

MainConcept HEVC SDK Evaluation Guide

April 20, 2015

Welcome to MainConcept HEVC SDK

This document is intended to guide you through the evaluation process of the MainConcept HEVC Encoder. It covers the basics of the encoder sample application, details settings and provides examples on using configuration files.

Abstract

The MainConcept HEVC / H.265 encoder is a module which converts raw frames (RGB or YUV) into HEVC / H.265 elementary streams according to the specifications set forth in ISO/IEC 23008-2 or ITU-T H.265. The encoder's sample application demonstrates the use of the encoder and is distributed in source and binary format together with source code to facilitate customer application development.

Decoding or demultiplexing of source files as well as multiplexing to container formats like MP4, MPEG-2 Transport Stream or MKV is not covered by the sample application.

Using the sample application

The following description is based on the Windows version of `sample_enc_hevc` but it applies as well to the OS X and Linux versions.

The basic usage of `sample_enc_hevc` is as follows:

```
sample_enc_hevc -<fourcc> -w <width> -h <height> -f <frame_rate> -v <inputfile> -o  
<outputfile> [options]
```

Basic parameters (mandatory)

- **Fourcc:** Any supported color space. The native colorspace of the encoder is I420 but any other supported color space can be specified here. A full list of supported color spaces is found in the HEVC SDK documentation.
- **Width:** Source Picture Width in pixels
- **Height:** Source Picture Height in pixels
- **Frame_rate:** Frame rate of the source image. May be specified as integer or decimal (i.e. 23.976)
- **Inputfile:** Absolute or relative path to source file (RGB or YUV raw frames in one contiguous file)

- **Outputfile:** Absolute or relative path to destination file. Suggested extensions are “.hevc” or “.265”

Optional parameters (selection)

- **Config File (-c):** absolute or relative path to a configuration (or ini) file. For additional information about config files please refer to the following section in this document.
- Pre-configured settings structure for common use cases. Most important presets are:
 - **-Main** (generic HEVC Main Profile)
 - **-Main10** (Main 10 profile defaults using BT.709 and 10-bit resolution)
 - **-divxhevc720p**, **-divxhevc1080p** and **-divxhevc4k**: Predefined presets for DivX HEVC compliance
- **Performance (-perf):** Predefined performance levels ranging from value 0 to value 31 whereby 0 is the absolute fastest configuration and 31 is the best possible, yet slowest performance level.

Configuration files

Configuration files may be used to provide a complete `hevc_v_settings` structure to the encoder or they may be used to only specify parts of the settings structure and use defaults or presets for the remaining fields.

Configuration files are plain text files similar to an `[.ini]` file. The configuration file needs to start with a section identifier. The section identifier can be one of `[HEVC Settings]` or `[HEVC Layer 0000]`.

Example partial configuration file for Main (8-bit) encoding

```
# config file

[HEVC Settings]
preset           = 0
profile          = 1
bit_depth_luma   = 8
bit_depth_chroma = 8

[HEVC Layer 0000]
width            = 3840
height          = 2160
bit_rate_mode    = 2
bit_rate         = 30000000
hss_rate         = 60000000
cpb_size         = 60000000
hrd_conformance = 1
```

This configuration file will set the bit depth to 8 bit (i.e. Main profile) and set the output dimensions to 3840x2160, set rate control mode to VBR (values are explained in the HEVC Encoder documentation), set average bit rate, maximum bit rate (in bits per second) and CPB size and ensure HRD compliance.

Example partial configuration file for Main 10 encoding

```
# config file

[HEVC Settings]
preset                = 1
profile               = 2
bit_depth_luma        = 10
bit_depth_chroma      = 10

[HEVC Layer 0000]
width                 = 3840
height                = 2160
bit_rate_mode         = 2
bit_rate              = 30000000
hss_rate              = 60000000
cpb_size              = 60000000
hrd_conformance       = 1
```

This configuration file will set the bit depth to 10 bit (i.e. Main 10 profile) and set the output dimensions to 3840x2160, set rate control mode to VBR (values are explained in the HEVC Encoder documentation), set average bit rate, maximum bit rate (in bits per second) and CPB size and ensure HRD compliance.

Configuring High Tier vs. Main Tier

By default the encoder will use Main Tier bitrate limits to calculate the HEVC Level. Using the following section in a partial configuration file will enable High Tier:

```
[HEVC Layer 0000]
high_tier              = 1
```

Enhanced Color Gamut (BT.2020)

In order to specify enhanced color gamut (also known as BT.2020 non-const Luma) it is required to specify the values for `transfer_characteristics`, `matrix_coefficients` and `colour_primaries` in the `hevc_v_settings` structure by using a partial configuration file as follows:

```
# config file for BT.2020

[HEVC Settings]
colour_primaries       = 9
matrix_coefficients     = 9
transfer_characteristics = 14
```

Note: BT.2020 is only applicable when using Main 10 profile on images with 3840 x 2160 resolution. It does not apply to any lower resolution.

When the source frames are in a YUV color space (like I420) no additional color conversion will take place. The encoder will simply signal that the material shall be decoded to enhanced color gamut. When the input frames are in RGB color space the encoder will actually perform conversion from RGB to YUV using BT.2020 recommendations.

Using third-party decoders as input

The `sample_enc_hevc` application is capable of receiving input via `stdio` so that any other decoding application which supports output to `stdio` can be used to feed frames into the encoder. For doing so use a hyphen (-) as the input file name like so:

```
<decoding application> -i inputfilename -pix_fmt yuv420p -f rawvideo - |  
sample_enc_hevc -i420 -w <width> -h <height> -f <frame_rate> -v - -o outputfile -c  
<config_file> -perf <performance>
```

Legal subtext

Copyright © 2014 MainConcept GmbH or its affiliates. All rights reserved.

**MAIN
CONCEPT**™

MainConcept and its logos are registered trademarks of MainConcept GmbH or its affiliates. This software is protected by copyright law and international treaties. Unauthorized reproduction or distribution of any portion is prohibited by law.

DivX and DivX Plus Streaming are registered trademarks of DivX, LLC in the USA and other countries.

All other company or product names are trademarks or registered trademarks of their respective owners. This software is protected by copyright law and international treaties. Unauthorized reproduction or distribution of any portion is prohibited by law.

AAC's HE-AAC and HE-AAC v2 versions are regarded as today's most efficient general perceptual audio codecs. AAC has been standardized by ISO and IEC as part of the MPEG specifications. It is understood that it may be necessary to execute a patent license with the appropriate AAC licensing entities in order to obtain all rights necessary to create and exploit products utilizing AAC and it is recommended to contact the appropriate licensing entities, e.g. Via Licensing (www.vialicensing.com), and negotiate in good faith the adequate contracts, if any.

Fraunhofer Institute for Integrated Circuits IIS
Attention: Audio and Multimedia Departments - MC AAC LL
Am Wolfsmantel 33
91058 Erlangen, Germany
www.iis.fraunhofer.de/amm
amm-info@iis.fraunhofer.de

Adobe and Flash are trademarks or registered trademarks of Adobe Systems Incorporated in the USA and other countries.

Dolby Digital codec manufactured under license from Dolby Laboratories. Dolby and the double-D symbol are trademarks of Dolby Laboratories. Copyright 2003-2007 Dolby Laboratories, all rights reserved.

Quicktime is a registered trademark of Apple Computer, Inc.

Edition: April 2015