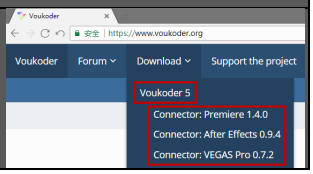
English version is derived from the x264 x265 Ultimate Tutorial Project by same author iAvoe

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 with libx264, libx265 presets from this tutorial loaded, currently the best exp. solution	

x265.exe command line for new users

[Download ffmpeg & x265 to a memorable path, in screenshot they are at D:\]

[Open Windows CMD/PowerShell or Linux/MacOS Bash/Terminal, write path & ffmpeg.exe, ffprobe.exe, x265.exe and enter; makesure all program exists]

[ffmpeg build ver.] ffmpeg.exe; [x265 build ver.] x265.exe -V

[CMD auto-filling] Write some portion of PATH/filename, and hit [Tab] will trigger auto-fill

[Gain source video info 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
```

[interlaced] not a progressive video, check top/bottom field goes first & add x265 parameter --interlaced<tff/bff>

[variable frame rate] source 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] nb_frames÷encoding speed (fps)=time(second)

[x265's required info] ffmpeg -pix_fmt<given by src video, similar as picture above>

[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 --hist-scenecut --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

ffmpeg, VS, avs2yuv pipe

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

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

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

VSpipe.exe VSScript.vpy --y4m - | x265.exe - --y4m --output

```
VSpipe/avs2yuv   VSScript.vpy - | x265.exe --input-res <WxH> --fps <int/flo/frac> - --output

avs2yuv.exe      AVSScript.avs -raw   - | x265.exe --input-res <WxH> --fps <int/flo/frac> - --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)

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(?,1)

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

bt2020: G(8500,39850)B(6550,2300)R(35400,14600)WP(15635,16450)L(?,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)>

-- cll <same value as master-display max L>

Color Primaries

--colormatrix <as src, e.g.: gbr bt709 fcc bt470bg smpte170m YCgCo bt2020nc bt2020c smpte2085 ictcp>

--transfer <as source, e.g.: gbr bt709 fcc bt470bg smpte170m YCgCo bt2020nc bt2020c smpte2085 ictcp>

Encoding speed reference

Processor: R7 5800X all core 4.5Ghz w/ negative voltage auto-offset, 67°C under FC140, avg 15440pts under CbR23 (PBO2 4.85Ghz minus 30 curve offset, 86°C under FC140, only raises 2%, thus unused)

RAM: Hynix MFR 2×2R×8GB/2x16GB, 3000Mhz 15-17-17-35 1T 1.44V, F-U-MCLK 1:1:1 sync

Source: 1920x1080 yuv420p8 24000/1001fps 312MB low quality h.264 film source, high contrast texture complex foreground, static low contrast background, 20238 frames

Method: 10bit crf 28 to enhance depth error, low quality source reduces result difference, high contrast complex texture forces encoder to reduce skipping functions

preset slow: 16m 27s, avg~20.5fps, results in 217MB, visible quality loss (more visible in HQ source)

Gen•Simple: 24m 48s, avg~13.6fps, 1.5x slower than top, in 159MB, visible quality loss

Anime•HC: 36m 36s, avg~9.21fps, 2.2x slower than top, in 145MB, visible quality loss (film src)

Film•HC: 78m 57s, avg~4.27fps, 4.8x slower than top, in 189MB, very small loss

veryslow: 133m 16s, avg~2.53fps, 8.1x slower than top, in 221MB, very small loss

Gen-Purpose·Simple·LQ

no more configurable options for simplicity, only a few fps slower than top

splt-trans --preset slow --hist-scenecut

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

tgt. depth -D 8/10/12 (default 8bit or lowest built in x265.exe, same or convert to lower depth only w/ --dither)

multi node --pools ,,,, (e.g.: "-,+"states PC w/ 2 nodes & use the 2nd only, using both nodes causes mem. delay)

others crop: --display-window < integer "←, ↑ ,→, ↓ " pixels >, ≥16 core cpu opt.: --pme, interlaced: --field, pixel depth reduction quality+: --dither, begin; ending frame: --seek; --frames, crf/abr resist noise factor: --rc-grain

colorspace ffmpeg -pix_fmt yuv420p / yuv422p / yuv444p / yuv420p10 / yuv422p10 / yuv444p10...

(ffmpeg pipe) x265 CLI parameters

- ffmpeg.exe -thread_queue_size 5000 -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -an -f yuv4mpegpipe -pix_fmt<ffprobe pix_fmt> -strict unofficial - | x265.exe --preset slow --hist-scenecut --me umh --subme 5 --merange 48 --weightb --aq-mode 4 --bframes 5 --ref 3 --hash 2 --allow-non-conformance --y4m - --output ".\v_out.hevc"

libx265 CLI, compatible w/ libav fork

- ffmpeg.exe -thread_queue_size 5000 -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -c:v libx265 -pix_fmt<ffprobe pix_fmt> -x265params "preset=slow:hist-

scenecut=1:me=umh:subme=5:merange=48:weightb=1:bframes=5:ref=3:hash=2:allow-non-conformance=1" -c:a copy ".\v_out.hevc"

libkvazaar CLI (in dev, crf mode missing) (libx265 ffmpeg CLI is lacking 85% of params, skipped)

- ffmpeg.exe -thread_queue_size 5000 -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -c:v libkvazaar -pix_fmt<ffprobe 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=4:rd=3:mv-rdo=1:rdoq-skip=1:intra-rdo-et=1:sao=edge:hash=checksum" -c:a copy ".\v_out.hevc"

ffmpeg multiplex all tracks (encapsulation 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 encapsulation formats: Wikipedia - Subtitle formats support

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"`
-

Customize·Standard.

Lots of custom options for optimizations

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

me-mc --me umh --subme <24fps=3, 48fps=4, 60fps=5, 100fps=6> --merange 48 --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 --hist-scenecut <fast: --fast-intra / mid: leave blank / slow: --b-intra / slower: --constrained-intra >

quantization --crf <18~20 low loss 19 ~22 good> --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 <3fast, 2mid, 1slow> --rc-lookahead <3 × fps> --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

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

tgt. depth -D 8/10/12 (default 8bit or lowest built in x265.exe, same or convert to lower depth only w/ --dither)

multi node --pools ,,,, (e.g.: "-,+"states PC with 2 nodes & use the 2nd only, using both nodes causes mem. delay)

others crop: --display-window < integer "←, ↑ ,→, ↓ " pixels >, ≥16 core cpu opt.: --pme, interlaced: --field, pixel depth reduction quality+: --dither, begin; ending frame: --seek; --frames, crf/abr resist noise factor: --rc-grain

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

(ffmpeg pipe) x265 CLI parameters

- ffmpeg.exe -thread_queue_size 5000 -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -an -f yuv4mpegpipe -strict unofficial -pix_fmt<ffprobe pix_fmt> - | x265.exe --ctu ◯ --min-cu-size 16 --tu-intra-depth 3 --tu-inter-depth 3 --limit-tu 1 --rdpenalty 1 --me umh --subme ◯ --merange 48 --weightb --ref 3 --max-merge ◯ --early-skip --no-open-gop --min-keyint 5 --fades --bframes 8 --b-adapt 2 --radl 3 --pbratio 1.2 --hist-scenecut --fast-intra --b-intra --constrained-intra --crf ◯ --crqpoffs -3 --crqpoffs -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 - --output ".\v_out.hevc"

libx265 CLI, compatible w/ libav fork

- ffmpeg.exe -thread_queue_size 5000 -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -c:v libx265 -pix_fmt<ffprobe pix_fmt> -x265params "ctu=◯:min-cu-size=16:tu-intra-depth=3:tu-inter-depth=3:limit-tu=1:rdpenalty=1:me=umh:subme=◯:merange=48: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:hist-scenecut=1:fast-intra=1:b-intra=1:constrained-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" -c:a copy ".\v_out.hevc"

ffmpeg multiplex all tracks (encapsulation 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 encapsulation formats: Wikipedia - Subtitle formats support

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"`

High Compression·Film·HQ Source

splt-trans --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 48 --weightb

ref-rateol --ref 3 --max-merge 4 --no-open-gop --min-keyint 3 --keyint 310 --fades --bframes 8 --b-adapt 2 --radl 3

intra coding --hist-scenecut --constrained-intra --b-intra

quantization --crf 21.8 --qpmin 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 3 --limit-refs 0 --rskip 0 --rc-lookahead <1.8×fps> --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>

tgt. depth -D 8/10/12 (default 8bit or lowest built in x265.exe, same or convert to lower depth only w/ --dither)

multi node --pools ,,,, (e.g.: "-,+"states PC with 2 nodes & use the 2nd only, using both nodes causes mem. delay)

others crop: --display-window < integer "←, ↑ ,→, ↓ " pixels >, ≥16 core cpu opt.: --pme, interlaced: --field, pixel depth reduction quality+: --dither, begin; ending frame: --seek; --frames, crf/abr resist noise factor: --rc-grain

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

(ffmpeg pipe) x265 CLI parameters

- ffmpeg.exe -thread_queue_size 5000 -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -an -f yuv4mpegpipe -strict unofficial -pix_fmt<ffprobe pix_fmt> - | x265.exe --tu-intra-depth 4 --tu-inter-depth 4 --limit-tu 1 --me star --subme ◯ --merange 48 --weightb --ref 3 --max-merge 4 --no-open-gop --min-keyint 3 --keyint 310 --fades --bframes 8 --b-adapt 2 --radl 3 --hist-scenecut --constrained-intra --b-intra --crf 21.8 --qpmin 8 --crqpoffs -3 --ipratio 1.2 --pbratio 1.5 --rdoq-level 2 --aq-mode 4 --aq-strength ◯ --qg-size 8 --rd 3 --limit-refs 0 --rskip 0 --rc-lookahead ◯ --rect --amp --psy-rd ◯ --qp-adaptation-range 3 --deblock 0:0 --limit-sao --sao-non-deblock --selective-sao 3 --hash 2 --allow-non-conformance --y4m - --output ".\v_out.hevc"

libx265 CLI, compatible w/ libav fork

- ffmpeg.exe -thread_queue_size 5000 -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -c:v libx265 -pix_fmt<ffprobe pix_fmt> -x265params "tu-intra-depth=4:tu-inter-depth=4:limit-tu=1:me=star:subme= ◯ :merange=48:weightb=1:ref=3:max-merge=4:open-gop=0:min-keyint=3:keyint=310:fades=1:bframes=8:b-adapt=2:radl=3:hist-scenecut=1:constrained-intra=1:b-intra=1:crf=21.8:qpmin=8:crqpoffs=-3:ipratio=1.2:pbratio=1.5:rdoq-level=2:aq-mode=4:aq-strength= ◯ :qg-size=8:rd=3:limit-refs=0:rskip=0:rc-lookahead= ◯ :rect=1:amp=1:psy-rd= ◯ :qp-adaptation-range=3:deblock=0:0:limit-sao=1:sao-non-deblock=1:selective-sao=3:hash=2:allow-non-conformance=1" -c:a copy ".\v_out.hevc"

ffmpeg multiplex all tracks (encapsulation 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 encapsulation formats: Wikipedia - Subtitle formats support

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"`

Editing footage·Render & Reuse

block/unit spitting --ctu 32

motion est.&cmp --me star --subme <24fps=3, 48fps=4, 60fps=5, 100fps=6> --merange 48 --analyze-src-pics

intraframe search --max-merge 4 --early-skip --b-intra

rate control --hist-scenecut --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>

R-D optimization --splitrd-skip

deblock --deblock -1:-1

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

tuning --tune grain

tgt pixel bit depth -D 8/10/12

others crop: --display-window < integer "←, ↑ ,→, ↓ " pixels >, ⩾16 core cpu opt.: --pme, interlaced: --field, pixel depth reduction quality+: --dither, begin; ending frame: --seek; --frames, crf/abr resist noise factor: --rc-grain, multi-node: --pools ,,,,

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

(ffmpeg pipe) x265 CLI parameters

- ffmpeg.exe -thread_queue_size 5000 -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -an -f yuv4mpegpipe -strict unofficial -pix_fmt<ffprobe pix_fmt> - | x265.exe --ctu 32 --me star --subme ◯ --merange 48 --analyze-src-pics --max-merge 4 --early-skip --b-intra --hist-scenecut --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 - --output ".\v_out.hevc"

libx265 CLI, compatible w/ libav fork

- ffmpeg.exe -thread_queue_size 5000 -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -c:v libx265 -pix_fmt<ffprobe pix_fmt> -x265params "ctu=32:me=star:subme=◯:merange=48:analyze-src-pics=1:max-merge=4:early-skip=1:hist-scenecut=1:open-gop=0:min-keyint=1:keyint=◯:ref=3:fades=1:bframes=7:b-adapt=2:radl=3:constrained-intra=1: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" -c:a copy ".\v_out.hevc"

ffmpeg multiplex all tracks (encapsulation 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 encapsulation formats: Wikipedia - Subtitle formats support

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"
```

Anime·High Compression·Subtitle Groups

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

me-mc --me umh --merange 48 --subme <24fps=3, 48fps=4, 60fps=5, 100fps=6> --weightb <remove weightb for 80's anime that doesn't have lighting fades for performance> --max-merge 4 --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 --hist-scenecut --constrained-intra --b-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> --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

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

tgt. depth -D 8/10/12 (default 8bit or lowest built in x265.exe, same or convert to lower depth only w/ --dither)

multi nodes --pools ,,,, (e.g.: "-,+"states PC with 2 nodes & use the 2nd only, using both nodes causes mem. delay)

others crop: --display-window < integer "←, ↑ ,→, ↓ " pixels >, ⩾16 core cpu opt.: --pme, interlaced: --field, pixel depth reduction quality+: --dither, begin; ending frame: --seek; --frames, crf/abr resist noise factor: --rc-grain

colorspace ffmpeg -pix_fmt yuv420p / yuv422p / yuv444p / yuv420p10 / yuv422p10 / yuv444p10...

(ffmpeg pipe) x265 CLI parameters

- ffmpeg.exe -thread_queue_size 5000 -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -an -f yuv4mpegpipe -strict unofficial -pix_fmt<ffprobe pix_fmt> - | x265.exe --tu-intra-depth 4 --tu-inter-depth 4 --max-tu-size 16 --me umh --subme ◯ --merange 48 --weightb --max-merge 4 --early-skip --ref 3 --no-open-gop --min-keyint 5 --keyint ◯ --fades --bframes 16 --b-adapt 2 --radl 3 --bframe-bias 20 --hist-scenecut --constrained-intra --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 --single-sei --y4m - --output ".\v_out.hevc"

libx265 CLI, compatible w/ libav fork

- ffmpeg.exe -thread_queue_size 5000 -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -c:v libx265 -pix_fmt<ffprobe pix_fmt> -x265params "tu-intra-depth=4:tu-inter-depth=4:max-tu-size=16:me=umh:subme=◯:merange=48:weightb=1:max-merge=4:early-skip=1:ref=3:open-gop=0:min-keyint=5:keyint=◯:fades=1:bframes=16:b-adapt=2:radl=3:bframe-bias=20:hist-scenecut=1:constrained-intra=1: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:single-sei=1" -c:a copy ".\v_out.hevc"

Anime·ripper's cold war·HEDT Only

`Paused dark flat scenes must look AS-IS, results less & slower compression than sub grps`

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

me-mc --me star --subme <24fps=3, 48fps=4, 60fps=5, 100fps=6> --merange 52 --analyze-src-pics --weightb --max-merge 4

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

intra coding --hist-scenecut --b-intra

quantization --crf 17 --crqpoffs -5 --cbqpoffs -2 --ipratio 1.67 --pbratio 1.33

lossless qnt --cu-lossless

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

aq --hevc-aq --aq-strength 1.4 --qg-size 8

md --rd 5 --limit-refs 0 --rskip 0 --rc-lookahead <2.5 × fps> --rect --amp --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

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

others crop: --display-window < integer "←, ↑ ,→, ↓ " pixels >, ⩾16 core cpu opt.: --pme, interlaced: --field, pixel depth reduction quality+: --dither, begin; ending frame: --seek; --frames, crf/abr resist noise factor: --rc-grain, target depth: -D 8/10/12, multi-node: --pools ,,,,

(ffmpeg pipe) x265 CLI parameters

- ffmpeg.exe -thread_queue_size 5000 -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -an -f yuv4mpegpipe -strict unofficial -pix_fmt<ffprobe pix_fmt> - | x265.exe --tu-intra-depth 4 --tu-inter-depth 4 --max-tu-size 4 --limit-tu 1 --me star --subme ◯ --merange 52 --analyze-src-pics --weightb --max-merge 4 --ref 3 --no-open-gop --min-keyint 1 --keyint ◯ --fades --bframes 16 --b-adapt 2 --radl 2 --hist-scenecut --b-intra --crf 16 --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 0 --rc-lookahead ◯ --rect --amp --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 --single-sei --y4m - --output ".\v_out.hevc"

libx265 CLI, compatible w/ libav fork

- ffmpeg.exe -thread_queue_size 5000 -loglevel 16 -hwaccel auto -y -hide_banner -i ".\v_in.mp4" -c:v libx265 -pix_fmt<ffprobe pix_fmt> -x265params "tu-intra-depth=4:tu-inter-depth=4:max-tu-size=4:limit-tu=1:me=star:subme=◯:merange=52:analyze-src-pics=1:weightb=1:max-merge=4:mcstf=1:ref=3:open-gop=0:min-keyint=1:keyint=◯:fades=1:bframes=16:b-adapt=2:radl=2:hist-scenecut=1:b-intra=1:crf=16: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=0:rc-lookahead=◯:rect=1:amp=1: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:single-sei=1" -c:a copy ".\v_out.hevc"