



libde265 HEVC Performance Test Report

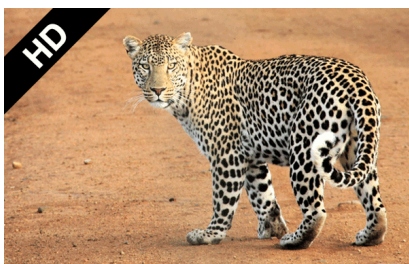
libde265 HEVC - High Efficiency Video Coding

libde265 HEVC

High Efficiency Video Coding (HEVC) is the new video compression standard, a successor to H.264/MPEG-4 AVC (Advanced Video Coding). HEVC was jointly developed by the ISO/IEC Moving Picture Experts Group (MPEG) and ITU-T Video Coding Experts Group (VCEG) as ISO/IEC 23008-2 MPEG-H Part 2 and ITU-T H.265.



- ★ Greatly reduces the data compression rate compared to H.264/MPEG-4 AVC
- ★ Supports 8K UHD and resolutions up to 8192x4320
- ★ Cuts the costs for streaming and network bandwidth by 50 %
- ★ The libde265 HEVC app for iOS plays video streams in H.265 format. Available on the App Store (Requires iOS6/7)



HD video quality with 50% of the bandwidth

Users are given access to the highest quality content even on slow connections. The libde265 HEVC codec will enable streaming services to simultaneously deliver full HD video content to twice as many users in comparison to predecessor H.264 video content, or cut the costs for streaming and network bandwidth by 50%.



Open Source Software

libde265 HEVC is provided by struktur AG and licensed under open source GNU Lesser General Public License (LGPL). libde265 will successfully open a field of consumer and professional applications such as high-quality HD and 4K/8K UHD video streaming, low-latency/low-bandwidth video conferencing, and full mobile coverage.



API

Congestion-aware video decoding robustness for 3/4G and LTE network usage and a versatile API standard facilitate the adoption within web-browsers and on-demand video streaming services. Implementation examples include Linux GStreamer plugin, Mac OS VLC, Windows DirectShow filter and ffmpeg.

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Decoder performance

Absolute frame-rates (v0.7)

Intel® Core™ i7-4960X CPU @ 3.60GHz

CPU was in 'ondemand' configuration. 'Performance' configuration gives 10%-15% higher fps.

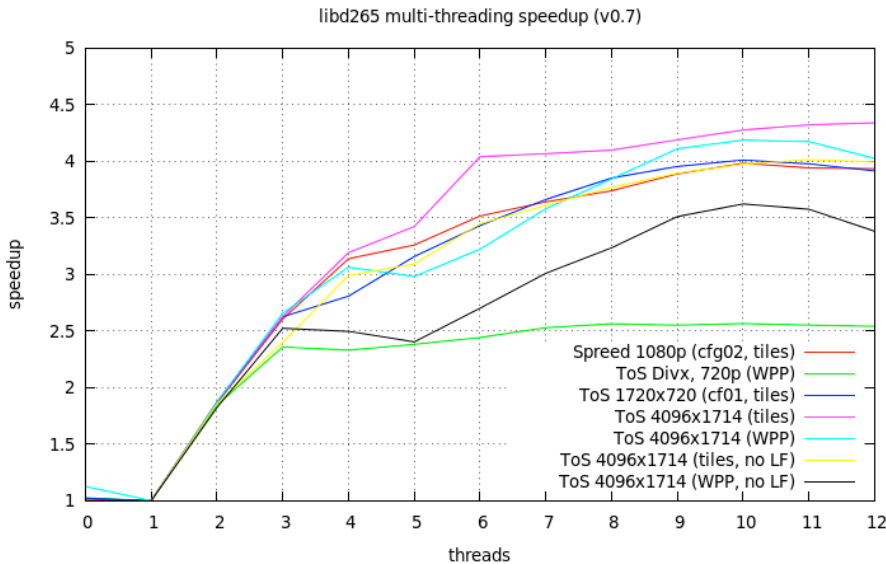
threads	Speed HD(T) Speed movie tiles 1920x1080	ToS (D) 7 (W) Tears of Steel DivX encoder WPP 1280x720	ToS 7 (T) Tears of Steel tiles 1720x720	ToS 4K (T) Tears of Steel tiles 4096x1714	ToS 4K (W) Tears of Steel WPP 4096x1714	ToS 4K (TN) Tears of Steel tiles no deblock- ing + SAO 4096x1714	ToS 4K (WN) Tears of Steel WPP no deblock- ing + SAO 4096x1714
1	83.14	215.84	150.07	28.82	25.35	42.15	40.93
2	154.76	397.85	280.38	54.04	47.37	78.21	74.64
3	216.66	509.10	393.94	75.73	67.38	101.16	103.34
4	260.94	503.13	421.34	92.00	77.68	126.04	102.21
5	271.04	514.17	473.98	98.66	75.58	130.33	98.38
6	292.41	527.05	515.10	116.45	81.70	145.32	110.56
7	302.75	546.02	549.62	117.24	90.75	152.15	123.21
8	310.90	553.52	578.10	118.15	97.44	158.92	132.43
9	323.29	550.79	593.53	120.75	104.22	164.15	143.71
10	331.15	553.86	602.10	123.25	106.16	167.54	148.32
11	327.78	551.15	597.07	124.60	105.83	169.28	146.40
12	327.19	548.55	587.60	125.11	102.06	168.39	138.44

AMD Athlon™ 64 X2 Dual Core Processor 4200+, 2.2 GHz, no SSE

threads	ToS (D) Tears of Steel – DivX encoder 720p
1	34.34
2	45.97

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Speedup (libde265, v0.7)



- Spread: Spread movie
- ToS: Tears of Steel movie
- no LF: deblocking and SAO disabled

Subjective video performance comparison HEVC – H.264/MPEG-4

The average bit rate reduction for HEVC compared to H.264/MPEG-4 is:

Video coding standard	Average bit rate reduction compared to H.264/MPEG-4 AVC HP			
HEVC	480p	720p	1080p	4K UHD
	52 %	56 %	62 %	64 %

Supported decoding features

feature	v0.5	v0.6	v0.7
P slices	yes	yes	yes
B slices	yes	yes	yes
AMP	yes	yes	yes
PCM	yes	yes	yes
deblocking	yes	yes	yes
SAO	yes	yes	yes
weighted pred.	yes	yes	yes
adaptive quant.	incomplete	yes	yes

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feature	v0.5	v0.6	v0.7
multiple slices	no	incomplete	yes
dependent slices	no	incomplete	yes
scaling lists	no	yes	yes
long-term MC	no	incomplete	yes
ref.pic.list modification	no	yes	yes
chroma 4:2:2	no	no	no
10 bit	no	no	no
parallel WPP	yes	yes	yes
parallel tiles	yes	yes	yes
parallel frames	no	no	no
SSE acceleration	yes	yes	yes
frame-dropping API	no	no	incomplete ¹⁾
non-conformant speed hacks	no	no	yes ²⁾

Incomplete: may work for some streams

¹⁾ Streams with multiple temporal sub-streams only

²⁾ Deblocking and sao can be switched off to increase decoding speed

High Efficiency Video Coding (HEVC) is the new video compression standard



Decoding results for conformance bitstreams

Correct decoding:

- | | | |
|---------------------|-------------------|------------------|
| • AMP_[ABDEF] | • MAXBINS_[ABC] | • RPS_[ABCDEF] |
| • AMVP_[ABC] | • MERGE_[ABCDEFG] | • RQT_[ABCDEFG] |
| • CAINIT_[ABCDEFGH] | • MVCLIP_A | • SAO_[ABCDEFG] |
| • CIP_[ABC] | • MVDL1ZERO_A | • SDH_A |
| • DBLK_[ABCDEFG] | • MVEDGE_A | • SLICES_A |
| • DELTAQP_[ABC] | • NUT_A | • SLIST_[ABCD] |
| • DSLICE_[ABC] | • OPFLAG_A | • SLPLP_A |
| • ENTP_C | • PICSIZE_[ABCD] | • STRUCT_[AB] |
| • EXT_A | • PMERGE_[ABCDE] | • TILES_[AB] |
| • HRD_A | • POC_A | • TMVP_A_MS_[23] |
| • ipcm_[ABCDE] | • PPS_A | • TSCL_[AB] |
| • IPRED_[ABC] | • PS_[AB] | • TSKIP_A |
| • LS_[AB] | • RAP_[AB] | • TUSIZE_A |
| • LTRSPS_A | • RPLM_[AB] | • VPSID_A |
| | • WP[AB] | • WPP_[ABCDEF] |

Incorrect decoding:

- None, all streams decode correctly

Yet unsupported in current libde265 version 0.7 (10-bit decoding not yet supported):

- TSUNEQBD_A_MAIN10
- WP_MAIN10_B
- WPP_[ABCDEF]_MAIN10