# Media SDK Guide

## Video Quality MFT API Reference

## 1 Introduction

The Video Quality (VQ) Media Foundation Transform (MFT) allows developers to enhance the quality of raw video. The VQ MFT may be used in Windows Store and desktop applications. This document defines the various attributes for the video quality filters. These attributes may be specified programmatically in C/C++ in desktop applications, and in any of the languages supported by the Windows runtime (C#, Javascript, VB, C++) in Windows Store applications.

## 2 Operating Systems

The Video Quality MFT supports the following operating systems:

- Windows 8/8.1 Store 32- and 64-bit
- Windows 8/8.1 Desktop 32- and 64-bit
- Windows 7 32- and 64-bit

## 3 File formats

The Video Quality MFT supports the following input video format:

- YUV NV12

The Video Quality MFT supports the following output video formats:

- YUV NV12
- BGRA

## 4 Supported filter attributes

The Video Quality MFT supports the following video quality filter attributes.

### Video quality filter attributes

| VQ Feature | Parameter name | Supported range | Default settings | Remarks |
|---|---|---|---|---|
| Steady Video | AMF_EFFECT_STEADY_VIDEO | enables=TRUE / disables=FALSE | Default= FALSE | Image stabilization to compensate for shaky video |
| Steady Video | AMF_EFFECT_STEADY_VIDEO_STRENGTH | min=0 max=3 | Default =1 | Steady video strength |
| Steady Video | AMF_EFFECT_STEADY_VIDEO_DELAY | min=0 max=6 | Default =1 | Delay video on N frames from original stream |
| Steady Video | AMF_EFFECT_STEADY_VIDEO_ZOOM | min=90 max=100 | Default =95 | Frame reverse zooming(%). |
| Steady Video | AMF_EFFECT_STEADY_VIDEO_SIDEBYSIDE | enables=TRUE / disables=FALSE | Default= FALSE | Show original and processed frames side by side |
| Steady Video | AMF_EFFECT_STEADY_VIDEO_INDICATOR | enables=TRUE / disables=FALSE | Default= FALSE | Overlay AMD Steady Video logotype in right bottom corner when effect is “enables” |
| Deblocking | AMF_EFFECT_DEBLOCKING | enables=TRUE / disables=FALSE | Default= FALSE | Enable deblocking |
| Deblocking | AMF_EFFECT_DEBLOCKING_STRENGTH | min=0 max=100 | Default =50 | Deblocking strength |
| Mosquito Noise | AMF_EFFECT_MOSQUITO_NOISE | enables=TRUE / disables=FALSE | Default= FALSE | Enable mosquito noise removal filter |
| Mosquito Noise | AMF_EFFECT_MOSQUITO_NOISE_STRENGTH | min=0 max=100 | Default=50 | Mosquito noise removal strength |
| Denoise | AMF_EFFECT_DENOISE | enables=TRUE / disables=FALSE | Default= FALSE | Enable de-noise filter |
| Denoise | AMF_EFFECT_DENOISE_STRENGTH | min=1 max=100 | Default=64 | De-noise strength |
| Edge enhancement | AMF_EFFECT_EDGE_ENHANCEMENT | enables=TRUE / disables=FALSE | Default= FALSE | Enable edge enhancement |
| Edge enhancement | AMF_EFFECT_EDGE_ENHANCEMENT_STRENGTH | min=1 max=100 | Default=10 | Edge enhancement strength |

| VQ Feature | Parameter name | Supported range | Default settings | Remarks |
|---|---|---|---|---|
| Dynamic contrast | AMF_EFFECT_DYNAMIC_CONTRAST | enables=TRUE / disables=FALSE | Default= FALSE | Enable dynamic contrast |
| De-interlacing | AMF_EFFECT_DEINTERLACING | AMF_EFFECT_DEINTERLACING_AUTOMATIC<br><br>AMF_EFFECT_DEINTERLACING_WEAVE<br><br>AMF_EFFECT_DEINTERLACING_BOBE<br><br>AMF_EFFECT_DEINTERLACING_ADAPTIVE<br><br>AMF_EFFECT_DEINTERLACING_MOTION_ADAPTIVE<br><br>AMF_EFFECT_DEINTERLACING_VECTOR_ADAPTIVE<br><br>AMF_EFFECT_DEINTERLACING_PULLDOWN_DETECTION | Default = AMF_EFFECT_DE_INTERLACING_AUTOMATIC | Choose de-interlacing filter |
| De-interlacing pull-down detection | AMF_EFFECT_DEINTERLACING_PULLDOWN_DETECTION | enables=TRUE / disables=FALSE | Default= TRUE | Enable pull-down detection |
| Color vibrance effect | AMF_EFFECT_COLOR_VIBRANCE | enables=TRUE / disables=FALSE | Default= FALSE | Enhance color |
| Color vibrance effect | AMF_EFFECT_COLOR_VIBRANCE_STRENGTH | min=0 max=100 | Default= 40 | Color vibrance strength |
| Skin tone correction effect | AMF_EFFECT_SKINTONE_CORRECTION | enables=TRUE / disables=FALSE | Default= FALSE | Enable skin tone correction |
| Skin tone correction effect | AMF_EFFECT_SKINTONE_CORRECTION_STRENGTH | min=0 max=100 | Default = 50 | Skin tone correction strength |
| Gamma correction effect | AMF_EFFECT_GAMMA_CORRECTION | enables=TRUE / disables=FALSE | Default= FALSE | Enable gamma correction |
| Gamma correction effect | AMF_EFFECT_GAMMA_CORRECTION_STRENGTH | min=0.5 max=2.5 | Default = 1.0 | Gamma correction strength |
| Brighter whites effect | AMF_EFFECT_BRIGHTER_WHITES | enables=TRUE / disables=FALSE | Default= FALSE | Enhance the white |

| VQ Feature | Parameter name | Supported range | Default settings | Remarks |
|---|---|---|---|---|
| Dynamic range | AMF_EFFECT_DYNAMIC_RANGE | AMF_EFFECT_DYNAMIC_RANGE_NONE<br><br>AMF_EFFECT_DYNAMIC_RANGE_FULL (0 to 255)<br><br>AMF_EFFECT_DYNAMIC_RANGE_LIMITED (16 to 235) | Default = AMF_EFFECT_DYNAMIC_RANGE_NONE | Dynamic range of pixels |
| Brightness effect | AMF_EFFECT_BRIGHTNESS | min=0 max=100 | Default= 0 | Brightness effect |
| Contrast effect | AMF_EFFECT_CONTRAST | min=0 max=2 | Default= 0 | Contrast effect |
| Saturation effect | AMF_EFFECT_SATURATION | min=0 max=2 | Default= 0 | Saturation effect |
| Tint effect | AMF_EFFECT_TINT | min=0.0 max=30.0 | Default= 0.0 | Tint effect |
| False contour reduction effect | AMF_EFFECT_FALSE_CONTOUR_REDUCTION | enables=TRUE / disables=FALSE | Default= FALSE | Reduce false contouring effect in smooth gradient or flat regions of the image |
| False contour reduction effect | AMF_EFFECT_FALSE_CONTOUR_REDUCTION_STRENGTH | min=0 max=100 | Default = 50 | False contour reduction strength |
| Super resolution detail enhancement effect | AMF_EFFECT_SUPERRES_DT | enables=TRUE / disables=FALSE | Default = FALSE | Enhance the details of the image using the super resolution technique |
| Super resolution detail enhancement effect | AMF_EFFECT_SUPERRES_DT_STRENGTH | min=1 max=100 | Default = 50 | Detail enhancer strength |
| Super resolution motion compensation temporal noise reduction effect | AMF_EFFECT_SUPERRES_MCTNR | enables=TRUE / disables=FALSE | Default = FALSE | Motion compensated noise removal using super resolution |
| Super resolution motion compensation temporal noise reduction effect | AMF_EFFECT_SUPERRES_MCTNR_STRENGTH | min=1 max=100 | Default = 50 | Noise removal strength |

| VQ Feature | Parameter name | Supported range | Default settings | Remarks |
|---|---|---|---|---|
| Scale effect | AMF_EFFECT_SCALE | AMF_EFFECT_SCALE_BILINEAR<br><br>AMF_EFFECT_SCALE_BICUBIC | Default = AMF_EFFECT_SCALE_BILINEAR | Select interpolation type |
| Scale effect | AMF_EFFECT_SCALE_WIDTH | Width in pixels | Default = No scale | Width of the output |
| Scale effect | AMF_EFFECT_SCALE_HEIGHT | Height in pixels | Default = No scale | Height of the output |
| Demo mode | AMF_EFFECT_DEMOMODE | enables=TRUE / disables=FALSE | Default= FALSE | Apply video quality effects to only the vertical half of the image |
| Frame rate conversion | AMF_EFFECT_FRAMERATECONVERSION | enables=TRUE / disables=FALSE | Default= FALSE | Enable frame rate conversion |
| Frame rate conversion | AMF_EFFECT_FRAMERATECONVERSION_RATE | Output frame rate | | |
| Dynamic parameter change | AMF_EFFECT_DYNAMIC | enables=TRUE / disables=FALSE | | Notify dynamic change of VQ parameters |
| Average processing sample time in ms | AMF_PROCESSING_TRANSFORM_AVR_TIME | | | Return the average processing time |
| Minimum processing sample time in ms | AMF_PROCESSING_TRANSFORM_MIN_TIME | | | Return the minimum processing time |
| Maximum processing sample time in ms | AMF_PROCESSING_TRANSFORM_MAX_TIME | | | Return the maximum processing time |

# 5 Usage

## 5.1 On Windows Desktop applications (Win7/Win8/Win8.1)

To create the Video Quality MFT, use the following API.

```
STDAPI AMFCreateVideoTransformMFT(REFIID riid, void** ppvObject);
```

### 5.1.1 Video Quality MFT Cache Builder

All the video quality filters mentioned in Section 4 are implemented on the GPU using OpenCl. These kernels needs to be compiled during the run time. To avoid runtime cost, the Cache Builder is used.

All the OpenCL kernels used in the Video Quality filter will be precompiled to the host ASIC ISA on the first run and cached on the disk. The following APIs are used for building the cache.

- The following API creates the Cache Builder.
  `STDAPI AMFCreateCacheBuilderMFT(REFIID riid, void** ppvObject);`
- The following API builds the OpenCL kernels.
  `virtual HRESULT STDMETHODCALLTYPE BuildCache(IUnknown *pDeviceManager,IAMFCacheBuilderEvents *callback);`
- The following API checks whether the cache builder is necessary on the given Device.
  `virtual HRESULT STDMETHODCALLTYPE IsBuildCacheRequired(IUnknown *pDeviceManager);`

**Enabling and selecting Video Quality filters:**

All video processing parameters will be set via the standard `IMFAttributes` interface that is mandatory for every MFT. An application can get this interface via the `QueryInterface()` method. The application can set these properties statically before the MF session starts or dynamically during the playback or video conferencing session. To allow batch parameter configuration during execution, all changed parameters will be stored inside the MFT and applied only after a special parameter is set: `AMF_EFFECT_CHANGED`.

All parameters represent pairs of Globally Unique Identifier (GUID) and Value and are defined in the `VqMft.h` header file (<*installDirectory*>`/inc/VqMft.h`). The Value and type are described in Section 4. All parameters can be set to or queried from the MFT.

The following code snippet illustrates how the `IMFAttributes` interface is used:

```
IMFAttributes *attributes;
pMyMFT->GetAttributes(&attributes);
attributes->SetUINT32(AMF_EFFECT_STEADY_VIDEO,TRUE);
attributes->SetUINT32(AMF_EFFECT_STEADY_VIDEO_DELAY,2);
```

Notifications about dynamic changes in the attribute storage set are accomplished by polling the special property, `AMF_EFFECT_CHANGED`.

### 5.1.2 Capability Manager:

The Video Quality filter provides a C++ interface that allows the user to Query the capability manager for real time playback capabilities of the current ASIC based on the Video Quality feature set.

The following APIs are provided for using the capability manager.

- The following API creates the capability manager.
  `STDAPI AMFCreateCapabilityManagerMFT(REFIID riid, void** ppvObject);`
- The following API initializes the capability manager.
  `virtual HRESULT STDMETHODCALLTYPE Init(IUnknown *pDeviceManager,DWORD dwWidth,DWORD dwHeight,DWORD dwInterlaced)`

  `pDeviceManager` - Pointer to the device manager
  `dwWidth`, `dwHeight` - Width and height of the input video to be processed
  `dwInterlaced` - interlaced mode

- The following API checks whether the given feature is supported.
  `virtual HRESULT STDMETHODCALLTYPE IsEnabled(AMFCMRequestType requestType, GUID Feature)`

  `requestType` - `AMF_CM_REALTIME`: if the feature supported works real time on the given device
  `AMF_CM_NONREALTIME`: If set, returns the features that are supported on the device, even if the feature does not work real time on the device.

## 5.2 On Windows Store applications

In WinRT mode, an application does not have direct access to the Video Processor MFT. The MFT will be inserted as an effect using the `MediaElement:AddVideoEffect()` or `MediaCapture::AddEffectAsync()` method. For example, the MFT can be inserted as follows:

```
MediaElement:AddVideoEffect("mftvqLib.AMFvideoTransform",true,propertySet);
```

These methods have a parameter, `IPropertySet` (`PropertySet` in the preceding example), that is passed to the effect MFT during activation. The MFT keeps a pointer to this object and registers the data change listener using `IObservableMap<>` also implemented on this object. In this manner, the parameters can be changed dynamically.

All parameters represent pairs of String and Value and are defined in the `VqMft.h` header file (<*installDirectory*>/inc/VqMft.h). The Value and data type are described in Section 4. All parameters can be set to or queried from the MFT.

The following code snippet illustrates how the `PropertySet` object is used:

```
PropertySet^ propertyset = ref new PropertySet;
propertyset[AMF_EFFECT_STEADY_VIDEO]=true;
propertyset[AMF_EFFECT_STEADY_VIDEO_DELAY]=2;
AddVideoEffect("AMD.VQ.Effect",false,propertyset);
```

The **`MapChanged`** event raised by the `PropertySet` object provides notifications about dynamic changes in the property set.

### 5.2.1 Video Quality MFT Cache Builder

For the Cache Builder on Windows Store applications, use the following string to create the object.

```
extern const __declspec(selectany) WCHAR
RuntimeClass_mftvqLib_AMFCacheBuilder[] = L"mftvqLib.AMFCacheBuilder";
```

The following API is used for building the cache.

```
virtual HRESULT STDMETHODCALLTYPE BuildCache(IAMFCacheBuilderEvents
*callback) = 0;
```

### 5.2.2 Capability Manager:

To create the Capability Manager on Windows Store applications use the following string.

```
extern const __declspec(selectany) WCHAR
```

```
RuntimeClass_mftvqLib_AMFCapabilityManager[] =
L"mftvqLib.AMFCapabilityManager";
```

The following API is used for initializing the capability manager.

```
virtual HRESULT STDMETHODCALLTYPE Init(DWORD dwWidth,DWORD
dwHeight,DWORD dwInterlaced) = 0;
```

The following API is used for checking whether a particular feature is enabled.

```
virtual HRESULT STDMETHODCALLTYPE IsEnabled(AMFCMRequestType
requestType,HSTRING Feature) = 0;
```

For details on building Windows Store applications with the Video Quality filter, see the following samples: <*installDirectory*>/samples/mediaFoundation/transcodeVqWinStore <*installDirectory*>/samples/mediaFoundation/playbackVqWinStore.

# 6 References


1. http://msdn.microsoft.com/en-us/library/windows/desktop/ms703138(v=vs.85).aspx
2. http://msdn.microsoft.com/en-us/library/windows/apps/br211386.aspx
3. http://msdn.microsoft.com/en-us/library/windows/desktop/aa371827(v=vs.85).aspx



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