblock -1:-1 --hash 2 --allow-non-conformance --tune grain --y4m --input - --output ".\v_out.hevc"

β——libx265 CLI, copy audio & multiplex to MP4

- ffmpeg.exe -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -c:v libx265 -pix_fmt ◯ -x265-params "ctu=32:me=star:subme=◯:merange=◯:analyze-src-pics=1:max-merge=5:early-skip=1:open-gop=0:min-keyint=1:keyint=◯:ref=3:fades=1:bframes=7:b-adapt=2:radl=3:b-intra=1:crf=17:crqpoffs =-3:cbqpoffs=-2:rd=3:limit-modes=1:limit-refs=1:rskip=1:rc-lookahead=◯:splitrd-skip=1:deblock=-1,-1:hash=2:allow-non-conformance=1:tune=grain" -fps_mode passthrough -c:a copy ".\v_out.mp4"

Anime·High Compression·Subtitle Groups

splt-trans --tu-intra-depth 4 --tu-inter-depth 4 --max-tu-size 16

me-mc --me umh --subme <24fps=3, 48fps=4, 60fps=5, 100fps=6> --merange <1920:1080=48, 2560:1440=52, 3840:2160=56> --weightb --max-merge 5 --early-skip

ref-rateol --ref 3 --no-open-gop --min-keyint 5 --keyint <12×fps> --fades --bframes 16 --b-adapt 2 --radl 3 --bframe-bias 20

intra coding --b-intra <very slow & may cause artifacts: --constrained-intra>

quantization --crf 22 --crqpoffs -4 --cbqpoffs -2 --ipratio 1.6 --pbratio 1.3 --cu-lossless --tskip

rdoq --psy-rdoq 2.3 --rdoq-level 2

aq --hevc-aq --aq-strength 0.9 --qg-size 8

md --rd 3 --limit-modes --limit-refs 1 --rskip 1 --rc-lookahead <2.5 × fps, greater than bframes> --rect --amp

rdo --psy-rd 1.5 --splitrd-skip --rdpenalty 2 <EXP: --qp-adaptation-range 4>

deblock -sao --deblock 0:-1 --limit-sao --sao-non-deblock

input output --hash 2 --allow-non-conformance --single-sei <NAS streaming: --idr-recovery-sei>

bit depth -D 8/10/12 <Manual specifying required for x265.exe supporting multiple bit depths, default 8, do not cover low-to-high depth, covert high-to-low with --dither>

multi nodes --pools ,,,, (e.g.: "-,+"states a 2-node computer & use node 2, don't use >1 node per encode)

color space ffmpeg -pix_fmt yuv420p / yuv422p / yuv444p / yuv420p10 / yuv422p10 / yuv444p10...

α——(ffmpeg pipe) x265 CLI parameters

- ffmpeg.exe -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -an -f yuv4mpegpipe -strict unofficial -pix_fmt ◯ - | x265.exe -D ◯ --tu-intra-depth 4 --tu-inter-depth 4 --max-tu-size 16 --me umh --subme ◯ --merange ◯ --weightb --max-merge 5 --early-skip --ref 3 --no-open-gop --min-keyint 5 --keyint ◯ --fades --bframes 16 --b-adapt 2 --radl 3 --bframe-bias 20 --b-intra --crf 22 --crqpoffs -4 --cbqpoffs -2 --ipratio 1.6 --pbratio 1.3 --cu-lossless --tskip --psy-rdoq 2.3 --rdoq-level 2 --hevc-aq --aq-strength 0.9 --qg-size 8 --rd 3 --limit-modes --limit-refs 1 --rskip 1 --rc-lookahead ◯ --rect --amp --psy-rd 1.5 --splitrd-skip --rdpenalty 2 --qp-adaptation-range 4 --deblock -1:0 --limit-sao --sao-non-deblock --hash 2 --allow-non-conformance --y4m --input - --output ".\v_out.hevc"

β——libx265 CLI, copy audio & multiplex to MP4

- ffmpeg.exe -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -c:v libx265 -pix_fmt ◯ -x265-params "tu-intra-depth=4:tu-inter-depth=4:max-tu-size=16:me=umh:subme=◯:merange=◯:weightb=1:max-merge=5:early-skip=1:ref=3:open-gop=0:min-keyint=5:keyint=◯:fades=1:bframes=16:b-adapt=2:radl=3:bframe-bias=20:b-intra=1:crf=22:crqpoffs=-4:cbqpoffs=-2:ipratio=1.6:pbratio=1.3:cu-lossless=1:tskip=1:psy-rdoq=2.3:rdoq-level=2:hevc-aq=1:aq-strength=0.9:qg-size=8:rd=3:limit-modes=1:limit-refs=1:rskip=1:rc-lookahead=◯:rect=1:amp=1:psy-rd=1.5:splitrd-skip=1:rdpenalty=2:qp-adaptation-range=4:deblock=-1,0:limit-sao=1:sao-non-deblock=1:hash=2:allow-non-conformance=1" -fps_mode passthrough -c:a copy ".\v_out.mp4"

Anime·HEDT+HQ Src Only

Slower, less efficient and larger files compared to Anime-Subtitle-Groups' case, keeping over sharing

splt-trans --tu-intra-depth 4 --tu-inter-depth 4 --max-tu-size 4 --limit-tu 1 --rect --amp

me-mc --me star --subme <24fps=3, 48fps=4, 60fps=5, 100fps=6> --merange <1920:1080=52, 2560:1440=56, 3840:2160=64> --analyze-src-pics --weightb --max-merge 5

ref-rateol --ref 3 --no-open-gop --min-keyint 1 --keyint <12×fps> --fades --bframes 16 --b-adapt 2 --radl 2

intra coding --b-intra

quantization --crf 17.1 --crqpoffs -5 --cbqpoffs -2 --ipratio 1.67 --pbratio 1.33 --cu-lossless

rdoq --psy-rdoq 2.5 --rdoq-level 2

aq <Normal: --hevc-aq --aq-strength 1.4; Jpsdr mod: --aq-auto 10 --aq-bias-strength 1.3 --aq-strength-edge 1.4 --aq-bias-strength 1.1>

md --qg-size 8

--rd 5 --limit-refs 0 --rskip 2 --rskip-edge-threshold 3 --rc-lookahead <2.5×fps, greater than bframes> --no-cutree

rdo --psy-rd 1.5 --rdpenalty 2 <EXP: --qp-adaptation-range 5>

deblock --deblock -2:-2

sao --limit-sao --sao-non-deblock --selective-sao 1

input output --hash 2 --allow-non-conformance --single-sei <NAS streaming: --idr-recovery-sei>

bit depth -D 8/10/12 <Manual specifying required for x265.exe supporting multiple bit depths, default 8, do not cover low-to-high depth, covert high-to-low with --dither>

α——(ffmpeg pipe) std. x265 CLI parameters

- ffmpeg.exe -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -an -f yuv4mpegpipe -strict unofficial -pix_fmt ◯ - | x265.exe -D ◯ --tu-intra-depth 4 --tu-inter-depth 4 --max-tu-size 4 --limit-tu 1 --rect --amp --me star --subme ◯ --merange ◯ --analyze-src-pics --weightb --max-merge 5 --ref 3 --no-open-gop --min-keyint 1 --keyint ◯ --fades --bframes 16 --b-adapt 2 --radl 2 --b-intra --crf 17.1 --crqpoffs -5 --cbqpoffs -2 --ipratio 1.67 --pbratio 1.33 --cu-lossless --psy-rdoq 2.5 --rdoq-level 2 --hevc-aq --aq-strength 1.4 --qg-size 8 --rd 5 --limit-refs 0 --rskip 2 --rskip-edge-threshold 3 --rc-lookahead ◯--no-cutree --psy-rd 1.5 --rdpenalty 2 --qp-adaptation-range 5 --deblock -2:-2 --limit-sao --sao-non-deblock --selective-sao 1 --hash 2 --allow-non-conformance --y4m --input - --output ".\v_out.hevc"

β——(ffmpeg pipe) jpsdr mod x265 CLI parameters

- ffmpeg.exe -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -an -f yuv4mpegpipe -strict unofficial -pix_fmt ◯ - | x265.exe -D ◯ --tu-intra-depth 4 --tu-inter-depth 4 --max-tu-size 4 --limit-tu 1 --rect --amp --me star --subme ◯ --merange ◯ --analyze-src-pics --weightb --max-merge 5 --ref 3 --no-open-gop --min-keyint 1 --keyint ◯ --fades --bframes 16 --b-adapt 2 --radl 2 --b-intra --crf 17.1 --crqpoffs -5 --cbqpoffs -2 --ipratio 1.67 --pbratio 1.33 --cu-lossless --psy-rdoq 2.5 --rdoq-level 2 --aq-auto 10 --aq-bias-strength 1.3 --aq-strength-edge 1.4 --aq-bias-strength 1.1 --qg-size 8 --rd 5 --limit-refs 0 --rskip 2 --rskip-edge-threshold 3 --rc-lookahead ◯--no-cutree --psy-rd 1.5 --rdpenalty 2 --qp-adaptation-range 5 --deblock -2:-2 --limit-sao --sao-non-deblock --selective-sao 1 --hash 2 --allow-non-conformance --y4m --input - --output ".\v_out.hevc"

y——Standard libx265 CLI, copy audio & multiplex to MP4

- ffmpeg.exe -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -c:v libx265 -pix_fmt ◯ -x265-params "tu-intra-depth=4:tu-inter-depth=4:max-tu-size=4:limit-tu=1:rect=1:amp=1:me=star:subme=◯:merange=64:analyze-src-pics=1:weightb=1:max-merge=5:mcstf=1:ref=3:open-gop=0:min-keyint=1:keyint=◯:fades=1:bframes=16:b-adapt=2:radl=2:b-intra=1:crf=17.1:crqpoffs=-5:cbqpoffs=-2:ipratio=1.6:pbratio=1.33:cu-lossless=1:psy-rdoq=2.5:rdoq-level=2:hevc-aq=1:aq-strength=1.4:qg-size=8:rd=5:limit-refs=0:rskip=2:rskip-edge-threshold=3:rc-lookahead=◯:cutree=0:psy-rd=1.5:rdpenalty=2:qp-adaptation-range=5:deblock=-2:-2:limit-sao=1:sao-non-deblock=1:selective-sao=1:hash=2:allow-non-conformance=1" -fps_mode passthrough -c:a copy ".\v_out.mp4"