

# Intel® Media Software Development Kit 2018 R1 Release Notes

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## Overview

The **Intel® Media Software Development Kit\*** (further referred to as the Media SDK) is a software development package that exposes the media acceleration capabilities of Intel® platforms for video decoding, encoding, RAW video and photo processing. The API covers a wide range of Intel platforms. The Media SDK targets general application developers who want to integrate accelerated media into their applications.

## New Features

The Intel® Media SDK 2018 R1 introduces API version 1.26. This version is backward compatible with the previous API versions.

Following fixes, improvements and features were added for 6<sup>th</sup> Generation Intel® Core™, 7<sup>th</sup> Generation Intel® Core™, 8<sup>th</sup> Generation Intel® Core™, Intel® Celeron® and Pentium®.

- API updates comparing to 1.23:
  - mfxcommon.h: added enumerators MFX\_PLATFORM\_GEMINILAKE, MFX\_PLATFORM\_COFFEELAKE, MFX\_PLATFORM\_CANNONLAKE for definition new types of platforms.
  - mfxbrc.h: added extended buffer mfxExtBRC and structures mfxBRCFrameParam, mfxBRCFrameCtrl, mfxBRCFrameStatus and enumerators MFX\_BRC\_OK, MFX\_BRC\_BIG\_FRAME, MFX\_BRC\_SMALL\_FRAME, MFX\_BRC\_PANIC\_BIG\_FRAME, MFX\_BRC\_PANIC\_SMALL\_FRAME for definition possible BRC statuses.
  - mfxstructures.h: added structure mfxA2RGB10 and field mfxFrameData.A2RGB10.

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- mfxstructures.h: added new CodecId MFX\_CODEC\_AV1.
- mfxstructures.h: added extended buffer mfxExtEncodedUnitsInfo, struct mfxEncodedUnitInfo, and fields mfxExtCodingOption3::EncodedUnitsInfo, mfxExtCodingOption3::EnableNalUnitType, mfxEncodeCtrl::MfxNalUnitType.
- mfxstructures.h: added MFX\_MEMTYPE\_VIDEO\_MEMORY\_ENCODER\_TARGET for definition memory type.
- mfxstructures.h: added enumerators MFX\_HEVC\_NALU\_TYPE\_UNKNOWN, MFX\_HEVC\_NALU\_TYPE\_TRAIL\_N, MFX\_HEVC\_NALU\_TYPE\_TRAIL\_R, MFX\_HEVC\_NALU\_TYPE\_RADL\_N, MFX\_HEVC\_NALU\_TYPE\_RADL\_R, MFX\_HEVC\_NALU\_TYPE\_RASL\_N, MFX\_HEVC\_NALU\_TYPE\_RASL\_R, MFX\_HEVC\_NALU\_TYPE\_IDR\_W\_RADL, MFX\_HEVC\_NALU\_TYPE\_IDR\_N\_LP, MFX\_HEVC\_NALU\_TYPE\_CRA\_NUT for definition NAL unit types supported by HEVC encoder.
- mfxstructures.h: added extended buffers mfxExtMasteringDisplayColourVolume and mfxExtContentLightLevelInfo and enumerators MFX\_PAYLOAD\_OFF, MFX\_PAYLOAD\_IDR for definition type of HDR payloads.
- mfxstructures.h: added fields mfxVPPCompInputStream.TileId and mfxExtVPPComposite.NumTiles.
- mfxstructures.h: added enumerators MFX\_MBQP\_MODE\_QP\_VALUE, MFX\_MBQP\_MODE\_QP\_DELTA and fields mfxExtMBQP.Mode, mfxExtMBQP.BlockSize, mfxExtMBQP.DeltaQP.
- mfxstructures.h: added enumerators MFX\_ERROR\_PPS, MFX\_ERROR\_SPS, MFX\_ERROR\_SLICEHEADER, MFX\_ERROR\_SLICEDATA, MFX\_ERROR\_FRAME\_GAP and extended buffer mfxExtDecodeErrorReport.
- mfxstructures.h: added enumerators MFX\_CHROMA\_SITING\_UNKNOWN, MFX\_CHROMA\_SITING\_VERTICAL\_TOP, MFX\_CHROMA\_SITING\_VERTICAL\_CENTER, MFX\_CHROMA\_SITING\_VERTICAL\_BOTTOM, MFX\_CHROMA\_SITING\_HORIZONTAL\_LEFT, MFX\_CHROMA\_SITING\_HORIZONTAL\_CENTER and extended buffer mfxExtColorConversion.
- mfxstructures.h: added enumerators MFX\_MF\_DEFAULT, MFX\_MF\_DISABLED, MFX\_MF\_AUTO, MFX\_MF\_MANUAL and extended buffers mfxExtMultiFrameParam, mfxExtMultiFrameControl.

- mfxstructures.h: added field mfxExtCodingOption3::ExtBrcAdaptiveLTR.
- mfxstructures.h: added fields mfxExtHEVCParam::SampleAdaptiveOffset and enumerators MFX\_SAO\_UNKNOWN, MFX\_SAO\_DISABLE, MFX\_SAO\_ENABLE\_LUMA, MFX\_SAO\_ENABLE\_CHROMA for definition values of SampleAdaptiveOffset.
- mfxstructures.h: added field mfxExtCodingOption3::TransformSkip.
- mfxstructures.h: added field mfxExtHEVCParam::LCUSize.
- mfxstructures.h: added extended buffers mfxExtVP9Segmentation, structure mfxVP9SegmentParam and enumerators:
  - MFX\_VP9\_SEGMENT\_ID\_BLOCK\_SIZE\_UNKNOWN, MFX\_VP9\_SEGMENT\_ID\_BLOCK\_SIZE\_8x8, MFX\_VP9\_SEGMENT\_ID\_BLOCK\_SIZE\_16x16, MFX\_VP9\_SEGMENT\_ID\_BLOCK\_SIZE\_32x32, MFX\_VP9\_SEGMENT\_ID\_BLOCK\_SIZE\_64x64 for definition possible sizes of blocks.
  - MFX\_VP9\_SEGMENT\_FEATURE\_QINDEX, MFX\_VP9\_SEGMENT\_FEATURE\_LOOP\_FILTER, MFX\_VP9\_SEGMENT\_FEATURE\_REFERENCE, MFX\_VP9\_SEGMENT\_FEATURE\_SKIP for definition types of features which can be enabled.
  - MFX\_VP9\_REF\_INTRA, MFX\_VP9\_REF\_LAST, MFX\_VP9\_REF\_GOLDEN, MFX\_VP9\_REF\_ALTREF for definition types of reference frames.
- mfxstructures.h: added extended buffer mfxExtVP9TemporalLayers and structure mfxVP9TemporalLayer.
- mfxstructures.h: added extended buffer mfxExtVP9Param.
- mfxstructures.h: added extended buffer mfxExtVppMctf.
- mfxplugin.h: added new GUID for GACC - MFX\_PLUGINID\_HEVCE\_DP\_GACC.

For detailed API description please refer to mediasdk-man.pdf and mediasdkusr-man.pdf for plugin API.

- HW AVC Encode:
  - Added support of ROI delta QP.
  - Added Repartition check enabling/disabling feature for better quality/performance tradeoff flexibility.

- Added support of MFX\_FOURCC\_BGR4 and DXGI\_FORMAT\_R8G8B8A8\_UNORM input surfaces.
- Added support of encoded unit reporting.
- Added support of ExtBrcAdaptiveLTR.
- HW HEVC Encode:
  - Added support of MFX\_RATECONTROL\_LA\_EXT rate control method based on AVCe LookAhead implementation.
  - Added interlaced content encoding support.
  - Added support of HDR SEI messages configuration via mfxExtMasteringDisplayColourVolume and mfxExtContentLightLevelInfo.
  - Added support of SampleAdaptiveOffset as preview for the next generation Intel® processors.
  - Added support of TransformSkip as preview for the next generation Intel® processors.
  - Added support of LCUsize as preview for the next generation Intel® processors.
- GACC Encoder:
  - GACC encoder was included into default Media SDK plugin which is a part of graphics driver (mfxplugin\*.dll, since version 100.6003). Please see Media SDK 2018 R1 - HEVC Decoder and Encoder Release Notes for recommended way to load GACC.
- VP9 Encoder:
  - Added support of encoder as preview for the next generation Intel® processors.
- HW VPP:
  - Added support of field weaving and splitting algorithms.
  - Number of channels for composition were increased from 8 to 128 for DXD11.
  - Added support of chroma siting.
- Tracer updated to 1.26 API.

- Media RAW Accelerator Plug-in distribution is changed. It is distributed now as a part of default Media SDK plugin which is a part of graphics driver (mfxplugin\*.dll) and not included to the SDK package.
- Media SDK dynamic library for audio processing was deprecated.
- Screen Capture plug-in was deprecated.
- Stereoscopic 3D was deprecated.
- Premium Telecine Interlace Reverser Plug-in was deprecated.

All the new features listed above are not supported by software implementation of the Media SDK Library.

In a particular platform specific hardware implementation of the Media SDK Library some of the features may also be unsupported. Make sure to call `Query` functions to check the actual support.

Please see the Media SDK Reference Manual for details "`<install-folder>\Software Development Kit\doc\mediasdk-man.pdf`"

Please see the RAW Media Accelerator plug-in Reference Manual for details "`<install-folder>\Software Development Kit\doc\mediasdk-raw-accelerator-man.pdf`"

For information on the USER class please see "`<install-folder>\Software Development Kit\doc\mediasdkusr-man.pdf`"

For information on Multi-view Video Coding support please see "`<install-folder>\Software Development Kit\doc\mediasdkmvc-man.pdf`"

For information on JPEG\*/Motion JPEG Video Coding support please see "`<install-folder>\Software Development Kit\doc\mediasdkjpeg-man.pdf`"

Please see the Media SDK Interlace content support in HEVC encoder for Windows for more details "`<install-folder>\Software Development Kit\doc\mediasdk_hevc_interlace_whitepaper.pdf`"

Please see the Media SDK 2018 R1 - HEVC Decoder and Encoder Release Notes for more details about HEVC plugins "`<install-folder>\HEVC Decoder & Encoder\mediasdk_hevc_release_notes.pdf`"

## System Requirements

### Hardware

- IA-32 or Intel® 64 architecture processors with support for Intel® Streaming SIMD Extensions 2 instructions – for running software implementation of the Media SDK Library.

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- Hardware acceleration is available through hardware implementations of the Media SDK Library coming with Intel® Iris™ and HD Graphics Driver for Microsoft\* Windows\* 10 and Windows\* Server 2016 on platforms with:
  - 3<sup>rd</sup> Generation Intel® Core™ processors,
  - 4<sup>th</sup> Generation Intel® Core™ processors,
  - 5<sup>th</sup> Generation Intel® Core™ processors,
  - 6<sup>th</sup> Generation Intel® Core™ processors,
  - 7<sup>th</sup> Generation Intel® Core™ processors,
  - 8<sup>th</sup> Generation Intel® Core™ processors,
  - Intel® Core™ M processors,
  - Intel® Xeon® E3-1200 and E3-1500 v5 Family with C236 chipset and v4 Family with C226 chipset,
  - Selected SKUs of Intel® Celeron™ and Intel® Pentium™ processors with Intel HD Graphics which support Intel® Quick Sync Video,
  - Selected SKUs of Intel® Atom™ processors with Intel® HD Graphics which support Intel Quick Sync Video,
  - The next generation Intel® processors as rpe-release.

## Software

- Microsoft Windows 10 and updates.
- Microsoft Windows\* Server 2016.
- Microsoft Visual C++\* 2012 or later version of Microsoft Visual C++.

## Package Contents

<code>&lt;install-folder&gt;\Software Development Kit</code>	<ul style="list-style-type: none"> <li>• The Media SDK Release Notes (this file), End User License Agreement (EULA) "Media_SDK_EULA.rtf"</li> <li>• <code>redist.txt</code></li> <li>• <code>third_party_programs.txt</code></li> </ul>
<code>&lt;install-folder&gt;\Software Development Kit\bin\x64</code>	<p>The Media SDK Dynamic Library, software implementation:</p> <p><code>libmfxsw64.dll</code> for Intel® 64 architecture version 8.0.0.025</p>
<code>&lt;install-folder&gt;\Software Development Kit\bin\win32</code>	<p>The Media SDK Dynamic Library,</p>

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	<p>software implementation:</p> <p>libmfxsw32.dll for Intel® 32 architecture</p> <p>version 8.0.0.025</p>
<p>&lt;install-folder&gt;\Software Development Kit\bin\x64\588f1185d47b42968dea377bb5d0dcb4</p>	<p>The Media SDK Look Ahead plug-in:</p> <ul style="list-style-type: none"> <li>• Look Ahead plug-in mfxplugin64_h2641a_hw.dll for Intel® 64 architecture</li> <li>• Configuration file plugin.cfg</li> </ul> <p>Plugin product version: 1.26.6.25</p>
<p>&lt;install-folder&gt;\Software Development Kit\bin\win32\588f1185d47b42968dea377bb5d0dcb4</p>	<p>The Media SDK Look Ahead plug-in:</p> <ul style="list-style-type: none"> <li>• Look Ahead plug-in Mfxplugin32_h2641a_hw.dll for Intel® 32 architecture</li> <li>• Configuration file plugin.cfg</li> </ul> <p>Plugin product version: 1.26.6.25</p>
<p>&lt;install-folder&gt;\Software Development Kit\doc</p>	<p>Media SDK documentation:</p> <ul style="list-style-type: none"> <li>• Media SDK Reference Manual mediasdk-man.pdf</li> <li>• Media SDK Extensions for User-Defined Functions mediasdkusr-man.pdf</li> <li>• Media SDK Extensions for Multi-view Video Coding mediasdkmvc-man.pdf</li> <li>• Media SDK Extensions for JPEG*/Motion JPEG mediasdkjpeg-man.pdf</li> <li>• Media SDK Library Distribution and Dispatching Process Description mediasdk-distrib.pdf</li> <li>• RAW Accelerator Reference Manual media-raw-accelerator-man.pdf</li> <li>• Media SDK Interlace content support in HEVC encoder for</li> </ul>

	<p>Windows</p> <p>mediasdk_hevc_interlace_white paper.pdf</p>
<p>&lt;install-folder&gt;\Software Development Kit\include</p>	<p><b>External Media SDK headers:</b></p> <ul style="list-style-type: none"> <li>• Type definitions in <code>mfxdefs.h</code></li> <li>• Structure definitions in <code>mfxstructures.h</code>, <code>mfxastructures.h</code>, <code>mfxvstructures.h</code> and <code>mfxcommon.h</code></li> <li>• SDK session related definitions in <code>mfxsession.h</code></li> <li>• Video function definitions in C in <code>mfxvideo.h</code></li> <li>• C++ wrapper of the SDK video functions in <code>mfxvideo++.h</code></li> <li>• Extensions for Multi-view Video Coding options <code>mfxmvc.h</code></li> <li>• Extensions for User-Defined Functions <code>mfxplugin.h</code></li> <li>• C++ wrapper for User-Defined Functions <code>mfxplugin++.h</code></li> <li>• Extensions for JPEG*/Motion JPEG Video coding options <code>mfxjpeg.h</code></li> <li>• Structure definitions for RAW Media Accelerator <code>mfxcamera.h</code></li> <li>• Definitions for vp8 and vp9 codecs <code>mfxvp8.h</code>, <code>mfxvp9.h</code></li> <li>• Definitions for enc, pak functions and additional features <code>mfxenc.h</code>, <code>mfxpak.h</code>, <code>mfxla.h</code></li> <li>• Definitions for BRC <code>mfxbrc.h</code></li> </ul>
<p>&lt;install-folder&gt;\Software Development Kit\lib\x64</p>	<p><b>Static Dispatcher Library</b> <code>libmfx.lib</code> and <code>libmfx_vs2015.lib</code> for Microsoft* Visual Studio 2015</p>
<p>&lt;install-folder&gt;\Software Development Kit\lib\win32</p>	<p><b>Static Dispatcher Library</b> <code>libmfx.lib</code> and <code>libmfx_vs2015.lib</code> for Microsoft*</p>



	Visual Studio 2015
<install-folder>\Software Development Kit\opensource	Source code of the Media SDK dispatcher
<install-folder>\Software Development Kit\tools	<p>Contains the following tools in binary form:</p> <ul style="list-style-type: none"> <li>• Media SDK Tracer in folder <code>mediasdk_tracer</code>. This utility performs runtime recording of the Media SDK API calls and parameters to a log file.</li> <li>• Media SDK System Analyzer in folder <code>mediasdk_sys_analyzer</code>. This utility analyzes the system and reports back the Media SDK related capabilities, graphics driver and components status.</li> </ul>
<install-folder>\HEVC Decoder & Encoder	<p>HEVC Decoder and Encoder Release Notes</p> <p><code>mediasdk_hevc_release_notes.pdf</code></p>
<install-folder>\HEVC Decoder & Encoder\Plugin\2fca99749fdb49aeb121a5b63ef568f7	<p>The Media SDK HEVC encode plug-in:</p> <ul style="list-style-type: none"> <li>• Software encode plug-in <code>mfxplugin64_hevce_sw.dll</code> for Intel® 64 architecture</li> <li>• Configuration file <code>plugin.cfg</code></li> </ul> <p>Plugin product version: 1.26.8.25</p>
<install-folder>\HEVC Decoder & Encoder\Plugin\15dd936825ad475ea34e35f3f54217a6	<p>The Media SDK HEVC decode plug-in:</p> <ul style="list-style-type: none"> <li>• Software decode plug-in <code>mfxplugin64_hevcd_sw.dll</code> for Intel® 64 architecture</li> <li>• Configuration file <code>plugin.cfg</code></li> </ul> <p>Plugin product version: 1.26.8.25</p>
<install-folder>\HEVC Decoder & Encoder\Plugin\e5400a06c74d41f5b12d430bbaa23d0b	<p>The Media SDK HEVC GPU Accelerated Encode plug-in plug-in:</p> <ul style="list-style-type: none"> <li>• GACC plug-in</li> </ul>

	mfxplugin64_hevce_gacc.dll for Intel® 64 architecture <ul style="list-style-type: none"> <li>• Configuration file plugin.cfg</li> </ul> Plugin product version: 1.26.5.26
<install-folder>\Video Quality Caliper	Media Server Studio – Video Quality Caliper.
<Documents folder>\Intel® Media SDK 2018 R1 - Media Samples 8.3.26.352	The Media SDK Samples.

## Installation

- Installation requires full administrative rights.
- Run the installer `Intel_Media_SDK_2018_R1.msi`.

## Known Limitations

Media SDK libraries and driver have the following known limitations. Unless explicitly specified each limitation is relevant for both software and hardware implementations of SDK dynamic library.

### API

- The following APIs are not supported by the software implementation of the SDK library:
  - `mfxExtEncoderCapability`, `mfxExtEncoderResetOption`, `mfxExtAVCEncodedFrameInfo`;
  - `MFX_RATECONTROL_LA`, `MFX_RATECONTROL_ICQ`, `MFX_RATECONTROL_LA_ICQ`, `MFX_RATECONTROL_VCM`, `MFX_RATECONTROL_QVBR`, `MFX_RATECONTROL_LA_HRD` and any options related to these BRC modes;
  - `mfxExtVPPComposite`, `mfxExtVPPDeinterlacing`;
  - `mfxExtAVCRefListCtrl::ApplyLongTermIdx`, `LongTermIdx`;
  - `mfxExtEncoderROI`;
  - `mfxExtCodingOption2::Trellis`, `MBBRC`, `ExtBRC`, `RepeatPPS`, `BRefType`, `AdaptiveI`, `AdaptiveB`, `LookAheadDS`;
  - `mfxInfoMFX::ICQQuality`;
  - `mfxEncodeCtrl::SkipFrame`;
  - `MFX_PLUGINID_HEVCE_HW`, `MFX_EXTBUFF_HEVC_PARAM`, `mfxExtHEVCParam`;
  - `CreateAccelerationDevice`;

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- o MFXInitEx, MFXDoWork, mfxInitParam, mfxExtThreadsParam;
- o mfxInfoMFX::LowPower;
- o MFX\_EXTBUFF\_DECODED\_FRAME, mfxExtDecodedFrameInfo, MFX\_EXTBUFF\_TIME\_CODE, mfxExtTimeCode;
- o mfxExtCodingOption3;
- o mfxExtPredWeightTable;
- o mfxExtDirtyRect;
- o mfxExtMovingRect;
- o mfxInitParam::GPUCopy;
- o mfxInfoMFX::MaxDecFrameBuffering;
- o mfxVideoParam:: AllocId;
- o MFX\_MEMTYPE\_EXPORT\_FRAME;
- o mfxExtCodingOptionVPS;
- o mfxExtVPPRotation;
- o mfxExtVPPSignalInfo;
- o mfxExtVPPMirroring;
- o MFXVideoCORE\_QueryPlatform;
- o mfxPayload::CtrlFlags;
- o mfxFrameData::MemType;
- o mfxExtVPPScaling;
- o mfxExtVPPColorFill;
- o mfxExtEncodedSlicesInfo;
- o MFX\_MEMTYPE\_SHARED\_RESOURCE;
- o mfxCoreInterface::QueryPlatform;
- o mfxExtSceneChange;
- o mfxExtVPPColorFill;
- o mfxExtHEVCRegion;
- o mfxExtVPPFieldProcessing;
- o MFX\_DEINTERLACING\_ADVANCED\_SCD;
- o MFX\_DEINTERLACING\_FIELD\_WEAVING;
- o MFX\_REFRESH\_NO, MFX\_REFRESH\_VERTICAL, MFX\_REFRESH\_HORIZONTAL, MFX\_REFRESH\_SLICE;
- o MFXCoreInterface::QueryPlatform;
- o mfxExtDecVideoProcessing;
- o mfxExtMBForceIntra;
- o mfxExtBRC;
- o mfxEncodeCtrl::MfxNalUnitType;
- o mfxExtEncodedUnitsInfo;

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- mfxExtMasteringDisplayColourVolume;
  - mfxExtContentLightLevelInfo;
  - mfxExtMBQP;
  - mfxExtDecodeErrorReport;
  - mfxExtColorConversion;
  - mfxExtMultiFrameParam and mfxExtMultiFrameControl;
  - mfxExtVppMctf.
- The below APIs are not supported by the hardware implementation of SDK Library in this release. For other APIs not mentioned in this list make sure to call `Query` functions to check the actual support on a particular platform as it may vary.
    - mfxExtCodingOption2::AdaptiveI, AdaptiveB, UseRawRef;
    - mfxExtAVCEncodedFrameInfo::MAD, BRCPanicMode, QP;
    - MFX\_PLUGINID\_VP8D\_HW;
    - mfxExtChromaLocInfo;
    - MFXInitEx, MFXDoWork, mfxInitParam, mfxExtThreadsParam;
    - mfxExtDirtyRect;
    - mfxExtMoveRect;
    - mfxExtCodingOption3::ScenarioInfo, ContentInfo, EnableMBQP, DirectBiasAdjustment, GlobalMotionBiasAdjustment;
    - mfxExtCodingOptionVPS;
    - mfxExtEncodedSlicesInfo;
    - mfxExtSceneChange;
    - mfxExtHEVCRegion;
    - mfxExtVPPFieldProcessing;
    - mfxExtMBQP;
    - mfxExtVppMctf.

## Functional

### Common/general limitations:

- The SDK dispatcher `libmfx.lib` is best used with a standard DLL entry point (as recommended by Microsoft\*) when used in a DLL application such as a Microsoft DirectShow\* filter. The DLL entry point setting can be found under the `Link > Advanced compiler options`. Non-standard entry points can be used, but are not recommended.
- Loading of SDK dynamic libraries `libmfxsw64.dll` and `libmfxhw64.dll` not through the dispatcher is unsafe.
- Some versions of drivers for Windows 10 update codename "Redstone 3" changed Media SDK runtime location and removed registry entries, old dispatchers had a bug loading runtime in multi-GPU environment and Intel Graphics is not default device, when there are no registry information

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available. To work correctly with Media SDK, applications need to update dispatcher.

- Using the software implementation of SDK in parallel with Intel® Threading Building Blocks could impact performance.
- The number of internal tasks in hardware implementation is limited to 1024. This imposes a related limitation on the number of SDK sessions which depends on the number of components in a session and the asynchronous depth of each component: each component (DECODE, ENCODE or VPP) requires one task for synchronous operation and N tasks for asynchronous operation with depth N.
- This release supports only 64-bit Microsoft\* Windows\* applications.
- Microsoft DirectX\* 11.1 is the only supported acceleration infrastructure (due to headless mode requirement).
- On Windows 10 bitstreams produced by any encoder can be not bit exact from time to time, but no visible difference.
- Recommended to use system memory allocated with pointer alignment to 64, otherwise result can contain corruptions and sometimes pipeline can be broken.

JPEG encode, decode:

- The feature set of JPEG decoder/encoder is limited to the following:
  - Baseline mode only
    - DCT based;
    - 8-bit samples;
    - Sequential;
    - loadable 2 AC and 2 DC Huffman tables;
    - 3 loadable quantization matrixes;
    - interleaved and non-interleaved scans;
    - single and multiple scans.
  - No extended, lossless and hierarchical modes
    - no 12-bit samples;
    - no progressive;
    - no arithmetic coding;
    - no 4 AC and 4 DC Huffman tables.
- JPEG decoder does not set `Corrupted` flag of `mfxFrameData` structure, and does not accept `MFX_BITSTREAM_EOS` as `DataFlag` of `mfxBitstream` structure.
- Software library implementation can break pipeline in stress multisession encoding and complex threading graphs scenarios when two or more encoders sharing the same `mfxFrameSurface1` object and memory handling implemented through `MemId`.

- Encoder with GPU copy may produce stream with not bit to bit with stream encoded without GPU copy.

#### HEVC decode:

- HEVC HW plugin MAIN10 profile limited to Luma and Chroma BitDepth 10, all other BitDepth are unsupported in current implementation.
- HW HEVC decode plugin is limited to 4096x2304 resolution and doesn't implement SW fallback for higher resolutions 5<sup>th</sup> generation Intel® Core and Intel® Xeon E3 v4. You may use software implementation of HEVC decode from Intel® Media Server Studio 2015 – Professional Edition to support higher resolutions. On 6<sup>th</sup> Generation Intel Core and Xeon E3 v5 it is limited to 8192x8192 resolution.
- Interlaced decoding is supported only through separate field output(half frame size), and no specific reporting of such behavior implemented in current version, if App need interlace decode support, it can detect interlaced sequence through: get SEI through GetPayload, parse SEI message to get pic\_struct value for SEI semantics(See D.2.3 section of High efficiency video coding).

#### H.264 decode:

- H.264 decoder may consume more than 1 frame from the input bitstream and then propagate same timestamp to all of the consumed frames. If accurate time stamp handling is required the application has to make sure that it doesn't store more than one-frame wise data in the input bitstream.

#### MPEG-2 encode limitations:

- If the MPEG-2 Video encoder `mfxVideoParam::mfxInfoMFX::CodecProfile` is initialized to 0, then the stream will be encoded as `MXF_PROFILE_MPEG2_MAIN`. Additionally if the MPEG-2 Video encoder `mfxVideoParam::mfxInfoMFX::CodecLevel` is initialized to 0, then the stream will be encoded as `MXF_LEVEL_MPEG2_MAIN`.
- MPEG-2 encode may produce not bit to bit result from run to run on 5<sup>th</sup> generation Intel® Core and Intel® Xeon E3 v4. Run to run variation doesn't affect visual quality.
- `mfxExtCodingOption3::BRCPanicMode` not supported for windows.
- On 7<sup>th</sup>, 8<sup>th</sup> generations Intel® Core, encoder doesn't support `GopOptFlag = GOP_STRICT`.

#### HEVC encode limitations:

- Supports maximum resolution 4096x2172.
- Supports only CQP, CBR, VBR, ICQ and AVBR rate control methods, as well as `MXF_RATECONTROL_LA_EXT` with lookahead plugin.
- Query max macroblock per second report not supported.
- Next limitation for encoded bitstream:
  - No tiles support;
  - No P slice;
- QP Offset for HEVC is 1 by default.
- HW Accelerated HEVC encode supports next extended buffer ids, with listed limitations:
  - `MXF_EXTBUFF_CODING_OPTION`;

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- MFX\_EXTBUFF\_OPAQUE\_SURFACE\_ALLOCATION;
- MFX\_EXTBUFF\_HEVC\_REFLISTS;
- MFX\_EXTBUFF\_HEVC\_REFLIST\_CTRL;
- MFX\_EXTBUFF\_CODING\_OPTION\_VPS;
- MFX\_EXTBUFF\_ENCODED\_FRAME\_INFO;
- MFX\_EXTBUFF\_VIDEO\_SIGNAL\_INFO;
- MFX\_EXTBUFF\_CODING\_OPTION2;
- Supported:
  - MBBRC;
  - BRefType;
  - NumMbPerSlice;
  - DisableDeblockingIdc;
  - RepeatPPS;
  - NumMbPerSlice;
  - MaxFrameSize;
- MFX\_EXTBUFF\_CODING\_OPTION3;
- Supported:
  - PRefType;
  - EnableQPOffset;
  - QPOffset;
  - TransformSkip;
- MFX\_EXTBUFF\_CODING\_OPTION\_SPSPPS;
- MFX\_EXTBUFF\_HEVC\_TEMPORAL\_LAYERS;
- MFX\_EXTBUFF\_ENCODER\_RESET\_OPTION;
- MFX\_EXTBUFF\_HEVC\_PARAMS:
  - GeneralConstraintFlags: not supported;
  - SampleAdaptiveOffset not supported with target usage 7, explicit weighted prediction, LCUSize = 16 and 10 bit, LowPower encoder supports only MFX\_SAO\_ENABLE\_LUMA, MFX\_SAO\_ENABLE\_LUMA in combination with MaxSliceSize is not supported;
- MFX\_EXTBUFF\_LOOKAHEAD\_STAT;
- MFX\_EXTBUFF\_MASTERING\_DISPLAY\_COLOUR\_VOLUME;
- MFX\_EXTBUFF\_CONTENT\_LIGHT\_LEVEL\_INFO.
- Encoder with CBR rate control and height bitrate may produce stream with HRD overflows.
- MaxFrameSize violation may happen in case of low bitrate and specific content. To avoid MaxFrameSize violation recommend to set  $MaxFrameSize > 5 * Bitrate / FPS / 8$ .
- Encoder with CBR rate control, big resolution and small max bitrate may fail.
- Supports maximum payloads 160 byte per frame.
- GopOptFlag == MFX\_GOP\_CLOSED | MFX\_GOP\_STRICT isn't supported in HEVC by library.
- HEVC encoder doesn't check FrameOrder values of input frames in EncodedOrder mode.
- Certain GOP pattern and stream content interlace modes may result in worse visual quality comparing to progressive mode.

#### H.264 AVC/MVC encode limitations:

- Specific QSV-FF encode limitations:

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- Only I and P frame types supported, so no API related to B frames encoding supported.
- CQP, CBR, VBR and QVBR rate control methods only.
- Supported QP values range: 10 – 51.
- Only progressive encoding supported.
- Maximum number of reference frames equal to 3.
- Encoding quality can be worse than legacy encode with similar parameters.
- Encoding bitrates higher than 43 Mbps not supported in current implementation.
- MaxSliceSize feature can produce slices non-compliant to specified value, it is content dependent how often slice size overflow can occur, so need to be tested according to usage and requirement if such violations acceptable or not.
- QSV-FF encode not utilizing render engine, except next 2 cases:
  - Target Usage equal to 1 and NumRefFrame equal to 3.
  - ARGB used as input.
- Not supported `mfxExtCodingOption3::AdaptiveMaxFrameSize`.
- MaxQP with MaxFrameSize – not working, MaxQP will have more priority and MaxFrameSize will be violated.
- Frames for different views in single AU in MVC encoder must be provided to encoder in order specified by `mfxMVCViewDependency`.
- `MFX_EXTBUFF_AVC_REFLIST_CTRL` and `MFX_EXTBUFF_CODING_OPTION_SPSPPS` external buffers are not supported by MVC encoder.
- MVC encoder supports `MFX_PROFILE_AVC_STEREO_HIGH` only.
- H.264 encoder in software implementation doesn't support processing of `mfxExtPictureTimingSEI` template. During initialization 0xFFFF values will be reset to default values. In runtime 0xFFFF values will be put to bitstream as is.
- H.264 encoder in software implementation has next limitation: the value `NumberOfProcessors * Frame_Width * Frame_Height * 2.5` should not be greater than 2Gb if using CABAC, 1 GB if using CAVLC.
- `RefPicMarkRepSEI` syntax is not supported by MVC encoder.
- Known limitations for H.264 Multiple-Segment Encoding:
  - Hardcoded HRD parameters: `bit_rate_scale = 0`, `cpb_size_scale = 3`.
  - Encoded `bit_rate_value_minus1`, `bit_rate_scale` represent BitRate from original SPS within precision of Kbps (maximum supported BitRate is  $2^{16} - 1$  Kbps).
  - Encoded `cpb_size_value_minus1`, `cpb_size_scale` represent CpbSize from original SPS within precision of Kb (maximum supported CpbSize is  $2^{16} - 1$  Kb).
  - Encoded `time_scale`, `num_units_in_tick` could be both multiplied by 2 if the `time_scale` from original SPS is odd.
  - Conflicts between SPS/PPS and `mfxVideoParam` for parameters that are not covered by SPS/PPS could lead to change of parameters in SPS/PPS.



- Target usage 7 of H.264/MVC encoders in software implementation is known to have a non-monotonic quality versus bitrate dependency.
- MVC encoder ignores any user SEI messages for the dependent view.
- The look ahead bitrate control mode may produce non HRD compliant encoded streams.
- `mfExtCodingOption2::LookAheadDS` currently supports only `MFX_LOOKAHEAD_DS_OFF` and `MFX_LOOKAHEAD_DS_2x`, `MFX_LOOKAHEAD_DS_4x` will give the same result as `MFX_LOOKAHEAD_DS_2x`. `MFX_LOOKAHEAD_DS_OFF` is the default value for target usage 1 and 2. `MFX_LOOKAHEAD_DS_2x` is the default value for target usages 3 – 7.
- H.264 and MVC encoders may not obey the minimum compression ratio required by the Blu-Ray\*/AVCHD\* specifications when the requirement is stronger than in H.264 standard.
- The value reported via `mfExtEncoderCapability::MBPerSec` may be bigger than the actual maximum processing rate of the encoder.
- To change encoding parameters on the fly with `Reset()` function w/o IDR insertion application should drain all the buffered surfaces from encoder. Otherwise encoder may demonstrate undefined behavior after `Reset`.
- Call of `Reset` which starts new sequence (inserts IDR) will drop HRD conformance over the inserted IDR (CPB removal counter will be set to 0 in the IDR Picture Timing SEI).
- HRD violations are possible in specific scenarios (e.g. massive frame skipping).
- Encoder prohibits increase of DPB size (`NumRefFrame`) via `Reset` function even if new size is lower than initialization value. `Reset` function will return `MFX_ERR_INCOMPATIBLE_VIDEO_PARAM` on any attempt to increase `NumRefFrame`.
- Target usage `MFX_TARGETUSAGE_BEST_SPEED` may produce better objective quality than `MFX_TARGETUSAGE_BALANCED`.
- Encoder may not insert PCM macroblocks when required. Encoding of specific (complex) content with huge bitrate (which makes encoder insert many PCM MBs) may cause a GPU hang on Haswell.
- `Reset` function isn't supported for LookAhead BRC modes. `Reset` function doesn't return an error when called together with LA BRC. Result of such `Reset` call is undefined.
- B-pyramid isn't supported together with HRD compliant Look Ahead BRC (`MFX_RATECONTROL_LA_HRD`) and Look Ahead BRC with sliding window control (`MFX_RATECONTROL_LA` and `WinBRCTMaxAvgKbps` and `WinBRCTSize`).
- Careful memory/resource planning is needed when using Look Ahead BRC due to storage of pre-analyzed frames. 1:N and N:N transcoding use cases are especially demanding for memory.
- When external Look Ahead BRC is used in transcoding pipeline which includes Frame Rate conversion (FRC), FRC in the pipeline should take place before external Look Ahead. Otherwise encoder may return error `MFX_ERR_UNDEFINED_BEHAVIOR` from `EncodeFrameAsync` calls.

- Trellis option can be enabled only on lower target usages, on some of those it is enabled by default but can be switched off. Exact implementation details are hidden and may change with time and between platforms. Use of Query function to retrieve actual support is strongly recommended.
- SkipFrame feature has the following limitations:
  - If GOP has only P frames, arbitrary P can be skipped. When skipped, it is made non-reference.
  - If GOP has B frames, only non-reference B can be skipped.
- Some fails can happen during encoding in case of reinitialization of encoder in one session with DirectX11.
- On specific content and height bitrate encoder doesn't always re-code MB as PCM when its size exceed allowed by standard.
- Encoding using VBR and dynamically adjusted the MaxFrameSize on a per-frame basis algorithm may leads to HRD buffer underflow and quality artifacts.
- Max bitrate violations are possible in case of using VBR and specific payload.
- For RGB input in case of unspecified `mfxExtVideoSignalInfo::MatrixCoefficients` or not equals 1 will be used BT.601, if `mfxExtVideoSignalInfo::MatrixCoefficients = 1` - BT.709. Actual list of supported conversions may depend from version of driver. On 7<sup>th</sup> Generation Intel® Core™ and driver 15.46 `mfxExtVideoSignalInfo::MatrixCoefficients` will be ignored.
- For HW BRC: supported only `WinBRCSIZE <= 1` sec.
- Enable/disable repartition check is not supported in case of LowPower encoder mode.
- For explicit weighted prediction since 7<sup>th</sup> Generation Intel® Core™ supported only `LumaLog2WeightDenom / ChromaLog2WeightDenom = 6` or 0.
- Encoding fails could be observed on 8<sup>th</sup> Generation Intel® Core™ and Pentium platforms in case of `ExtBrcAdaptiveLTR` feature is turned on. Fails will be fixed in the nearest graphics driver updates.

#### MPEG-2 decode limitations:

- MPEG-2 Video decoder returns `MFX_ERR_UNDEFINED_BEHAVIOR` instead of `MFX_ERR_MORE_DATA` when part of sequence header is absent and `MFX_BITSTREAM_COMPLETE_FRAME` flag is set.
- Decoder does not support bitstreams with resolution bigger than 2096x2096. `MFXVideoDECODE_Init` returns `MFX_ERR_UNSUPPORTED` on such bitstreams.
- Decoder does not support MPEG-1 bitstreams. It is interpreted as corrupted MPEG-2 bitstream. `MFXVideoDECODE_Init` returns `MFX_ERR_NONE` and `MFXVideoDECODE_DecodeFrameAsync` returns `MFX_ERR_MORE_DATA` until valid MPEG-2 bitstream is found.
- Sequence headers are skipped if resolution exceeds maximum supported values (2096x2096) or level/chroma are invalid. It affects `MFXVideoDECODE_DecodeFrameAsync`.

- `mfxDecodeStat.NumFrame` that is returned from `GetDecodeStat` function is less by 1 than actual count of decoded frames if `GetDecodeStat` is called after buffered frames are returned.

#### VC1 decode limitations:

- VC1 decoder can't set corruption flag in P,B-Frames if previous I-Frame was missed.

#### VP9 encode limitation:

- BRC doesn't support configurations where amount of bits for frames in base layer is less than amount of bits for frames in upper layers. Encoder may produce stream with bitrate of base layer proportionally bigger or equal to upper layers.
- Distance between base layer frames more than 8 may leads decrease of compressing effective.

#### VPP component has next limitations:

- Composition has issues after reset with input system memory usage, input system memory not recommended for use with composition if resetting composition pipeline required.
- `MXF_FRCALGM_DISTRIBUTED_TIMESTAMP` is unsupported by InverseTelecine and Deinterlace (60i->60p) VPP filters.
- `mfxExtVppAuxData` is deprecated.
- `VPP::Query` in software implementation mistakenly indicates support for `MXF_FRCALGM_FRAME_INTERPOLATION` while it is actually not available.
- VPP scaling in software implementation may produce slightly blurred frames for RGB32 interlaced content.
- VPP Image Stabilization and FRC Interpolated filters will be deprecated and not recommended for use due to result image quality and product quality associated with these filters.
- When De-interlace and FRC filters used in pipeline `MXF_DEINTERLACING_BOB` will be used by default, if not specified explicitly to use `MXF_DEINTERLACING_ADVANCED`.
- `MXF_FOURCC_YV12` supported only via software fallback with DirectX\* 11.1 interface.
- VPP in software implementation always uses simple FRC algorithm based on repeat/drop frames and ignores `MXF_FRCALGM_FRAME_INTERPOLATION` flag.
- ADI may produce color artefacts on frame preceding a scene change.
- ADI may produce color artefacts in case of harmonic motion (repeated pattern and motion magnitude is the same as the periodic of repeated pattern).
- Multiple VPP filters being combined in one session may produce output that is not bit-exact with the output from the same VPP filters that are split by separate sessions, but the difference does not affect visual quality.
- Frames with interlaced content must have `CropH` multiple of 4. Otherwise, VPP may produce color artefacts on the bottom lines.

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- De-interlacing is supported for NV12, YUY2 formats only.
- Once enabled at the Init stage VPP de-interlacing for BOB mode is not disabled automatically if application provides input frames with picstruct set to MFX\_PICSTRUCT\_PROGRESSIVE.
- 1<sup>st</sup> frame is doubled during 30i->60p de-interlacing for MFX\_DEINTERLACING\_BOB and MFX\_DEINTERLACING\_ADVANCED\_NOREF modes.
- MFXVideoVPP\_GetVideoParam does not update values in attached extended buffers, except VPP\_DO\_USE.
- MFXVideoVPP\_Reset could return error if additional memory allocation is required based on provided video parameters (changed type of color or frame rate conversion for example). The application should close VPP component and then re-initialize it in this case. See MFXVideoVPP\_Reset in SDK API Reference Manual for more details about possible return statuses.
- Multiple RGB4 surfaces with PixelAlphaEnable enabled could give poor visual quality after composition on the same area with overlapping.
- Deprecated MFX\_EXTBUFF\_VPP\_PICTSTRUCT\_DETECTION enumerator.
- VPP Mirroring in pipeline with video to video memory in/output patterns can be supported only without any other filters, in/out memory patterns containing system memory is supported with any other legal filters combination.
- ADI with doubled framerate – there is an issue when first 3 frames copied instead of 2.
- On 6<sup>th</sup> generation Intel Core and Xeon E3 v5 Temporal Denoise enabled – this can affect some result of denoise on scene change and after reset with changed denoise factor.
- mfxExtVPPSignalInfo has to be attached to surface with NV12 format only when color conversion done.
- Rotate + Detail/ProcAmp – in combination affect each other, thus result can differ comparing running filters separately and in one call.
- Composition of more than 8 DirectX\* 11 surfaces along with alpha blending and overlapping gives poor visual quality. The reason is the last picture blend with background.

The Media RAW Accelerator Plug-in has the following known limitations:

- Current version supports sessions only initialized as MFX\_IMPL\_HARDWARE, MFX\_IMPL\_HARDWARE\_ANY, MFX\_IMPL\_VIA\_D3D11, MFX\_IMPL\_VIA\_D3D9.
- Software fallback implementation is not optimized thus performance is very poor.
- Software fallback can be not bit exact with GPU optimized version.
- Current version supports only system memory as input memory type.
- Current version supports only system memory as output memory type for MFX\_FOURCC\_ARGB16 and MFX\_FOURCC\_ABGR16 color types.
- Current version of plugin doesn't support opaque memory type.
- Additional Intel Media SDK session must be created to use traditional VPP features of Intel Media SDK HW Library.
- MFX\_GAMMA\_MODE\_VALUE currently not supported.

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- Current version supports only system memory output type for MFX\_FOURCC\_ARGB4 color type not supported with output Video memory type in case when total surface size is bigger than 6000x4000 on processors older than 6<sup>th</sup> generation Intel Core.
- For resolutions more than 6000x4000 result will be slightly different for padded content and non-padded content due to internal implementation.
- Application need to do MFXInit with API 1.10 version to have RAW Accelerator working on all available driver versions.
- MFX\_EXTBUF\_CAM\_FORWARD\_GAMMA\_CORRECTION API is slower than MFX\_EXTBUF\_CAM\_GAMMA\_CORRECTION on platforms older than 6<sup>th</sup> generation Intel Core processors.
- Vignette correction filter support is limited to photo with 8192x8192 resolution of picture on 6th Generation Intel® Core™ platforms.
- For resolutions width bigger than 8192 and MFX\_FOURCC\_ARGB16 or MFX\_FOURCC\_ABGR16 color types plug-in will fall back to GPU acceleration instead of fixed function on 6<sup>th</sup> generation Core platforms.
- 3D look up table filter supported only on 6<sup>th</sup> generation Core platforms and will utilize render engine for acceleration.

Non zero values of CropY may cause RunFrameVPPAsync to fail with MFX\_ERR\_DEVICE\_FAILED (-17 error code) only on 6<sup>th</sup> Generation Intel Core™ Processors based platforms.

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