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leonzhao7 opened this issue on Dec 24, 2019 · 3 comments

heap-buffer-overflow in put_epel_16_fallback when decoding file

Test Version

Test Environment

Test Configure

Test Program

Asan Output

```
root@ubuntu:~/# /opt/asan/bin/decd65 2b00001b510 -put_epel_16 fallback-heap-overflow.crash
WARNING: CTB outside of image area (concealing stream error...)
WARNING: pps header invalid
WARNING: faulty reference picture list
WARNING: pps header invalid
=====
==39540==ERROR: AddressSanitizer: heap-buffer-overflow on address 0x62b00001b510 at pc 0x000000433086 bp 0x7ffdf9965f60 sp 0x7ffdf99655f0
READ of size 2 at 0x62b00001b510 thread T0
#0 0x433085 in put_epel_16 fallback(short*, long, unsigned short const*, long, int, int, int, int, short*, int) /root/src/libde265/libde265/fallback-motion.cc:289
#1 0x52bf0e in acceleration_functions::put_hevc_epel(short*, long, void const*, long, int, int, int, short*, int) const ../libde265/acceleration.h:298
#2 0x52dc7a in void mc_chroma(unsigned short*(base_context const*, seq_parameter_set const*, int, int, int, short*, int, unsigned short const*, int, int, int))
/root/src/libde265/libde265/motion.cc:205
#3 0x51f8ba in generate_inter_prediction_samples(base_context*, slice_segment_header const*, de265_image*, int, int, int, int, int, int, int, int, int, int, PBMMotion const*)
/root/src/libde265/libde265/motion.cc:382
#4 0x52b8f9 in decode_prediction_unit(base_context*, slice_segment_header const*, de265_image*, PBMMotionCoding const&, int, int, int, int, int, int, int, int)
/root/src/libde265/libde265/motion.cc:2107
#5 0x47995d in read_coding_unit(thread_context*, int, int, int, int) /root/src/libde265/libde265/slice.cc:4310
#6 0x47b6fe in read_coding_quadtree(thread_context*, int, int, int, int) /root/src/libde265/libde265/slice.cc:4647
#7 0x47338a in read_coding_tree_unit(thread_context*) /root/src/libde265/libde265/slice.cc:2861
#8 0x47be11 in decode_substream(thread_context*, bool, bool) /root/src/libde265/libde265/slice.cc:4736
#9 0x47db9f in read_slice_segment_data(thread_context*) /root/src/libde265/libde265/slice.cc:5049
#10 0x40b7f1 in decoder_context::decode_slice_unit_sequential(image_unit*, slice_unit*) /root/src/libde265/libde265/dectx.cc:843
#11 0x40c6d7 in decoder_context::decode_slice_unit_parallel(image_unit*, slice_unit*) /root/src/libde265/libde265/dectx.cc:945
#12 0x40b589 in decoder_context::decode_some(bool*) /root/src/libde265/libde265/dectx.cc:730
#13 0x40e23e in decoder_context::decode(int*) /root/src/libde265/libde265/dectx.cc:1329
#14 0x405a61 in de265_decode /root/src/libde265/libde265/de265.cc:346
#15 0x404972 in main /root/src/libde265/decd65/decd65.cc:764
#16 0x7fa1b901182f in __libc_start_main (/lib/x86_64-linux-gnu/libc.so.6+0x2082f)
#17 0x402b28 in _start (/opt/asan/bin/decd65+0x402b28)

0x62b00001b510 is located 0 bytes to the right of 25360-byte region [0x62b000015200,0x62b00001b510)
allocated by thread T0 here:
#0 0x7fa1b9f12076 in __interceptor_posix_memalign (/usr/lib/x86_64-linux-gnu/libasan.so.2+0x99076)
#1 0x43e00d in ALLOC_ALIGNED /root/src/libde265/libde265/image.cc:54
#2 0x43e725 in de265_image_get_buffer /root/src/libde265/libde265/image.cc:132
#3 0x440639 in de265_image::alloc_image(int, int, de265_chroma, std::shared_ptr<seq_parameter_set const>, bool, decoder_context*, long, void*, bool)
/root/src/libde265/libde265/image.cc:384
#4 0x43afa4 in decoded_picture_buffers::new_image(std::shared_ptr<seq_parameter_set const>, decoder_context*, long, void*, bool) /root/src/libde265/libde265/dpb.cc:262
#5 0x40ee8b in decoder_context::generate_unavailable_reference_picture(seq_parameter_set const*, int, bool) /root/src/libde265/libde265/dectx.cc:1418
#6 0x411722 in decoder_context::process_reference_picture_set(slice_segment_header*) /root/src/libde265/libde265/dectx.cc:1648
#7 0x4141c9 in decoder_context::process_slice_segment_header(slice_segment_header*, de265_error*, long, nal_header*, void*) /root/src/libde265/libde265/dectx.cc:2866
#8 0x40acadb in decoder_context::read_slice_NAL(bitreader&, NAL_unit*, nal_header&) /root/src/libde265/libde265/dectx.cc:639
#9 0x40bdb3 in decoder_context::decode_NAL(NAL_unit*) /root/src/libde265/libde265/dectx.cc:1230
#10 0x40e17b in decoder_context::decode(int*) /root/src/libde265/libde265/dectx.cc:1318
#11 0x405a61 in de265_decode /root/src/libde265/libde265/de265.cc:346
#12 0x404972 in main /root/src/libde265/decd65/decd65.cc:764
#13 0x7fa1b901182f in __libc_start_main (/lib/x86_64-linux-gnu/libc.so.6+0x2082f)

SUMMARY: AddressSanitizer: heap-buffer-overflow /root/src/libde265/libde265/fallback-motion.cc:289 put_epel_16 fallback(short*, long, unsigned short const*, long, int, int, int,
int, short*, int)
```

POC file

libde265-put_epel_16_fallback-heap_overflow.zip
password: leon.zhao.7

CREDIT

Zhao Liang, Huawei Weiran Labs

ist199099 commented on Oct 16

With the tip of the stable branch at the time of this bug report ([d085715](#)) on Ubuntu 20.04 (with gcc 9.4.0 and clang 10.0.0) on the aarch64 architecture, I do not get a heap out-of-bounds read, but a heap out-of-bounds write, that may lead to arbitrary code execution.

```

WARNING: CTB outside image area (concealing stream error...)
WARNING: pps header invalid
SDL_Init() failed: Unable to open a console terminal
WARNING: faulty reference picture list
WARNING: pps header invalid
*****
--781426--ERROR: AddressSanitizer: heap-buffer-overflow on address 0xffff96314500 at pc 0xffff9d21b1f4 bp 0xfffffa35bba0 sp 0xfffffa35bb0
WRITE of size 2 at 0xffff96314500 thread T0
#0 0xffff9d21b1f0 in put_weighted_bipred_16 fallback(unsigned short*, long, short const*, short const*, long, int, int, int, int, int, int, int, int)
(/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x160f10)
#1 0xffff9d260c28 in acceleration_functions::put_weighted_bipred(void*, long, short const*, short const*, long, int, int, int, int, int, int, int, int) const
(/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1a5c28)
#2 0xffff9d253874 in generate_inter_prediction_samples(base_context*, slice_segment_header const*, de265_image*, int, int, int, int, int, int, int, int, int, int, int, int, int, int)
(/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x198874)
#3 0xffff9d25574 in decode_prediction_unit(base_context*, slice_segment_header const*, de265_image*, PBMotionCoding const*, int, int, int, int, int, int, int, int)
(/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x14574)
#4 0xffff9d2a9380 in read_coding_unit(thread_context*, int, int, int) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1ee380)
#5 0xffff9d2ab4f0 in read_coding_quadtree(thread_context*, int, int, int) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1f04f0)
#6 0xffff9d2a8e4 in read_coding_tree_unit(thread_context*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1e68e4)
#7 0xffff9d2abe38 in decode_substream(thread_context*, bool, bool) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1f0e38)
#8 0xffff9d2af84 in read_slice_segment_data(thread_context*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1f2f84)
#9 0xffff9d1e32b4 in decoder_context::decode_slice_unit_sequential(image_unit*, slice_unit*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1282b4)
#10 0xffff9d1e3bac in decoder_context::decode_slice_unit_parallel(image_unit*, slice_unit*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x128bac)
#11 0xffff9d1e2650 in decoder_context::decode_some(bool*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x127650)
#12 0xffff9d1e5c44 in decoder_context::decode(int*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x12ac44)
#13 0xffff9d1c943c in de265_decode (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x10e43c)
#14 0xaaadfb974c0 in main (/home/azureuser/lib265/lib265/.libs/lib265+0x74c0)
#15 0xffff9cb2e0c in __libc_start_main ../csu/libc-start.c:308
#16 0xaaadfb9490 (/home/azureuser/lib265/lib265/.libs/lib265+0x490)

0xffff96314500 is located 0 bytes to the right of 25344-byte region [0xffff9630e200,0xffff96314500)
allocated by thread T0 here:
#0 0xffff9d95b2d8 in __interceptor_posix_malign ../../src/libsanitizer/asan/asan_malloc_linux.cc:217
#1 0xffff9d22b2fc in ALLOC_ALIGNED(unsigned long, unsigned long) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1702fc)
#2 0xffff9d22b0f8 in de265_image_get_buffer(void*, de265_image_spec*, de265_image*, void*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x170bf8)
#3 0xffff9d226a0 in de265_image::alloc_image(int, int, de265_chroma, std::shared_ptr<seq_parameter_set const*, bool, decoder_context*, encoder_context*, long, void*>)
(/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1736a0)
#4 0xffff9d226bec in decoded_picture_buffer::new_image(std::shared_ptr<seq_parameter_set const*, decoder_context*, long, void*>, bool)
(/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x16bbecc)
#5 0xffff9d1eccf4 in decoder_context::process_slice_segment_header(slice_segment_header*, de265_error*, long, nal_header*, void*)
(/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x131cf4)
#6 0xffff9d1ebdc in decoder_context::read_slice_nal(bitreader&, NAL_unit*, nal_header&) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x126dbc)
#7 0xffff9d1e54c8 in decoder_context::decode_NAL_NAL_unit*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x12a4c8)
#8 0xffff9d1e5b24 in decoder_context::decode(int*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x12ab24)
#9 0xffff9d1c943c in de265_decode (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x10e43c)
#10 0xaaadfb974c0 in main (/home/azureuser/lib265/lib265/.libs/lib265+0x74c0)
#11 0xffff9cb2e0c in __libc_start_main ../csu/libc-start.c:308
#12 0xaaadfb9490 (/home/azureuser/lib265/lib265/.libs/lib265+0x490)

```

```
SUMMARY: AddressSanitizer: heap-buffer-overflow (/home/azureuser/libbde265/libbde265/.libs/libbde265.so.0+0x10f010) in put_weighted_dipred_16_fallback(unsigned short*, long, short const*, short const*, long, int, int, int, int, int, int, int, int, int, int)
Shadow bytes around the buggy address:
0x200ff2c62850: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x200ff2c62860: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x200ff2c62870: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x200ff2c62880: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x200ff2c62890: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

```

0x0200ff2c628a0: [fa]fa fa fa fa fa fa fa fa fa fa fa fa fa fa
0x0200ff2c628b0: fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa
0x0200ff2c628c0: fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa
0x0200ff2c628d0: fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa
0x0200ff2c628e0: fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa
0x0200ff2c628f0: fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa
Shadow byte legend (one shadow byte represents 8 application bytes):
Addressable: 00
Partially addressable: 01 02 03 04 05 06 07
Heap left redzone: fa
Freed heap region: fd
Stack left redzone: f1
Stack mid redzone: f2
Stack right redzone: f3
Stack after return: f5
Stack use after scope: f8
Global redzone: f9
Global init order: f6
Poisoned by user: f7
Container overflow: fc
Array cookie: ac
Intra object redzone: bb
ASAN internal: fe
Left alloca redzone: ca
Right alloca redzone: cb
Shadow gap: cc
==781426==ABORTING

```

ist199099 commented on Oct 16

The same happens on the x86_64 architecture:

```

CTR outside of image area (concealing stream error...)
WARNING: pps header invalid
SDL_Init() failed: Unable to open a console terminal
WARNING: faulty reference picture list
WARNING: pps header invalid
=====
==791137==ERROR: AddressSanitizer: heap-buffer-overflow on address 0x62b000014508 at pc 0x7fdad54ad4fb bp 0x7ffff67eb7c8 sp 0x7ffff67eb7c0
WRITE of size 2 at 0x62b000014508 thread T0
#0 0x7fdad54ad4fa in put_weighted_bipred16_fallback(unsigned short*, long, short const*, short const*, long, int, int, int, int, int, int, int, int)
(/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x16b4fa)
#1 0x7fdad54e6469 in acceleration_functions::put_weighted_bipred(void*, long, short const*, short const*, long, int, int, int, int, int, int, int, int) const
(/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1a4469)
#2 0x7fdad54bcf0 in generate_inter_prediction_samples(base_context*, slice_segment_header const*, de265_image*, int, int, int, int, int, int, int, int, int, int, int)
(/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x199cf0)
#3 0x7fdad54e5e7d in decode_prediction_unit(base_context*, slice_segment_header const*, de265_image*, PBMMotionCoding const*, int, int, int, int, int, int, int, int)
(/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1a3e7d)
#4 0x7fdad55253a6 in read_coding_unit(thread_context*, int, int, int, int) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1e33a6)
#5 0x7fdad55272bd in read_coding_quadtree(thread_context*, int, int, int, int) [clone .localalias] (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1e52bd)
#6 0x7fdad551e92d in read_coding_tree_unit(thread_context*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1dc92d)
#7 0x7fdad5527a81 in decode_substream(thread_context*, bool, bool) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1e5a81)
#8 0x7fdad55297ec in read_slice_segment_data(thread_context*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1e77ec)
#9 0x7fdad547880f in decoder_context::decode_slice_unit_sequential(image_unit*, slice_unit*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x13680f)
#10 0x7fdad5479911 in decoder_context::decode_slice_unit_parallel(image_unit*, slice_unit*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x137011)
#11 0x7fdad547cfca3 in decoder_context::decode_some(bool*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x135ca3)
#12 0x7fdad547ace2 in decoder_context::decode(int*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x138ce2)
#13 0x7fdad54610e0 in de265_decode (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x11f0e0)
#14 0x55a6ae05007f in main (/home/azureuser/lib265/lib265/.libs/lib265+0x807f)
#15 0x7fdad4e26082 in __libc_start_main ../csu/libc-start.c:308
#16 0x55a6ae0409cd in _start (/home/azureuser/lib265/lib265/.libs/lib265+0x59cd)

0x62b000014508 is located 0 bytes to the right of 25352-byte region [0x62b0000e200,0x62b000014508)
allocated by thread T0 here:
#0 0x7fdad58776e5 in __interceptor_posix_memalign ../../src/libsanitizer/asan/asan_malloc_linux.cc:217
#1 0x7fdad54ba459 in ALLOC_ALIGNED(unsigned long, unsigned long) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x178459)
#2 0x7fdad54bc5d0 in de265_image_get_buffer(void*, de265_image_spec*, de265_image_spec*, void*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x178c50)
#3 0x7fdad54bd2eb in de265_image::alloc_image(int, int, de265_chroma, std::shared_ptr<seq_parameter_set const*, bool, decoder_context*, encoder_context*, long, void*, bool>)
(/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x17b2eb)
#4 0x7fdad54b5da2 in decoded_picture_buffer::new_image(std::shared_ptr<seq_parameter_set const*, decoder_context*, long, void*, bool>)
(/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x173da2)
#5 0x7fdad5481332 in decoder_context::process_slice_segment_header(slice_segment_header*, de265_error*, long, nal_header*, void*)
(/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x13f332)
#6 0x7fdad54772ea in decoder_context::read_slice_NAL(bitreader8, NAL_unit*, nal_header8) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x1352ea)
#7 0x7fdad547a58c in decoder_context::decode_NAL(NAL_unit*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x13858c)
#8 0x7fdad547abe9 in decoder_context::decode(int*) (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x138be9)
#9 0x7fdad54610e0 in de265_decode (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x11f0e0)
#10 0x55a6ae05007f in main (/home/azureuser/lib265/lib265/.libs/lib265+0x807f)
#11 0x7fdad4e26082 in __libc_start_main ../csu/libc-start.c:308

SUMMARY: AddressSanitizer: heap-buffer-overflow (/home/azureuser/lib265/lib265/.libs/lib265.so.0+0x16b4fa) in put_weighted_bipred16_fallback(unsigned short*, long, short
const*, short const*, long, int, int, int, int, int, int, int, int)
Shadow bytes around the buggy address:
 0x0c567ffffa850: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 0x0c567ffffa860: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 0x0c567ffffa870: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 0x0c567ffffa880: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
 0x0c567ffffa890: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
=>0x0c567ffffa8a0: 00[f]a fa fa fa fa fa fa fa fa fa fa fa fa fa
 0x0c567ffffa8b0: fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa
 0x0c567ffffa8c0: fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa
 0x0c567ffffa8d0: fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa
 0x0c567ffffa8e0: fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa
 0x0c567ffffa8f0: fa fa fa fa fa fa fa fa fa fa fa fa fa fa fa
Shadow byte legend (one shadow byte represents 8 application bytes):
Addressable: 00
Partially addressable: 01 02 03 04 05 06 07
Heap left redzone: fa
Freed heap region: fd
Stack left redzone: f1
Stack right redzone: f2
Stack mid redzone: f3
Stack after return: f5
Stack use after scope: f8
Global redzone: f9
Global init order: f6
Poisoned by user: f7
Container overflow: fc

```

```
Array cookie:      ac
Intra object redzone: bb
ASan internal:     fe
Left alloca redzone: ca
Right alloca redzone: cb
Shadow gap:        cc
==791137==ABORTING
```

ist199099 commented on Oct 16

I cannot reproduce this in the tip of the stable branch ([b371427](#)) on Ubuntu 20.04 (with gcc 9.4.0 and clang 10.0.0) on the x86_64 and aarch64 architectures.

This has been assigned [CVE-2020-21606](#).

Assignees

No one assigned

Labels

None yet

Projects

None yet

Milestone

No milestone

Development

No branches or pull requests

2 participants

