



Microsoft Skype for Business

H.264 Video Encoder Specification

Document Number: H105958

Published: November 2016

Disclaimer: This document is provided “as-is”. Information and views expressed in this document, including URL and other Internet Web site references, may change without notice. You bear the risk of using it.

This document does not provide you with any legal rights to any intellectual property in any Microsoft product. You may copy and use this document for your internal, reference purposes.

Feedback: You have no obligation to give Microsoft any suggestions, comments or other feedback (“Feedback”) relating to the materials herein (“Materials”). However, any Feedback you voluntarily provide may be used in Microsoft products and related specifications or other documentation (collectively, “Microsoft Offerings”) which in turn may be relied upon by other third parties to develop their own products. Accordingly, if you do give Microsoft Feedback on any version of these Materials or the Microsoft Offerings to which they apply, you agree: (a) Microsoft may freely use, reproduce, license, distribute, and otherwise commercialize your Feedback in any Microsoft Offering; (b) you also grant third parties, without charge, only those patent rights necessary to enable other products to use or interface with any specific parts of a Microsoft product that incorporate your Feedback; and (c) you will not give Microsoft any Feedback (i) that you have reason to believe is subject to any patent, copyright or other intellectual property claim or right of any third party; or (ii) subject to license terms which seek to require any Microsoft Offering incorporating or derived from such Feedback, or other Microsoft intellectual property, to be licensed to or otherwise shared with any third party.

© 2016 Microsoft Corporation. All rights reserved.

Table of Contents

1.	Revision history.....	4
2.	Overview	4
2.1.	Performance levels	4
3.	Test Specifications.....	5
3.1.	Normative references	6
3.2.	Contacting Microsoft	7
3.3.	Terms Used in This Document	7
3.3.1.	Abbreviations	7
3.3.2.	Definitions	8
4.	Requirements.....	8
4.1.	“Skype for Business” Standard Logo Requirements	8
4.2.	“Skype for Business” Premium Logo Requirements	12
5.	Technical Evaluation Setup and Procedure	15
5.1.	Video Sequences.....	15
5.2.	Coding toolsets	16
5.3.	Test procedure for tethered webcams	16
6.	Microsoft Skype for Business H.264 HW Encoder Requirements.....	17
6.1.	Common Requirements	17
6.1.1.	USB driver requirement	17
6.1.2.	Aspect ratios and image resolutions.....	17
6.1.3.	Frame rate.....	18
6.1.4.	Video preview	19
6.1.5.	Encoder latency.....	19
6.1.6.	Dynamic resolution change.....	19
6.1.7.	Dynamic profile change	20
6.1.8.	Dynamic level change	20
6.1.9.	Dynamic add/remove temporal layers	20
6.1.10.	Dynamic maximum reference frame change.....	21
6.1.11.	IDR frame request	21
6.1.12.	Sample aspect ratio.....	21

6.1.13.	Control of periodic key frames.....	22
6.1.14.	Rate control mode	22
6.1.15.	Long Term Reference (LTR) control	22
6.1.16.	Slice control.....	22
6.1.17.	Bitstream Conformance	23
6.1.18.	Quality Conformance	25
6.1.19.	Longevity	29
6.2.	Standard Logo Requirements	30
6.2.1.	Single UCConfig Mode 0 Bitstream	30
6.2.2.	Simulcast UCConfig Mode 0 Bitstream	34
6.2.3.	Single UCConfig Mode 1 Bitstream with 2 Layers.....	35
6.2.4.	Simulcast UCConfig Mode 1 Bitstream with 2 Layers.....	39
6.2.5.	Single UCConfig Mode 1 Bitstream with 3 Layers.....	40
6.2.6.	Simulcast UCConfig Mode 1 Bitstream with 3 Layers.....	43
6.2.7.	Memory Usage Test	44
6.2.8.	Benchmark Test	45
6.3.	Premium Logo Requirements	46
6.4.	Quality Conformance Bars	46
6.4.1.	Standard Logo Requirements.....	46
6.4.2.	Premium Logo Requirements	71
7.	Device-Specific Requirements	95
7.1.	Hardware Media Foundation Transform (HMFT)	95
7.1.1.	General Requirement.....	95
7.1.2.	Dynamic Controls	96
7.2.	H.264 USB Camera	97
7.2.1.	General Requirement.....	97
7.2.2.	Dynamic Controls	97

1. Revision history

Revision	Date	Description
1.0	August 2013	First release of the unified specification. Based on Lync specification revision G and Skype specification version 8.
2.0	August 2014	Added max_dec_frame_buffering, memory usage, memory leak, and benchmark requirements. Relaxed constant bitrate control requirement in low fps and low bandwidth conditions.
3.0	November 2016	Lync rebranded to Skype for Business

2. Overview

The technical requirements listed in this document, the *Skype for Business H.264 Video Encoder Specification*, have been derived solely for the purpose of maximizing interoperability and optimizing the functional and quality experience of stand-alone webcams as well as PCs with integrated H.264 video encoders used with Skype for Business. Any use of this technical specification for platforms other than the *Microsoft Skype for Business Server* platform is not authorized.

Partners, who license, develop market and/or sell devices that are qualified by Microsoft are required to adhere to the specifications outlined in this document. Partners seeking changes, modifications and/or additions to this specification will be required to receive written approval from Microsoft before certification of the device. Microsoft reserves the right to update the contents of this technical specification at any time without prior notice. Purposes of such updates include the capture of new capabilities in Microsoft Skype for Business platforms, new device categories, as well as performance improvements in the hardware used in peripheral devices.

2.1. Performance levels

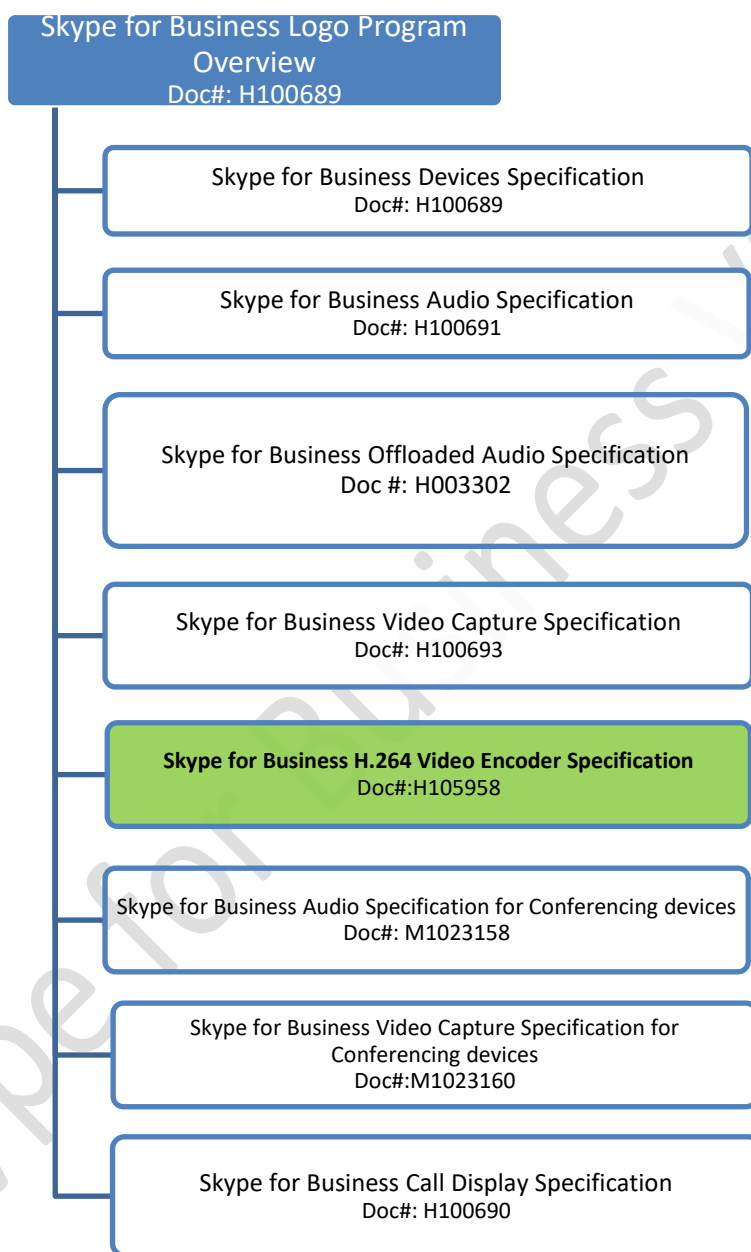
This document provides performance requirements for Skype for Business certified devices.

There are two levels of video performance defined by this specification:

- Standard: Defines a mandated video quality level that, when achieved, allows use of both Skype for Business logos in association with the product.
- Premium: Defines Skype for Business's preferred video quality level. Customer facing marketing collateral for Skype for Business Certified devices does not currently distinguish between standard and premium.

3. Test Specifications

The family of documents supporting the Skype for Business logo program is shown below and contains detailed requirements that candidate devices, being submitted to the *Logo Program*, must meet



The technical requirements listed in this document, the *Skype for Business H.264 Video Encoder Test Specification*, have been derived solely for the purpose of maximizing interoperability and optimizing the quality of experience of devices used with Skype for Business. Any use of this technical specification for platforms other than optimizing the quality for Skype for Business is not authorized.

Partners who license, develop, market, and/or sell Skype for Business devices that are qualified by Microsoft, are required to adhere to the specifications outlined in this document. Partners seeking changes, modifications and/or additions to this specification will be required to receive written approval from Microsoft before certification of the device. Microsoft reserves the right to update the contents of this technical specification at any time without prior notice. Purposes of such updates include the capture of new capabilities in Skype for Business platform, new device categories, as well as performance improvements in the hardware used in peripheral devices.

The document is structured as follows: Section 3.1 explains the normative references and terminology. In Section 4 an overview of the requirements for both, standard and premium logo requirements is given. Section 5 describes the technical evaluation setup and the procedure on how to test the H.264 encoder. Section 6 then defines the detailed requirements which include bitstream conformance and quality requirements.

3.1. Normative references

The H.264/MPEG-4 AVC and SVC standards (referred to hereafter simply as H.264) are specified in the following document:

1. ITU-T Rec. H.264 | ISO/IEC 14496-10 Advanced video coding for generic audiovisual services. The standard is available at <http://www.itu.int/rec/T-REC-H.264>. Unless otherwise specified, this document refers to the edition approved by ITU-T in January 2012 (posted at the ITU-T web site link above).
2. The Scalable Video Coding (SVC) extensions to the H.264/MPEG-4 AVC standard (referred to hereafter simply as SVC) are specified in Annex G of the above document.

Microsoft Skype for Business Specification for H.264 AVC and SVC Encoder (referred to hereafter as UCConfig Spec). The specification is available at <http://technet.microsoft.com/en-us/lync/gg278176.aspx>. Unless otherwise specified, this document refers to edition v1.1 (posted at the Microsoft web site link above).

Universal Serial Bus Device Class Definition for Video Devices, Revision 1.5. This specification is available at http://www.usb.org/developers/devclass_docs#approved.

Hardware Encoder Requirements and Guidelines. This document is available from Microsoft upon request.

Calculation of average PSNR differences between RD-curves, March 26, 2001. This document is available at http://wftp3.itu.int/av-arch/video-site/0104_Aus/VCEG-M33.doc

3.2. Contacting Microsoft

For any questions regarding the requirements detailed in the specification, please contact the Microsoft Skype for Business Partner Team by sending an email message to skypelynclogo@microsoft.com.

3.3. Terms Used in This Document

This section describes standard terms and conventions used throughout the Microsoft Skype for Business Specification.

3.3.1. Abbreviations

For the purposes of this specification, the following abbreviations apply:

CABAC	Context-based Adaptive Binary Arithmetic Coding
CAVLC	Context-based Adaptive Variable Length Coding
FPS	Frames per second
GOP	Group Of Pictures
HW	Hardware
IDR	Instantaneous Decoding Refresh
IHV	Independent Hardware Vendor
LTR	Long Term Reference
MB	Macroblock
MLVEC	Microsoft Skype Video Encoding Conformance
MM	Filename convention for multiple streams in multiple transmission mode
MS	Filename convention for multiple streams in single transmission mode
MST	Multi-Session Transport
NALU	Network Abstraction Layer Unit
POC	Picture Order Count
PPS	Picture Parameter Set
QP	Quantization Parameter
S	Filename convention for single stream
SEI	Supplemental Enhancement Information
SPS	Sequence Parameter Set
SST	Single Session Transport
STR	Short Term Reference
SVC	Scalable Video Coding
TID	Temporal ID
TL	Temporal layer
VUI	Video Usability Information

3.3.2. Definitions

For the purposes of this specification, the following definitions apply:

Bitstream	A NALU stream that may consist of one or multiple independently coded H.264 AVC or SVC elementary bitstreams interleaved in a particular way as defined in UCConfig Spec.
Reference Frame	a frame that may be used for inter prediction in the decoding process of subsequent frame(s) in decoding order.
Simulcast Stream	A NALU stream that consist one H.264 AVC or SVC elementary bitstream.
Stream	Short name for “simulcast stream”.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119.

4. Requirements

4.1. “Skype for Business” Standard Logo Requirements

The SkypeforBusiness Logo H.264 video codec specification contains requirements for each of the UCConfig Modes as specified in the “Unified Communications Specification for H.264 AVC and SVC Encoder Implementation” which can be found [here](#). Encoders must support UCConfig Mode 1 and the corresponding requirements outlined below in order to participate in the Skype for Business Logo program. It should be noted that the standard requirements are intended for encoders targeting a maximum resolution of 1080p.

We distinguish three categories of H.264 encoders:

1. Tethered USB webcams with H.264 HW encoder
2. H.264 HW encoder dedicated to integrated webcams in laptops/tablets/mobile phones
3. Generic H.264 HW encoder (e.g. Intel HD Graphics chipsets with [Intel Quick Sync Video](#) technology) which can be applied to any raw video bitstream from internal or external cameras

The standard requirements for each category and the purpose of these requirements are summarized in Table 1-Table 3 below.

Table 1: Standard Logo Requirements for Windows 7/8

Requirement Sets	UCConfig Mode 1
Temporal Layers	≥ 2
Max MB Processing Rate	≥ 244800 (1x1080p@30fps)
Resolution	≥ 2 resolution
Maximum Resolution	$\geq 1080p$
Dynamic resolution change	Required to be within 5 frames
Dynamic IDR request	Required to be within 2 frames
Variable frame rate support	Required
Simulcast Streams	≥ 2 streams
Simulcast transport mode	Multiplexed mode for Category 1 encoders, and multiple stream mode for Category 2/3 encoders.
Profile	Constrained Baseline and Constrained High profiles
Rate Control Mode	Constant QP or Bitrate Control ¹
Quality	Meet Windows 7/8 standard quality bar
Memory	Meet memory usage and memory leak requirements

Remark: The above table requires that in order to participate in the Standard Logo program, encoders must be able to generate at least a total of two layers.

Table 2: Standard Logo Requirements for Windows 8.1

Requirement Sets	UCConfig Mode 1
Temporal Layers	≥ 3
Max MB Processing Rate	≥ 244800 (1x1080p@30fps)
Resolution	≥ 4 resolution
Maximum Resolution	$\geq 1080p$
Dynamic resolution change	Required to be within 1 frame latency
Dynamic profile change	Required to be within 1 frame latency
Dynamic level change	Required to be within 1 frame latency
Dynamic add/remove temporal layers	Required to be within 1 frame latency
Dynamic maximum reference frame change	Required to be within 1 frame latency
LTR Control	Required to be within 1 frame latency
Dynamic IDR request	Required to be within 1 frame latency
Sample aspect ratio	Required
Variable frame rate support	Required
Simulcast Streams	≥ 4 streams
Simulcast transport mode	Multiplexed mode for Category 1 encoders, and multiple stream mode for Category 2/3 encoders.

¹ For Category 1/2 encoders, Bitrate Control mode is mandatory.

Requirement Sets	UCConfig Mode 1
Multiple slices per frame	Support fixed number of MB row per slice except for last slice
Profile	Constrained Baseline and Constrained High profiles
Rate Control Mode	Constant QP and Bitrate Control ²
Quality	Meet Windows 8.1 standard quality bar
Memory	Meet memory usage and memory leak requirements

Table 3: Purpose of Standard Logo Requirements

² Bitrate Control mode is only required for Category 1/2 encoders.

Requirement categories	Purpose
Temporal Layers	Having two or more temporal layers allows encoding at two different frame rates (e.g. 15fps and 7.5fps or 30fps and 15fps). This allows to: <ul style="list-style-type: none"> - Adjust bitrate to different bandwidth constraints for multiple receiving clients - Adapt to bandwidth changes during a call - Implement better error resilience
Max MB Processing Rate	Allow for either one HD bitstream in 720p at 30fps or 2 or more simulcast bitstreams with aggregated macro block (MB) processing rate smaller than or equal to one HD stream, for example, one simulcast bitstream in 540p at 30fps and the other in 360p at 30fps. This will be used to allow: <ul style="list-style-type: none"> - Adjustment of bitrate to different bandwidths - Adjustment of resolution to different receive capabilities (e.g. small vs. large render window size)
Resolution	Supporting the simultaneous encoding of two or more resolutions will make sure that clients with different bandwidths or different receive capabilities will be able to have good video quality
Maximum Resolution	Maximum resolution is to define the preferred resolution in p2p mode when only one bitstream is present.
Dynamic resolution change	In case of bandwidth decrease during the video call e.g. due to adding application sharing modality Skype for Business may decide to switch the resolution of the encoder. To avoid a large video glitch to be perceived on the receiving side the duration of the dynamic resolution change is specified.
Dynamic profile/level/temporal layer count/max number of reference frame change	In conferences with frequent join/leave of participants each with different capabilities, dynamic controls in prompt response to conference dynamics are required to present great video experiences.
LTR control	When communicating over lossy networks, LTR controls are required for error recovery without introducing bandwidth peaks (i.e. if using IDR frames) in the transmission.
Dynamic IDR request	IDR frames are required in order to re-synchronize encoder and decoder after video packets are lost during the transmission over a lossy channel.
Sample aspect ratio	When input samples are not square pixels, it is required to carry sample aspect ratio info in the bitstream so the receive side can restore the original aspect ratio properly.
Variable frame rate support	In low lighting conditions the H.264 encoder needs to be able to adjust the frame rate so that a larger exposure time can be chosen by the camera to avoid a low signal to noise ratio.
Simulcast Streams	The simulcast streams are used to allow for: <ul style="list-style-type: none"> - Adjustment of bitrate to different bandwidths - Adjustment of resolution to different receive capabilities (e.g. small vs. large render window size)
Simulcast Transport Mode	It is required that Category 3 encoders support multiple stream mode as then Skype for Business application does not need to demultiplex the stream before transmitting over the wire. For Category 1/2 encoders that multiple H.264 elementary bitstreams are sent from the encoder to the host via one pin, only multiplexed mode is however feasible.

Requirement categories	Purpose
Profile	Supporting Constrained Baseline profile allows to be interoperable with legacy AVC decoders. Supporting the Constrained High profile will allow to: <ul style="list-style-type: none"> - Achieve better rate-distortion performance by using CABAC, 8x8 transform, or quantizer scale matrices - Achieve better quality by using QP for Cb/Cr channels
Rate Control Mode	Rate control functionality is needed to adjust to fluctuating bandwidth. At a minimum the bitrate control mode needs to be supported. It is preferred that the constant QP mode is supported as this allows Skype for Business to implement a rate control which can take feedback from the decoder on loss rate and decoder capabilities into account
Quality	Quality requirements for different video sequences are needed to ensure good encoder performance under a variety of real world conditions such as e.g. low and high motion content, low and high texture content, etc.
Memory	High memory usage or memory leaks will cause Skype for Business reliability issues.

4.2. “Skype for Business” Premium Logo Requirements

Encoders must support (1) **UCConfig Mode 1 standard requirements** and (2) **UCConfig Modes 1 premium requirements** in order to participate in the Premium Logo Program. The premium requirements and their purpose are summarized in Table 4-Table 6.

Table 4: Premium Logo Requirements Windows 7/8

Requirement Sets	UCConfig Mode 1
Temporal Layers	≥ 3
Max MB Processing Rate	≥ 244800 (1x1080p@30fps)
Resolution	≥ 3 resolutions
Maximum Resolution	≥ 1080p
Dynamic resolution change	Required within 2 frames
Dynamic IDR request	Required within 1 frame
Variable frame rate support	Required
Simulcast Streams	≥ 3
Simulcast Transport Mode	Multiplexed mode for Category 1 encoders, and multiple stream mode for Category 2/3 encoders.
Multiple slices per frame	Support fixed number of MB row per slice except for last slice
Profile	Constrained Baseline and Constrained High profiles
Rate Control Mode	Constant QP and Bitrate Control ²
Quality	Meet Windows 7/8 premium quality bar

Remark: The above table requires that in order to meet the premium requirements, encoders must be able to generate at least a total of 9 layers in order to meet the UCConfig Mode 1 requirements.

Table 5: Premium Logo Requirements for Windows 8.1

Requirement Sets	UCConfig Mode 1
Temporal Layers	≥ 3
Max MB Processing Rate	≥ 489600 (2x1080p@30fps)
Resolution	≥ 4 resolution
Maximum Resolution	$\geq 1080p$
Dynamic resolution change	Required to be within 1 frame latency
Dynamic profile change	Required to be within 1 frame latency
Dynamic level change	Required to be within 1 frame latency
Dynamic add/remove temporal layers	Required to be within 1 frame latency
Dynamic maximum reference frame change	Required to be within 1 frame latency
LTR Control	Required to be within 1 frame latency
Dynamic IDR request	Required to be within 1 frame latency
Sample aspect ratio	Required
Variable frame rate support	Required
Simulcast Streams	≥ 4 streams
Simulcast transport mode	Multiplexed mode for Category 1 encoders, and multiple stream mode for Category 2/3 encoders.
Multiple slices per frame	Support fixed number of MBs per slice except for last slice and number of bytes per slice within in -10% precision
Profile	Constrained Baseline, Constrained High
Rate Control Mode	Constant QP and Bitrate Control ²
Quality	Meet Windows 8.1 premium quality bar

Table 6: Purpose of premium requirements

Requirement categories	Purpose
Temporal Layers	Three or more temporal layers are preferred as then Skype for Business can support scalability in terms of 30fps, 15fps and 7.5fps. Compared to the standard requirements this allows a finer-grain scalability to: <ul style="list-style-type: none"> - Adjust bitrate to different bandwidth constraints for multiple receiving clients - Adapt to bandwidth changes during a call - Implement better error resilience
Max MB Processing Rate	Unchanged from standard requirements and thus same purpose applies
Resolution	Unchanged from standard requirements and thus same purpose applies
Maximum Resolution	Same purpose applies as the standard requirements, but higher resolution support is required.
Dynamic resolution change	Same purpose applies as the standard requirements, but stricter requirements on the duration of the dynamic resolution change.
Dynamic profile/level/temporal layer count/max number of reference frame change	Same purpose applies as the standard requirements
LTR control	Same purpose applies as the standard requirements
Dynamic IDR request	Same purpose applies as the standard requirements, but shorter response time support is required.
Sample aspect ratio	Same purpose applies as the standard requirements
Variable frame rate support	In low lighting conditions the H.264 encoder needs to be able to adjust the frame rate so that a larger exposure time can be chosen by the camera to avoid a low signal to noise ratio.
Simulcast Streams	For the premium requirements we want to have enough simulcast streams in addition to the temporal layers to be able to achieve: <ul style="list-style-type: none"> - Adjustment of bitrate to different bandwidths - Adjustment of resolution to different receive capabilities (e.g. small vs. large render window size) This is in addition to the scalability which is given by the temporal layers.
Simulcast Transport Mode	Same purpose applies as the standard requirements.
Multiple slices per frame	Allowing multiple slices per frame will allow to achieve better error concealment and allow smaller packetization. Slice mode also will allow to decrease decoder latency.
Profile	The requirement for the base layer and temporal scalable layers is unchanged from standard requirements and thus same purpose applies.
Rate Control Mode	For premium logo it is not only preferred but required that the constant QP mode is supported as this allows Skype for Business to implement a rate control which can take feedback from the decoder on loss rate and decoder capabilities into account
Quality	Premium logo encoders are expected to achieve higher video quality than standard logo encoders.

5. Technical Evaluation Setup and Procedure

Figure 1 shows the functional diagram of the Microsoft Skype Video Encoding Conformance (MLVEC) toolkit provided with this document. The toolkit contains two parts: a bitstream generator that runs on the physical device to produce bitstreams as defined in the rest of this document and a conformance verifier that analyzes the produced bitstreams and generates the test reports.

The bitstream generator reads clips as the input to the hardware encoder, generates bitstreams via the hardware encoder as commended in the input config script, and output the bitstreams and test logs to the local working directory. The logo clips with various resolutions, scenarios, and contents are provided with this document, as summarized in Section 5.1. The bitstream generator does not support tethered USB webcams and camera vendors are expected to use their proprietary solution (e.g. via a development board) to generate bitstreams as defined in the rest of this document.

The conformance verifier reads the output bitstreams and test logs, apply functional and quality checks against those and generate the test report. Depending on whether encoders are targeting the standard requirements or the premium requirements the encoders must generate bitstreams according to the syntax conformance requirements specified in Sections 6.2, or 6.3. Each bitstream and all the extractable sub-bitstreams must meet the syntax conformance requirements given in Sections 6.2 and or 6.3 as well as the quality conformance requirements specified in Section 6.3. The conformance verifier may be run on the device under test or on a powerful PC to speed up the execution (particularly when the device under test is not powerful).

The detailed instructions on how to use the test toolset can be found in MLVEC usage manual.

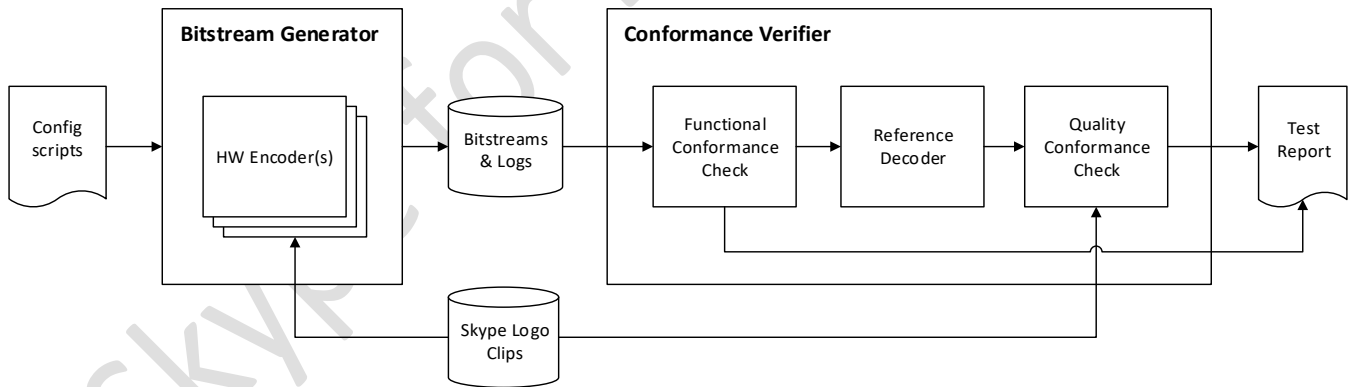


Figure 1. Microsoft Skype Encoding Conformance Toolkit Diagram

5.1. Video Sequences

The video sequences are chosen such that it is ensured that the encoder works well in typical video conferencing situations. Additionally all supported encoder resolutions will be tested.

The clips mainly contain a single person in front of a webcam or handheld device. In addition conference room scenarios with multiple people in front of the camera are covered by the video sequences. The following types of clips are used throughout the technical evaluation.

- **HIMOTION16_9**: One person with high texture content in front of a 16:9 aspect ratio webcam with high motion movements
- **HIMOTION4_3**: Similar clip as HIMOTION16_9 but with 4:3 aspect ratio
- **LOWMOTION16_9**: One person in front of a 16:9 aspect ratio webcam with low motion movements and high texture clothing
- **HANDHELD3_4**: One person using the front-facing camera of a handheld device (i.e., mobile or slate device) with 3:4 aspect ratio. This clip is containing hand-jitter. The first half of the clip the person is standing still and the second half of the clip the person is moving to a different location to include high motion content.
- **HANDHELD9_16**: Similar clip as HANDHELD3_4 but with aspect ratio of 9:16
- **LOWLIGHT16_9**: Clip with one person in an office with low lighting and moderate motion with aspect ratio of 16:9
- **2PEOPLE16_9**: Conferencing scenario where two people sit in front of a webcam with 16:9 aspect ratio. The clip has high motion and high texture.
- **PANO20_3**: Clip from a RoundTable 360 degree panoramic camera with approximately 20:3 aspect ratio

5.2. Coding toolsets

Two sets of coding toolsets are considered in this specification, each of which is defined by an H.264 profile used to generate the bitstreams. For each profile, the encoder must enforce the use of the required tools given in Table 7. Other tools such as e.g. 8x8 transform that are included in the profile but are not required in the table below may be used to increase bitstream quality or coding efficiency.

Table 7: H.264 profiles used in this Specification

Index	Profile Name	Required Tools
1	Constrained Baseline Profile	CAVLC
2	Constrained High Profile	CABAC ³

5.3. Test procedure for tethered webcams

Tethered USB webcams usually don't have a possibility to feed the pre-recorded clips into the hardware encoder. Due to this we are currently requiring these tests to be run on a development kit which allows feeding the pre-recorded clips into the encoder.

³ CABAC is required for bitstreams encoded with Constrained High profile. Bitstreams encoded with Constrained High profile may optionally support CAVLC.

6. Microsoft Skype for Business H.264 HW Encoder Requirements

6.1. Common Requirements

In the following sections requirements are given which apply irrespective of whether standard or premium logo requirements are targeted.

6.1.1. USB driver requirement

H.264 HW encoders which are used with tethered or integrated USB webcams need to support the Version 1.5 of the USB Video Class (UVC) Definition for Video Devices standard (http://www.usb.org/developers/devclass_docs#approved). In addition they also will need to support the Windows 8 Device Requirements for H.264 webcams in the section Device.Streaming.Webcam.H264 (<http://msdn.microsoft.com/library/windows/hardware/hh748188>). Lync 2013 will only support H.264 USB webcams which comply with the UVC 1.5 standard as well as pass the Windows 8 Device requirements.

6.1.2. Aspect ratios and image resolutions

As discussed in Section 4.1, there are three categories of H.264 encoders. The resolutions which must be supported by the H.264 HW encoder depend on the encoder category. In Table 8 the aspect ratios which must be supported by the H.264 HW encoder are listed. Based on the supported aspect ratios the mandatory resolutions for each aspect ratio can be found in Table 9.

Table 8: Aspect ratios to be supported by the encoder

Encoder category	Approx. 16:9	Approx. 4:3	Approx. 9:16	Approx. 3:4	20:3 panorama
Encoder for tethered USB webcam	Yes	Yes	No	No	No
Encoder for integrated webcam	Yes	Yes	Yes, if device allows rotation (e.g. Windows tablet, mobile phone)	Yes, if device supports rotation.	No
Generic encoder	Yes	Yes	Yes	Yes	Yes

It should be pointed out that tethered or integrated webcams still need to support all the resolutions given in the Skype for Business Video Capture Specification for any non-encoded video bitstream.

For devices which support rotation (e.g. tablets/mobile phones) the H.264 HW encoder also has to support the 9:16 and 3:4 aspect ratios as well.

Generic H.264 HW encoders need to be able to encode all the aspect ratios listed in Table 8 because such encoders will also need to be able to encode raw video bitstreams coming from any USB video source. Therefore also panoramic video as delivered by the RoundTable/Polycom CX5000 USB device has to be supported.

If the encoder supports simulcast streams then each simulcast stream must have the same aspect ratio.

For each supported aspect ratio the resolutions which the H.264 hardware encoder must be able to generate are given in Table 9 below.

Table 9: Resolutions to be supported by the encoder

Approx. 16:9	Approx. 4:3	Approx. 9:16	Approx. 3:4	20:3 panorama
1080p: 1920x1080	VGA: 640x480	540x960	480x640	Pano288p: 1920x288
720p: 1280x720	424x320 (optional)	480x848	320x424 (optional)	Pano192p: 1280x192
540p: 960x540 ⁴	QVGA: 320x240	360x640	240x320	Pano144p: 960x144
480p: 848x480	212x160 (optional)	270x480	160x212 (optional)	
360p: 640x360	QQVGA:160x120	240x424		
270p: 480x270		180x320		
240p: 424x240 ⁵				
180p: 320x180				

6.1.3. Frame rate

The H.264 HW encoder must be able to allow the camera to adjust exposure in low lighting conditions and therefore has to support variable frame rate. The frame rate of the camera should never go below 15fps to ensure that the user doesn't perceive lower subjective quality due to low frame rate.

The frame rate range which must be supported by the H.264 hardware encoder is given by the maximum frame rate for each resolution in the table below and the minimum of 7.5fps. Skype for Business may decide to request encoding at 7.5fps if the network bandwidth is constrained and therefore we require support of a minimum frame rate of 7.5fps even if the camera will always provide 15fps.

Table 10: Maximum frame rates required to be supported by the encoder.

Resolution (16:9)	Max fps	Resolution (9:16)	Max fps	Resolution (4:3)	Max fps	Resolution (3:4)	Max fps	Resolution (20:3)	Max fps
1920x1080	30	540x960	30	640x480	30	480x640	30	1920x288	30 ⁶
1280x720	30	480x848	30	424x320	15	320x424	15	1280x192	30
960x540	30	360x640	30	320x240	15	240x320	15	960x144	15
848x480	30	270x480	15	212x160	15	160x212	15		
640x360	30	240x424	15	160x120	15				
480x270	15	180x320	15						
424x240	15								

⁴ The resolution 960x544 is also allowed but 960x540 is preferred. Same applies to the portrait resolution 544x960.

⁵ The resolution 432x240 is also allowed but 424x240 is preferred. Same applies to the portrait resolution 240x432.

⁶ It should be noted that currently the video sequences for panoramic video (20:3 aspect ratio) are only available at a frame rate of 15fps. At a later point this specification will be updated to include a panoramic video clip with 30fps.

320x180	15								
---------	----	--	--	--	--	--	--	--	--

6.1.4. Video preview

USB webcams with a H.264 HW encoder will still need to provide a raw video bitstream for the video preview. The preview pin must support a resolution of up to 640x360 for 16:9 resolutions and in case it supports 4:3 resolutions as well it must support up to 640x480 for the preview pin. The aspect ratio of the video preview bitstream must be the same as the aspect ratio of the H.264 bitstream. The frame rate for the video preview must be 30fps. The color space must be one of the following:

1. IYUV/I420
2. NV12/NV21
3. YUY2

The above list is ordered in terms of preference by Skype for Business 2016.

It must be possible to control the video preview pin separately from the H.264 pin. The following controls are needed to be separate:

- Start/stop
- Resolution
- Frame rate

The reason for this requirement is that the preview pin may be used for the software encoder to generate another simulcast stream in a conference call e.g. to send VC1 encoded video to Lync 2010 clients.

6.1.5. Encoder latency

The encoder latency requirement ensures that the H.264 HW encoder does not induce any excessive latency which would degrade the overall Skype for Business video end-to-end experience.

The requirement is that the encoding time has to be within 33ms except that one frame may be encoded within 66ms in every 10 second span when running in medium encoding speed mode⁷ if the encoder supports multiple encoding algorithms.

6.1.6. Dynamic resolution change

In case the receiving client changes the video render size a different resolution may be requested from the sender and therefore the H.264 HW encoder has to be able to support dynamic resolution changes. For USB webcams without H.264 HW encoding there is already a requirement for the time which is allowed to change resolutions. For non-H.264 USB webcams this will only occur infrequently in case the camera is reopened. For H.264 HW encoders however this will occur much more often and thus the requirement is much more stringent, i.e., much less latency is allowed for changing the resolution dynamically.

⁷ This corresponds to CODECAPI_AVEncCommonQualityVsSpeed equal to 50.

The requirements are given in the table below:

Windows 7/8:

	Standard	Premium
Dynamic resolution change	5 frames latency	2 frames latency

Windows 8.1:

	Standard	Premium
Dynamic resolution change	1 frame latency	1 frame latency

6.1.7. Dynamic profile change

The requirements are given in the table below:

Windows 8.1:

	Standard	Premium
Dynamic profile change	1 frame latency	1 frame latency

6.1.8. Dynamic level change

The requirements are given in the table below.

Windows 8.1:

	Standard	Premium
Dynamic level change	1 frame latency	1 frame latency

6.1.9. Dynamic add/remove temporal layers

The requirements are given in the table below. Note that IDR is not allowed if adding/removing a temporal layer does not change the content of SPS/PPS. The encoder must wait until it is encoding a base layer frame before applying the new temporal pattern.

Windows 8.1:

	Standard	Premium
Add/Remove temporal layers	1 frame latency	1 frame latency

Note that if the next frame is in the base layer, the encoder must change temporal layer count immediately (i.e. within 1 frame latency). Otherwise the encoder must apply the control in the next base layer frame in order to preserve the dyadic temporal structure to meet the standard requirement⁸.

⁸ In conformance to Windows 8.1 Hardware Certificate Kit (WHCK) requirement, this requirement is applied when GoP size is set to be infinite.

6.1.10. Dynamic maximum reference frame change

The requirements are given in the table below.

Windows 8.1:

	Standard	Premium
Dynamic maximum reference frame change	1 frame latency	1 frame latency

6.1.11. IDR frame request

In case of severe packet loss or new clients joining the conference call the receiving client may request an IDR frame from the sender. Therefore the H.264 HW encoder must support IDR frame requests.

Every IDR frame must include a sequence parameter set NAL unit and a picture parameter set NAL unit that refers to the sequence parameter set NAL unit and is referred by the coded slices in the IDR frame. SPS shall have max_dec_frame_buffering equal to max_num_ref_frames⁹. The latency of responding to such IDR frame request must not be longer than specified in the table below.

Windows 7/8:

	Standard	Premium
IDR frame request	2 frames latency	1 frame latency

For the premium program, there are two implementation options accepted in this spec:

1. The new IDR frame is inserted as the next frame immediately. The dyadic temporal structure may be reset on the new IDR frame.
2. The new IDR frame is inserted as the next base layer frame. The dyadic temporal structure is preserved.

It is strongly recommended to implement the second option.

Windows 8.1:

	Standard	Premium
IDR frame request	1 frame latency	1 frame latency

Starting from Windows 8.1, the second option is a mandatory requirement⁸.

6.1.12. Sample aspect ratio

In case that the input samples are not square pixels, the sample aspect ratio is needed to be carried in VUI such that the receiver can restore the original aspect ratio properly. The latency of responding to VUI update for sample aspect ratio must not be longer than specified in the table below:

⁹ B frames are not considered in the scope of this document.

Windows 8.1:

	Standard	Premium
Sample Aspect Ratio	1 frame latency	1 frame latency

6.1.13. Control of periodic key frames

In Skype for Business , group of pictures (GOP) structure is created through dynamic IDR frame request controlled by the application. HW encoders must allow to disable encoder controlled periodic key frames completely (i.e., a GOP of infinity).

6.1.14. Rate control mode

For Category 3 encoders, Constant QP rate control mode is preferred in Windows 7/8 and mandatory in Windows 8.1 for the standard requirements and is always mandatory for the premium requirements. The QP value has to be applied within one frame latency.

For Category 1 and 2 encoders, the low delay variable bit rate (VBR) rate control mode is mandatory in windows 7/8/8.1 for both the standard and premium requirements, and Constant QP mode is mandatory for the standard requirement in Windows 8.1 and premium requirements in Windows 7/8/8.1.

For USB webcams details on the implementation of both, constant QP as well as low delay VBR rate control modes can be found in the USB Video Class Device Specification.

6.1.15. Long Term Reference (LTR) control

There are three LTR controls required for Windows 8.1:

1. Set the number of application-controlled LTR frames
2. Mark the current frame as a LTR frame
3. Use a LTR frame to encode the current frame

The encoder must support at least 2 application-controlled LTR frames. The latency of mark and use LTR frames must not be longer than specified in the table below:

	Standard	Premium
LTR control	1 frame latency	1 frame latency

6.1.16. Slice control

Slice control is mandatory for premium requirements for all categories of encoders and standard requirements for Windows 8.1. If encoders support slice control mode then the QP control has to be applied on an entire frame. The latency of slice control must not be longer than specified in the table below:

	Standard	Premium
Slice control	1 frame latency	1 frame latency

6.1.17. Bitstream Conformance

Test bitstreams must be decoded by processing it with the test toolkit provided with this specification. When processed by the test toolkit, the bitstream shall not cause any error or non-conformance messages to be reported by the reference software decoder included in the test toolkit.

Furthermore, all sub-bitstreams extractable from a full test bitstream must also be decoded by processing it with the test toolset. For example, if a bitstream consists of two temporal layers the following two sub-bitstreams are considered:

- Sub-bitstream that consists of one layer: the base temporal layer (temporal_id = 0, dependency_id = 0 and quality_id = 0),
- Sub-bitstream that consists of two layers: the base temporal layer (temporal_id = 0, dependency_id = 0 and quality_id = 0) and the enhancement temporal layer (temporal_id = 1, dependency_id = 0 and quality_id = 0)

Additional syntax requirements specific to each UCConfig Mode are elaborated in the rest of this section.

6.1.17.1. Single Stream

When the encoder is requested to generate one single stream, the bitstream must obey the constraints below according to the associated UCConfig Mode.

6.1.17.1.1. UCConfig Mode 0

- The value of pic_order_cnt_type in SPS must be 2.
- Coded slice NALUs with nal_unit_type 1 and 5 must be present in the bitstream. Coded slice NALUs with nal_unit_type 2, 3 and 20 must not be present in the bitstream.
- When present, the values of temporal_id, quality_id, dependency_id and priority_id in prefix NALUs must be 0.
- PicOrderCnt must be non-decreasing in decoder order.
- slice_type must be 0, 2, 5, or 7.
- The value of entropy_coding_mode_flag must be the 0 when toolset 1 is used, and 1 when toolset 2 is used.
- The value of constrained_set4_flag and constraint_set5_flag must be 0 when toolset 1 is used, and 1 when toolset 2 is used.
- In case the encoder supports constant QP mode the value of (pic_init_qp_minus26 + 26) + slice_qp_delta + mb_qp_delta must be equal to the requested QP value.

6.1.17.1.2. UCConfig Mode 1

- The value of pic_order_cnt_type in SPS must be 2.

- Coded slice NALUs with `nal_unit_type` 1 and 5 must be present in the bitstream. For each coded slice NALU with type 1 or 5, it must be preceded with a prefix NALU with `nal_unit_type` 14. Coded slice NALUs with `nal_unit_type` 2, 3 and 20 must not be present in the bitstream.
- The values of `dependency_id` and `quality_id` all prefix NALUs must be 0.
- The value of `temporal_id` must be 0 for prefix NALUs associated with base layer coded slices, defined as coded slices of an IDR picture or coded slices that depend on layer representations with `temporal_id` equal to 0 and can be used as reference of any subsequent coded slices. The value of syntax element `nal_ref_idc` of coded slices with `temporal_id` equal to 0 must be non-zero.
- The value of `temporal_id` must be 1 for prefix NALUs associated with first temporal enhancement layer coded slice (if present), defined as coded slices that depend on layer representations with `temporal_id` equal to 0 and can be used as reference of coded slices with `temporal_id` greater than 1. The value of syntax element `nal_ref_idc` of coded slices with `temporal_id` equal to 1 must be non-zero if the maximum `temporal_id` value in the bitstream is greater than 1, and zero otherwise.
- The value of `temporal_id` must be 2 for prefix NALUs associated with second temporal enhancement layer coded slices (if present), defined as coded slices that depend on layer representation with `temporal_id` equal to 0 or 1 and can be used as reference of coded slices with `temporal_id` greater than 2. The value of syntax element `nal_ref_idc` of coded slices with `temporal_id` equal to 2 must be non-zero if the maximum `temporal_id` value in the bitstream is greater than 2, and zero otherwise¹⁰.
- The values of `priority_id` must be equal to the values of `temporal_id` in prefix NALUs.
- `PicOrderCnt` variable must be non-decreasing in decoding order.
- `slice_type` must be 0, 2, 5, or 7.
- The values of `entropy_coding_mode_flag` must be the 0 when toolset 1 is used, and 1 when toolset 2.
- The value of `constrained_set4_flag` and `constraint_set5_flag` must be 0 when toolset 1 is used, and 1 when toolset 2 is used.
- $(pic_init_qp_minus26 + 26) + slice_qp_delta + mb_qp_delta$ must be equal to the requested QP value.

When operating in the constant QP mode, the following constraint must also be obeyed:

- $(pic_init_qp_minus26 + 26) + slice_qp_delta + mb_qp_delta$ must be equal to the requested QP value.

¹⁰ This document only considers bitstreams up to three temporal layers. Therefore the value of syntax element `nal_ref_idc` of coded slices with `temporal_id` equal to 2 (when present) must be always 0 in the context of this document.

6.1.17.2. Simulcast Stream

6.1.17.2.1. Multiple Stream Mode

When the encoder is requested to generate multiple simulcast streams and the Multiple Stream mode is supported, encoders must generate multiple independently coded bitstreams, each of which obey the constraints specified in Section 6.1.17.1 according to the associated UCConfig Mode.

6.1.17.2.2. Multiplexed Mode

When the encoder is requested to generate multiple simulcast streams and the Multiplexed mode is supported, encoders must generate one single multiplexed bitstream according to the multiplexing rules specified in the UCConfig specification. Each composing stream in the multiplex bitstream must obey the constraints specified in Section 6.1.17.1 according to the associated UCConfig Mode and obey the following constraints:

- `pic_parameter_set_id` found in each picture parameter set NALU with `nal_unit_type` 8 must be unique across streams.
- `seq_parameter_set_id` found in each sequence parameter set NALU with `nal_unit_type` 7 must be unique across streams.
- `seq_parameter_set_id` found in each subset sequence parameter set NALU with `nal_unit_type` 8 must be unique across streams.
- The values of `priority_id` in each composing stream except the one with lowest resolution must be shifted up such that the values are non-overlapped and continuous. The values of `priority_id` in low resolution streams must be smaller than those in high resolution streams.

6.1.18. Quality Conformance

When an encoder supports multiple encoding algorithms, the medium encoding speed mode⁷ is used for quality conformance verification.

When LTR control is requested (Windows 8.1 only) for quality conformance verification, the encoder must generate bitstreams with the following configuration:

- IDR and the next base layer frame are marked as LTR with *LongTermFrameIdx* equal to 0 and 1 respectively.
- Subsequent LTR frames are generated at every 1 second and assigned with *LongTermFrameIdx* equal to 0 if the previous LTR frame has *LongTermFrameIdx* equal to 1 (and vice versa) and only use the previous LTR frame as the reference.
- When an LTR frame is inserted, all STR frames in the decoding picture buffer (DPB) shall be marked as “unused for reference”.

6.1.18.1. Constant QP

The minimum supported QP range is [20, 45]. Even if the encoder does not expose the constant QP control, it still needs to generate the bitstreams with constant QP for the R-D curve and similarly PSNR tests. This can be done using, for example, a development board. The exact QP values which must be used are specified with each conformance test in the rest of this document.

6.1.18.1.1. Rate-Distortion (RD) Measurements

For the purpose of quality conformance, rate-distortion performance (in units of bits per seconds, bps and PSNR (Peak Signal to Noise Ratio)) is used as a metric for coding efficiency. Conformant encoders must generate bitstreams that result in a better rate-distortion curve compared to the rate-distortion curve points provided in Section 6.3.

To simplify the comparison of the two rate-distortion curves the following algorithm is used to compute a single value which characterizes the average distance ΔPSNR between these two rate-distortion curves. In essence this computes the area between two rate-distortion curves and normalizes it by the bitrate range. The algorithm is implemented in the test tool as follows:

- Fit an interpolation curve through the four data points of the rate-distortion curve for the device under test as well as the reference values from Section 6.3. The interpolation curve is obtained by the following formula:

$$\text{PSNR} = a + b \cdot \text{bitrate} + c \cdot \text{bitrate}^2 + d \cdot \text{bitrate}^3$$

where a, b, c, d are determined such that the interpolation curves passes through all four data points of the rate-distortion curve given by the $(\text{PSNR}, \text{bitrate})$ values.

- Compute the integral I_{DUT} of the fitted curve for the device under test (DUT) as well as the integral I_{Ref} of the fitted curve for the reference values from Section 6.3. The integrals are computed using the logarithmic scale for the bitrate.
- The average distance ΔPSNR is computed by the difference $I_{DUT} - I_{Ref}$ divided by the integration interval given by the bitrate range.

The **average distance ΔPSNR has to be larger than zero** for all the rate-distortion curves provided in Section 6.3.

6.1.18.1.2. PSNR Measurements

For the purpose of quality conformance as well as for the rate-distortion computation, PSNR (Peak Signal to Noise Ratio) is used as a metric for video quality performance. The PSNR value is calculated as the distance between the decoded YUV and the original YUV clip for the Y channel. The definition of the average PSNR for the whole video sequence is:

$$\overline{PSNR} = \sum_{k=1}^K \min \left[20 \log_{10} \left(\frac{255}{\sqrt{\frac{1}{M \cdot N} \sum_{i=0}^{M-1} \sum_{j=0}^{N-1} [Y_{Original}(i,j) - Y_{Codec}(i,j)]^2}} \right); 50 \right]$$

where

- K is the number of frames in the video sequence
- M, N are the horizontal and vertical dimensions of the video frame
- $Y_{Original}(i,j)$ is the Y-channel value at the i -th horizontal and j -th vertical position of the original video frame
- $Y_{Codec}(i,j)$ is the Y-channel value at the i -th horizontal and j -th vertical position of the video frame encoded by the device under test and decoded by the test tool.

It should be noted that the PSNR for each frame is capped at 50dB to ensure that any perfectly reconstructed frame does not bias the average PSNR computation.

In addition to the average PSNR over the whole video sequence also the minimum PSNR has to be computed. The minimum PSNR is given as the average PSNR of the 2% of frames with minimum PSNR in the entire video sequence. **Conformant encoders must have a minimum PSNR which is higher than the provided reference** in Section 6.3

6.1.18.2. Rate Control

For variable and constant bit rate buffer modeling, this document specifies rate control operation in terms of a leaky bucket model similar to the Universal Serial Bus Device Class Definition for Video Devices specification. The bits used to encode each picture are analogous to cups of water being dumped into the top of the bucket when each picture is encoded (after re-ordering the pictures as necessary for bitstream orders that differ from display order); the level of water in the bucket indicates the number of bits waiting to be sent to the decoder; and the water leaking out of a hole in the bottom of the bucket corresponds to bits flowing into the decoder through a transmission channel. The leaky bucket is a traffic meter that contains two parameters:

- R_{Avg} = Average bitrate at which bit can flow out from the bottom of the bucket in bits per second
- B = Buffer size in bits obtained by multiplying the bitrate with the leaky bucket size given in seconds

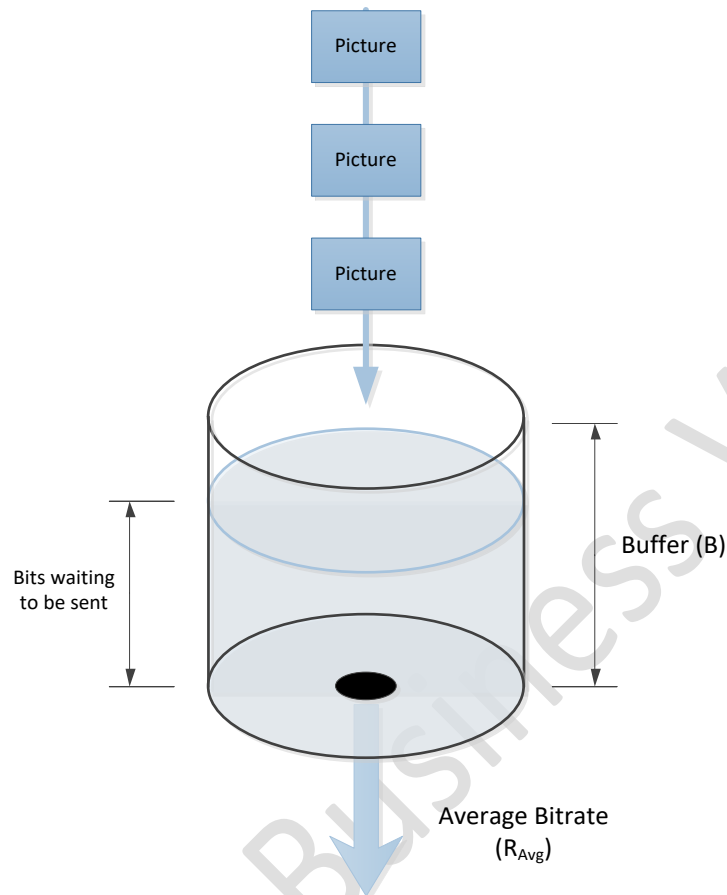


Figure 2: Leaky bucket model

The buffer serves to smooth out local bit rate fluctuations while limiting the total bit usage that is possible over longer durations and limiting the buffering capacity necessary for a decoder to be able to decode the video content.

The leaky bucket model at the encoder has a corresponding mirror-image model that operates from the decoder perspective. As bits leak out of the encoder buffer, they conceptually enter into a corresponding decoder input buffer, which continues to fill up until the decoding time of a picture arrives – at which time the bits for that picture are removed from the decoder’s CPB.

If too many bits are dumped into the bucket too quickly, the buffer capacity B would be exceeded before enough bits have time to drain out of the hole in the bottom of the bucket, and the buffer is said to “overflow” from the encoder perspective. From the decoder perspective, an overflow could occur if the removal of pictures from the decoder CPB at the decoding times of those pictures is not fast enough to keep up with the amount of bits that have been flowing into it from the encoder.

For the purpose of quality conformance in rate control mode two tests will be performed with the following requirements:

1. Quality conformance for constant bit rate control:
 - a. The initial fullness of the leaky bucket is 0
 - b. Prefix, SEI and AUD NALUS are not contributed to leaky bucket fullness.
 - c. The leaky bucket shall never overflow
 - d. Maximum consecutive frame drop must not exceed 200ms when bit rate ≥ 125 Kbps and source frame rate ≥ 15 fps, and must not exceed 1 second otherwise.
 - e. Average PSNR for the entire sequence has to meet the quality bars given in Section 6.3
 - f. Only the first frame of the encoded video sequence is allowed to be an IDR frame
 - g. The initial IDR frame needs to be encoded with QP=34
 - h. The encoder must support minimally 48 Kbps under QQVGA.
2. Quality conformance for bit rate changes:
 - a. Within 1 second after the new average bitrate R_{Avg} is messaged to the encoder the buffer size B must be reduced to reflect the new bitrate. After 1 second also the leaky bucket shall never overflow and the maximum consecutive frame drop must not exceed 200ms.
 - b. Only the first frame of the encoded video sequence is allowed to be an IDR frame.
 - c. The initial IDR frame needs to be encoded with QP=34.

The bit rate for the bitstreams using temporal scalability are defined for all sub-bitstreams. This means that the bit rate is defined for base layer, base layer plus second temporal layer, and base layer plus second and third temporal layers. The above requirements shall apply to all individual sub-bitstreams.

The average PSNR is computed according to the formula given in Section 6.1.18.1.1. In case of the current frame being dropped the previous encoded frame will be used to compare against the current raw frame.

To allow for proper evaluation of the performance of the encoder in the rate control mode the conformant encoders must generate bitstreams in which the first coded slice of a picture is immediately preceded by a registered user SEI message, called *MS timestamp SEI message*. The payload size of the MS timestamp SEI message is 11. The value of `itu_t_t35_country_code` is 0xB5. The first and second `itu_t_t35_payload_bytes` are 0x53 and 0x4C followed by an 8 bytes byte additional payload syntax element. The first four bytes of the additional payload syntax element are 0x4C, 0x59, 0x4E and 0x43 (i.e., corresponding to ASCII code of "LYNC"). The last four byte of the additional payload syntax element is the timestamp of the picture that the slice corresponds to, relative to the first picture in the entire bitstream, in units of 1 millisecond. The payload data described above are in decoder order. The SEI messages shall be coded in the Annex B byte stream format. The verification of the leaky bucket regulation is on bitstreams with SEI messages stripped.

6.1.19. Longevity

The encoder must sustain glitch-free for 2 hour. That is, the encoding time must be within 33 ms except that one frame can be encoded within 66 ms in a per-10 second span. When generating simulcast streams, the concurrent encoding sessions must sustain glitch-free individually for 2 hours.

6.2. Standard Logo Requirements

To meet the standard logo requirements for UCConfig Mode1, the encoder must be able to generate bitstreams in UCConfig Mode 0 and UCConfig Mode 1. The detailed requirements are specified below. It should be noted that for Category 1 (tethered USB webcams with H.264 encoder) and Category 2 (integrated USB webcams) encoders only a certain subset of aspect ratios is required as called out in Section 6.1.2 in Table 8. Therefore some of the video sequences which are listed in the tables in this section as well as in the premium logo requirements in Section 6.3 do not need to be encoded for such products.

6.2.1. Single UCConfig Mode 0 Bitstream

6.2.1.1. Quality test

Encoders must generate UCConfig Mode 0 bitstreams with all the possible combinations of contents, frame rates, resolutions, and QP values, specified in the table below. The encoding toolsets have been defined in Table 7.

Table 11: Bitstream configuration in Constant QP mode

Content	Frame Rate	Resolution	Encoding Toolset	Quantization Parameter
HIMOTION16_9	30Hz	1080p, 720p, 540p, 480p, 360p	1	26, 30, 34, 38
	15Hz	270p, 240p, 180p		
HIMOTION4_3	30Hz	VGA, 424x320		
	15Hz	QVGA, 212x160		
LOWMOTION16_9	30Hz	720p, 360p		
	15Hz	240p, 180p		
HANDHELD3_4	30Hz	480x640, 320x424		
	15Hz	240x320, 160x212		
HANDHELD9_16	30Hz	540x960, 480x848, 360x640		
	15Hz	270x480, 240x424, 180x320		
LOWLIGHT16_9	15Hz	720p, 360p		
	15Hz	240p, 180p		
2PEOPLE16_9	30Hz	720p, 360p		
	15Hz	240p, 180p		
PANO20_3	30Hz ¹¹	1920x288, 1280x192		
	15Hz	960x144		

Each bitstream must be named as

[UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_QP[QP_Value].264. The

¹¹ It should be noted that currently the video sequences for panoramic video (20:3 aspect ratio) are only available at a frame rate of 15fps. At a later point this specification will be updated to include a panoramic video clip with 30fps.

quality bars for these bitstreams are listed in Table 32 in Section 6.4.1. The encoder must ensure that all requirements for the PSNR sets and the rate-distortion curve are met.

For encoders running in Windows 8.1, encoders must generate another set of UCConfig Mode 0 bitstreams with one LTR frame being used/marked at every 1 second following the configuration specified in Section 6.1.18. Each bitstream must be named as [UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_QP[QP_Value]_LTR.264. The quality bars for these bitstreams are listed in Table 33 in Section 6.4.16.4. The encoder must ensure that all requirements for the PSNR sets and the rate-distortion curve are met.

6.2.1.2. Dynamic IDR request test

Encoders must generate another UCConfig Mode 0 bitstream specified in Table 12 to verify the dynamic IDR request requirements elaborated in Section 6.1.11. IDR frames are required to be inserted every 2 or 1.5 seconds:

Table 12: Bitstream configuration in periodic IDR mode

Content	Frame Rate	Resolution	Encoding Toolset	Quantization Parameter
HIMOTION16_9	30Hz	720p	1	30

The bitstream must be named as [UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_IDR_GOP_[IDR_Interval_In_Millisecond].264.

6.2.1.3. Dynamic control test

For encoders running in Windows 8.1, encoders must generate another UCConfig Mode 0 bitstream specified in Table 13 and Table 14 to verify the dynamic control requirements elaborated in Sections 6.1.7-6.1.16. The encoder is requested to apply the following controls at a particular frame time:

Table 13: Bitstream configuration in dynamic controls

Frame Index	Content	Frame Rate	Resolution	Encoding Toolset	Quantization Parameter	Control Description
0	HIMOTION16_9	15Hz	240p	1	26	Set number of max reference frame to 3, number of application controlled LTR buffers to 2 ¹² , 8 MB rows per slice, and level to 3.0

¹² Per Windows 8.1 requirement, all frames after an IDR, inclusive, shall be automatically marked as LTR frames if 1) the frame is not already set to be marked as a long term reference frame, 2) the frame is a base layer frame (i.e. syntax element temporal_id equal to 0, and 3) the number of frames currently marked as LTR is less than the maximum long-term frame index plus 1.

30	HIMOTION16_9	15Hz	240p	1	36	Mark frame as LTR with LongTermFrameIdx equal to 0 and use LTR with LongTermFrameIdx 1 to encode the current frame
60	HIMOTION16_9	15Hz	240p	1	46	Dynamic IDR request
90	HIMOTION16_9	15Hz	240p	1	36	Mark frame as LTR with LongTermFrameIdx equal to 1 and use LTR with LongTermFrameIdx 0 to encode the current frame
120	HIMOTION16_9	15Hz	240p	1	26	Dynamic IDR request
150	HIMOTION16_9	30Hz	720p	2	36	Change resolution/profile, set level to 3.1, and slice size to 23 MB rows per slice
180	HIMOTION16_9	30Hz	720p	2	46	Mark frame as LTR with LongTermFrameIdx equal to 0 and use LTR with LongTermFrameIdx 1 to encode the current frame
210	HIMOTION16_9	30Hz	720p	2	36	Dynamic IDR request
240	HIMOTION16_9	30Hz	720p	2	26	Mark frame as LTR with LongTermFrameIdx equal to 1 and use LTR with LongTermFrameIdx 0 to encode the current frame
270	HIMOTION16_9	30Hz	720p	2	36	Dynamic IDR request

The bitstream must be named as [UCConfig_Mode]S_[Clip]_Dynamics.264.

Table 14: Bitstream configuration in dynamic control extensions

Frame Index	Content	Frame Rate	Resolution	Encoding Toolset	Quantization Parameter	Control Description
0	HIMOTION16_9	30Hz	720p	2	[26]	max reference frames = 3; LTR buffers = 2; 2 slices per frame; level to 3.1
30	HIMOTION16_9	30Hz	720p	2	[26]	Mark frame as LTR with LongTermFrameIdx equal to 0
40	HIMOTION16_9	30Hz	720p	2	[26]	Use LTR with LongTermFrameIdx 0 to encode the current frame

60	HIMOTION16_9	30Hz	720p	2	[26]	Mark frame as LTR with LongTermFrameIdx equal to 1
70	HIMOTION16_9	30Hz	720p	2	[26]	use LTR with LongTermFrameIdx 1 to encode the current frame

The bitstream must be named as [UCConfig_Mode]S_[Clip]_Dynamics_Ext.264.

6.2.1.4. Dynamic bitrate control test

For the constant bitrate control tests the encoder must generate the bitstreams specified below. Only the first frame of the encoded video sequence is allowed to be an IDR frame. This initial IDR frame needs to be encoded with QP = 34. Each bitstream must be named as [UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_RC[Leaky_Bucket_Size]ms[Bi trate]Kbps.264. The PSNR quality bars for these bitstreams are listed in Table 34 in Section 6.3. The encoder must ensure that all requirements for the PSNR sets and the rate-distortion curve are met.

Table 15: Bitstream configuration in Rate Control mode

Content	Frame Rate	Resolution	Encoding Toolset	Leaky Bucket Size	Full Bitrate
HIMOTION16_9	30Hz	1080p	1	500ms, 1000ms	2500Kbps
		720p			1200Kbps
		360p			500Kbps
	15Hz	240p			250Kbps
		180p			150Kbps
HANDHELD3_4	30Hz	480x640			500Kbps
	15Hz	240x320			250Kbps

For the tests measuring convergence time during bitrate changes the encoder needs to generate a bitstream for each of the bitstream configurations given in Table 16. The encoder must generate bitstreams according to the following procedure:

- Full bitrate for the first 5 seconds (i.e. frame 0-149 for 30fps and frame 0-74 for 15fps video sequences)
- 90% of full bitrate from 5 to 10 seconds (i.e. frame 150-299 for 30fps and frame 75-149 for 15fps)
- 75% of full bitrate from 10 to 15 seconds (i.e. frame 300- 449 for 30fps and frame 150-224 for 15fps)
- 50% of full bitrate from 15 to 20 seconds (i.e. frame 450-599 for 30fps and frame 225-299 for 15fps)

Each bitstream must be named as

[UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_RC[Leaky_Bucket_Size]ms[Bi
trate]KbpsConvergenceTest.264.

The bitrate must converge to the new value within one second after each of the bitrate changes.

Table 16: Bitstream configuration in Convergence Time Mode

Content	Frame Rate	Resolution	Encoding Toolset	Leaky Bucket Size	Full Bitrate
HIMOTION16_9	30Hz	1080p	1	500ms, 1000ms	4000Kbps
		720p			2500Kbps
		360p			800Kbps
	15Hz	240p			350Kbps
		180p			250Kbps
HANDHELD3_4	30Hz	480x640			1500Kbps
	15Hz	240x320			350 Kbps

6.2.2. Simulcast UCConfig Mode 0 Bitstream

Encoders must generate two simulcast bitstreams with all the possible combinations of content, frame rate, resolution, and constant QP parameter, specified the table below. The left value in the parentheses represents the corresponding configuration of the first simulcast stream, and the right value represents the corresponding configuration of the second simulcast stream.

Table 17: Bitstream configuration in Constant QP mode

Content	Frame Rate	Resolution	Encoding Toolset	Quantization Parameter
HIMOTION16_9	(30Hz, 15Hz)	(720p, 180p),	(1,1)	(26, 30), (30, 34), (34, 38), (38, 42)
HANDHELD3_4		(480x640, 240x320)		

For encoders operating in multiple stream mode, each bitstream must be named as

[UCConfig_Mode]MM_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_QP[QP_Value].264. The reference for quality conformance is listed in in Table 35 in Section 6.3.

For encoders operating in multiplexed mode, each bitstream must be named as

[UCConfig_Mode]MS_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_QP[QP_Value].264 where content, frame rate, resolution, encoding toolset, and QP correspond to the highest resolution stream. The reference for quality conformance of each individual simulcast stream is identical to that specified for multiple stream mode in Table 35 in Section 6.3.

6.2.3. Single UCConfig Mode 1 Bitstream with 2 Layers

6.2.3.1. Quality test

Encoders must generate bitstreams that consist of one or two temporal layers with all the possible combinations of contents, frame rates, resolutions, and QP values, as specified in Table 18 below. When two QP values are grouped with a bracket, the encoder must generate **two temporal layers** in which the base temporal layer has QP of the left value and the second temporal layer has QP of the right value. It should be pointed out that the temporal layers need to be dyadic, i.e. for two temporal layers and max frame rate of 30fps, encode the base layer at 15fps and the enhancement layer at 15fps (the base layer plus enhancement layer must yield 30fps). For two temporal layers and max frame rate of 15fps, encode the base layer at 7.5fps and the enhancement layer at 7.5fps (the base layer plus enhancement layer must yield 15fps).

Table 18: Bitstream configuration in Constant QP mode

Content	Max Frame Rate	Resolution	Encoding Toolset	QP [base, 2 nd TL]
HIMOTION16_9	30Hz	720p, 360p	2	[26,29], [30,33], [34,37], [38,41]
LOWMOTION16_9	15Hz	240p		
2PEOPLE16_9				
LOWLIGHT16_9	15Hz	720p, 360p, 240p		
HIMOTION4_3	30Hz	VGA	1	
	15Hz	QVGA		
HANDHELD3_4	30Hz	480x640	1	
	15Hz	240x320		
HANDHELD9_16	30Hz	540x960, 360x640	2	
	15Hz	240x424		

Each bitstream must be named as [UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_QP[QP_Value].264. The reference for quality conformance is listed in Table 36 in Section 6.3.

For encoders running in Windows 8.1, encoders must generate another set of UCConfig Mode 1 bitstreams additionally with a LTR frame being used/marked at every 1 second following the configuration specified in Section 6.1.18. Each bitstream must be named as [UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_QP[QP_Value]_LTR.264. The quality bars for these bitstreams are listed in Table 37 in Section 6.3. The encoder must ensure that all requirements for the PSNR sets and the rate-distortion curve are met.

6.2.3.2. Dynamic IDR request test

Encoders must generate another UCConfig Mode 1 bitstream specified in Table 20 to verify the dynamic IDR request requirements elaborated in Section 6.1.11. IDR frames are required to be inserted every 2 or 1.5 seconds.

Table 19: Bitstream configuration in periodic IDR mode

Content	Frame Rate	Input/Output Resolution	Encoding Toolset	Quantization Parameter
HIMOTION16_9	30Hz	720p	2	[30,33]

The bitstream must be named as

[UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_IDR_GOP_[IDR_Interval_In_Millisecond].264.

6.2.3.3. Dynamic control test

For encoders running in Windows 8.1, encoders must generate another UCConfig Mode 1 bitstream specified in Table 20 - Table 26 to verify the dynamic control requirements elaborated in Section 6.1.7-6.1.16. The encoder is requested to apply the following controls at a particular frame:

Table 20: Bitstream configuration in dynamic controls

Frame Index	Content	Frame Rate	Resolution	Encoding Toolset	Quantization Parameter	Control Description
0	HIMOTION16_9	15Hz	180p	1	[26,29]	Set number of max reference frames to 3, number of application controlled LTR buffers to 2^{12} , slice size to 6 MB rows per slice, and level to 3.0
30	HIMOTION16_9	15Hz	180p	1	[31,34]	Mark frame as LTR with LongTermFrameldx equal to 0 and use LTR with LongTermFrameldx 1 to encode the current frame
60	HIMOTION16_9	15Hz	180p	1	[36,39]	Dynamic IDR request
90	HIMOTION16_9	15Hz	180p	1	[31,34]	Mark frame as LTR with LongTermFrameldx equal to 1 and use LTR with LongTermFrameldx 0 to encode the current frame
100	HIMOTION16_9	15Hz	180p	1	[26]	Remove a temporal layer
110	HIMOTION16_9	15Hz	180p	1	[31,34]	Add a temporal layer
120	HIMOTION16_9	30Hz	720p	2	[36,39]	Change resolution/profile change, set level to 3.1, and slice size to 23 MB rows per slice

180	HIMOTION16_9	30Hz	720p	2	[31,34]	Mark frame as LTR with LongTermFrameIdx equal to 0 and use LTR with LongTermFrameIdx 1 to encode the current frame
210	HIMOTION16_9	30Hz	720p	2	[26,29]	Dynamic IDR request
240	HIMOTION16_9	30Hz	720p	2	[31,34]	Mark frame as LTR with LongTermFrameIdx equal to 1 and use LTR with LongTermFrameIdx 0 to encode the current frame
270	HIMOTION16_9	30Hz	720p	2	[36,39]	Dynamic IDR request

The bitstream must be named as [UCConfig_Mode]S_[Clip]_Dynamics.264.

Table 21: Bitstream configuration in dynamic control extension I

Frame Index	Content	Frame Rate	Resolution	Encoding Toolset	Quantization Parameter	Control Description
0	HIMOTION16_9	30Hz	720p	2	[26,29]	max reference frames = 3; LTR buffers = 2; 2 slices per frame; level to 3.1
30	HANDHELD9_16	30Hz	720x1280	2	[26,29]	max reference frames = 3; LTR buffers = 2; 2 slices per frame; level to 3.1

The bitstream must be named as [UCConfig_Mode]S_[Clip]_Dynamics_Ext_1.264.

Table 22: Bitstream configuration in dynamic control extension II

Frame Index	Content	Frame Rate	Input Resolution	Output Resolution	Encoding Toolset	Quantization Parameter	Control Description
0	HIMOTION16_9	30Hz	360p	360p	2	[26,29]	max reference frames = 3; LTR buffers = 2; 2 slices per frame; level to 3.1
30	HANDHELD16_9	30Hz	720p ¹³	540p	2	[26,29]	max reference frames = 3; LTR buffers = 2; 2 slices per frame;

¹³ For encoder that is not capable of internal resizing, an external downscaler should be chained in order to create 540p input frames to generate 540p output bitstream from the encoder. For encoder that is capable of internal resizing, an external downscaler would be not necessary. The bitstream generator supports both types of encoder.

							level to 3.1
--	--	--	--	--	--	--	--------------

The bitstream must be named as [UCConfig_Mode]S_[Clip]_Dynamics_Ext_2.264.

6.2.3.4. Constant bitrate control test

For the constant bitrate control tests the encoder must generate the bitstreams specified below. Only the first frame of the encoded video sequence is allowed to be an IDR frame. This initial IDR frame needs to be encoded with QP = 34. When two bitrate values are grouped with a bracket, the encoder must generate two temporal layers (TL) in which the bitrate of the base temporal layer is regulated based on the left value and the bitrate of both the first and second temporal layers (i.e. the full bitstream) is regulated based on right value. Each bitstream must be named as [UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_RC[Leaky_Bucket_Size]ms[Bi trate]Kbps_T[Num_Of_Temporal_Layers].264.

The PSNR quality bars for these bitstreams are listed in Table 38 in Section 6.3. The encoder must ensure that all requirements for the PSNR sets and the rate-distortion curve are met.

Table 23: Bitstream configuration in Rate Control mode

Content	Frame Rate	Resolution	Encoding Toolset	Leaky Bucket Size	Bitrate [base, base + 2 nd TL]
HIMOTION16_9	30Hz	1080p ¹⁴	2	500ms, 1000ms	[1.5Mbps, 2.5Mbps]
		720p			[800Kbps, 1.2Mbps]
		360p			[300Kbps, 500Kbps]
	15Hz	240p			[180Kbps, 250Kbps]
HANDHELD3_4	30Hz	480x640	1		[300Kbps, 500Kbps]
	15Hz	240x320			[180Kbps, 250Kbps]

For the tests measuring convergence time during bitrate changes the encoder needs to generate a bitstream for each of the bitstream configurations given in Table 24. The encoder must generate bitstreams according to the following procedure:

- Full bitrate for the first 5 seconds (i.e. frame 0-149 for 30fps and frame 0-74 for 15fps video sequences)
- 90% of full bitrate from 5 to 10 seconds (i.e. frame 150-299 for 30fps and frame 75-149 for 15fps)
- 75% of full bitrate from 10 to 15 seconds (i.e. frame 300-449 for 30fps and frame 150-224 for 15fps)

¹⁴ Standard logo requires a maximum resolution of at least 720p. In case the HW encoder also allows encoding of 1080p then it also needs to pass the standard logo requirements for 1080p

- 50% of full bitrate from 15 to 20 seconds (i.e. frame 450-599 for 30fps and frame 225-299 for 15fps)

Each bitstream must be named as

[UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_RC[Leaky_Bucket_Size]ms[Bitrate]KbpsConvergenceTest.264.

The bitrate must converge to the new value within one second after each of the bitrate changes.

Table 24: Bitstream configuration in Convergence Test mode

Content	Frame Rate	Resolution	Encoding Toolset	Leaky Bucket Size	Bitrate [base, base + 2 nd TL]
HIMOTION16_9	30Hz	1080p ¹⁵	2	500ms, 1000ms	[2.5Mbps, 4.0Mbps]
		720p			[1.5Mbps, 2.5Mbps]
		360p			[500Kbps, 800Kbps]
	15Hz	240p			[250Kbps, 350Kbps]
HANDHELD3_4	30Hz	480x640	1		[800Kbps, 1500Kbps]
	15Hz	240x320			[250Kbps, 350Kbps]

6.2.4. Simulcast UCConfig Mode 1 Bitstream with 2 Layers

The encoder must generate two simulcast UCConfig Mode 1 bitstreams each consisting of **two temporal layers** with all the possible combinations of contents, frame rates, resolutions, and QP values, specified in the table below. The left value in the parentheses represents the corresponding configuration of the first simulcast stream, and the right value represents the corresponding configuration of the second simulcast stream. **The same QP value is used for the base and the second temporal layers in a bitstream.**

Table 25: Bitstream configuration in Constant QP mode

Content	Frame Rate	Resolution	Encoding Toolset	Quantization Parameter
HIMOTION16_9	(30Hz, 15Hz)	(720p, 180p),	(2,1)	(26, 30), (30, 34), (34, 38), (38, 42)
HANDHELD3_4		(480x640, 240x320)		

For encoders operating in multiple stream mode, each bitstream must be named as

[UCConfig_Mode]MM_
[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_QP[QP_Value]_T[Num_Of_Temporal_Layres].264
. The reference for quality conformance is listed in Table 39 in Section 6.3.

¹⁵ Standard logo requires a maximum resolution of at least 720p. In case the HW encoder also allows encoding of 1080p then it also needs to pass the standard logo requirements for 1080p

For encoders operating in multiplexed mode, each bitstream must be named as [UCConfig_Mode]MS_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_QP[QP_Value]_[Num_Of_Temporal_Layers].264 where content, frame rate, resolution, encoding toolset, and QP correspond to the highest resolution stream, for example, 1MS_HIMOTION_30_720p_2_QP26_T2.264. The reference for quality conformance of each individual simulcast stream is identical to that specified for multiple stream mode in Table 39 in Section 6.3.

6.2.5. Single UCConfig Mode 1 Bitstream with 3 Layers

6.2.5.1. Quality test

Encoders running in Windows 8.1 must also generate bitstreams that consist of three temporal layers with all the possible combinations of contents, frame rates, resolutions, and QP values, specified in the table below. The left, middle and right values in the bracket correspond to the QP for the first, second, and the third temporal layers in a bitstream, respectively. It should be pointed out that the temporal layers need to be again dyadic, i.e., base layer at 7.5Hz, base layer plus first enhancement layer at 15Hz and all three layers yielding a 30Hz video stream. For the 15Hz frame rate only two temporal layers need to be generated.

Table 26: Bitstream configuration in Constant QP mode

Content	Frame Rate	Resolution	Encoding Toolset	QP [base, 2 nd TL, 3 rd TL]
HIMOTION16_9,	30Hz	1080p, 720p, 360p	2	[26,29,30],[29,32,33],[32,35,36],[35,38,39]
HANDHELD3_4	30Hz	480x640	1	

Each bitstream must be named as [UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_QP[QP_Value].264 where QP refers to that of the base temporal layer if more than one temporal layer is present in the bitstream. The reference for quality conformance is listed in Table 40 in Section 6.3.

Encoders must generate another set of UCConfig Mode 1 bitstreams additionally with a LTR frame being used/marked at every 1 second following the configuration specified in Section 6.1.18. Each bitstream must be named as [UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_QP[QP_Value]_LTR.264. The quality bars for these bitstreams are listed in Table 41 in Section 6.4.16.4. The encoder must ensure that all requirements for the PSNR sets and the rate-distortion curve are met.

6.2.5.2. Dynamic IDR request test

Encoders must generate another UCConfig Mode 1 bitstream specified in Table 27 to verify the dynamic IDR request requirements elaborated in Section 6.1.11. IDR frames are required to be inserted in every 2 or 1.5 seconds.

Table 27: Bitstream configuration in periodic IDR

Content	Frame Rate	Resolution	Encoding Toolset	QP [base, 2 nd TL, 3 rd TL]
HIMOTION16_9	30Hz	1080p	2	[26,29,30]

The bitstream must be named as

[UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_IDR_GOP_[IDR_Interval_In_Millisecond].264

6.2.5.3. Dynamic control test

Encoders must generate another UCConfig Mode 1 bitstream specified in Table 27 to verify the dynamic control requirements elaborated in Section 6.1.7-6.1.16. The encoder is requested to apply the following controls at a particular frame:

Table 28: Bitstream configuration in dynamic controls

Frame Index	Content	Frame Rate	Resolution	Encoding Toolset	Quantization Parameter	Control Description
0	HIMOTION16_9	15Hz	240p	1	[26,29]	Set number of max reference frames to 3, number of application controlled LTR buffers to 2 ¹² , slice size to 8 slices per frame, and level to 3.0
30	HIMOTION16_9	15Hz	240p	1	[31,34]	Mark frame as LTR with LongTermFrameldx equal to 0 and use LTR with LongTermFrameldx 1 to encode the current frame
60	HIMOTION16_9	15Hz	240p	1	[36,39]	Dynamic IDR request
90	HIMOTION16_9	15Hz	240p	1	[31,34]	Mark frame as LTR with LongTermFrameldx equal to 1 and use LTR with LongTermFrameldx 0 to encode the current frame
120	HIMOTION16_9	30Hz	1080p	2	[26,29,30]	Change resolution/profile, set level to 4.1, slice size to 34 MB rows per slice, and

						number of max reference frames to 4
150	HIMOTION16_9	30Hz	1080p	2	[31,34]	Remove a temporal layer
175	HIMOTION16_9	30Hz	1080p	2	[31,34, 35]	Add a temporal layer
180	HIMOTION16_9	30Hz	1080p	2	[36,39,40]	Mark frame as LTR with LongTermFrameldx equal to 0 and use LTR with LongTermFrameldx 1 to encode the current frame
210	HIMOTION16_9	30Hz	1080p	2	[31,34,35]	Dynamic IDR request
240	HIMOTION16_9	30Hz	1080p	2	[26,29,30]	Mark frame as LTR with LongTermFrameldx equal to 1 and use LTR with LongTermFrameldx 0 to encode the current frame
270	HIMOTION16_9	30Hz	1080p	2	[31,34,35]	Dynamic IDR request

The bitstream must be named as [UCConfig_Mode]S_[Clip]_Dynamics_Premium.264

6.2.5.4. Constant bitrate control test

For the constant bitrate control tests the encoder must generate the bitstreams specified below. Only the first frame of the encoded video sequence is allowed to be an IDR frame. This initial IDR frame needs to be encoded with QP = 34. The left, middle and right values in the bracket correspond to the bitrate for the first temporal layer, first and second layers, and first, second, and third temporal layers (i.e. the full bitstream) in the bitstream, respectively. Each bitstream must be named as [UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_RC[Leaky_Bucket_Size]ms[Bi
trate]Kbps.264.

The PSNR quality bars for these bitstreams are listed in Table 42 in Section 6.3.

Table 29: Bitstream configuration in Rate Control mode

Content	Frame Rate	Resolution	Encoding Toolset	Leaky Bucket Size	Bitrate [base, base + 2 nd TL, base + 2 nd + 3 rd TLs]
HIMOTION16_9	30Hz	720p	2	500ms, 1000ms	[800Kbps, 1Mbps, 1.2Mbps]
		360p			[300Kbps, 400kbps, 500Kbps]

HANDHELD3_4	30Hz	480x640	1		[300Kbps, 400kbps, 500Kbps]
-------------	------	---------	---	--	-----------------------------

For the tests measuring convergence time during bitrate changes the encoder needs to generate a bitstream for each of the bitstream configurations given in Table 30. The encoder must generate bitstreams according to the following procedure:

- Full bitrate for the first 5 seconds (i.e. frame 0-149 for 30fps and frame 0-74 for 15fps video sequences)
- 90% of full bitrate from 5 to 10 seconds (i.e. frame 150-299 for 30fps and frame 75-149 for 15fps)
- 75% of full bitrate from 10 to 15 seconds (i.e. frame 300-449 for 30fps and frame 150-224 for 15fps)
- 50% of full bitrate from 15 to 20 seconds (i.e. frame 450-599 for 30fps and frame 225-299 for 15fps)

Each bitstream must be named as

[UCConfig_Mode]S_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_RC[Leaky_Bucket_Size]ms[Bitrate]KbpsConvergenceTest.264.

The bitrate must converge to the new value within one second after each of the bitrate changes.

Table 30: Bitstream configuration in Convergence Test mode

Content	Frame Rate	Resolution	Encoding Toolset	Leaky Bucket Size	Bitrate [base, base + 2 nd TL, base + 2 nd + 3 rd TLs]
HIMOTION16_9	30Hz	720p	2	500ms, 1000ms	[1.5Mbps, 2.0Mbps, 2.5Mbps]
		360p			[400Kbps, 600kbps, 800Kbps]
HANDHELD3_4	30Hz	480x640	1		[900Kbps, 1200kbps, 1500Kbps]

6.2.6. Simulcast UCConfig Mode 1 Bitstream with 3 Layers

Encoders running in Windows 8.1 must also generate two simulcast bitstreams each consists of three temporal layers for 720p, 360p and 480x640, two temporal layers for 180p, 320x424 and 240x320 with all the possible combinations of contents, frame rates, resolutions, and QP values, specified in the table below. The left value in the parentheses represents the corresponding configuration of the first

simulcast stream, the middle value represents the corresponding configuration of the second simulcast stream, and the right value represents the corresponding configuration of the third simulcast stream. The same QP value is used for all the temporal layers in a bitstream.

Table 31: Bitstream configuration in Constant QP mode

Content	Frame Rate	Resolution	Encoding Toolset	Quantization Parameter
HIMOTION16_9	(30Hz, 30Hz, 15Hz)	(720p, 360p, 180p),	(2,2,1)	(26, 29, 32, 34), (30, 33, 36, 39), (34, 37, 40, 43)
HANDHELD3_4	(30Hz, 15Hz, 15Hz)	(480x640 , 320x424, 240x320)		

Encoders must generate simulcast bitstreams in multiplexed mode. Each bitstream must be named as [UCConfig_Mode]M_[Clip]_[Frame_Rate]_[Resolution]_[Encoding_Toolset]_QP[QP_Value].264.

The quality bars for these bitstreams are listed in Table 43 in Section 6.3. The encoder must ensure that all requirements for the PSNR sets and the rate-distortion curve are met.

6.2.7. Memory Usage Test

Memory Usage Tests only apply for Category 3 encoders and only on Windows platform. It is estimated via `ppsmemCounters.PagefileUsage` in¹⁶

```

BOOL WINAPI GetProcessMemoryInfo(
    _In_ HANDLE Process,
    _Out_ PPROCESS_MEMORY_COUNTERS ppsmemCounters,
    _In_ DWORD cb
);

```

6.2.7.1. High Memory Usage Test

To verify memory usage against HW encoder, 300 raw video frames are fed to the HW encoder. The test captures the following memory usage snapshots to estimate the memory usage:

- B: Before `CoCreateInstance()` of the HW encoder.
- R_i: After the *i*-th `ProcessInput()` (*i* = 1, 2, ..., 300).

Memory usage is estimated as $U = \sum_{i=1}^{300} R_i / 300 - B$. It shall not exceed the thresholds described in the below table:

Resolutoin	Max Memory Usage (MB)
240p	35 MB
720p	55 MB

¹⁶ [http://msdn.microsoft.com/en-us/library/windows/desktop/ms683219\(v=vs.85\).aspx](http://msdn.microsoft.com/en-us/library/windows/desktop/ms683219(v=vs.85).aspx)

1080p	85 MB
-------	-------

The test contains two parts:

- Exercising HW encoder via a sink writer by setting the same input and output resolution in IMFSinkWriter::SetInputMediaType and IMFSinkWriterEncoderConfig::SetTargetMediaType and providing input samples in DX memory.
- Exercising HW encoder via CoCreateInstance() and providing input samples in system memory. This part of test only runs on x86 platforms.

6.2.7.2. Memory Leak Test

To detect memory leak, 100 HW encoders are created, fed with three raw video frames, and destroyed in a sequence. The test captures the following memory usage snapshots to identify whether memory leak is present:

- B_i: Before CoCreateInstance() of the i-th HW encoder (i = 1, 2, ..., 99).
- D_i: After the destroy of the i-th HW encoder (i = 1, 2, ..., 99).

Memory leak is identified if $(D_{100} - B_2) > 2 \text{ MB}$.

6.2.8. Benchmark Test

Benchmark tests only apply for Category 3 encoders.

6.2.8.1. Concurrent 1080p encoding/decoding test

The test runs a 1080p HW encoder/decoder pair and a 240p SW encoder/decoder pair for 5 min. The encoded frames are immediately looped to the paired decoder but the output textures are discarded. The test may exercise LTR and slice control if supported by the HW encoder. It is expected the encoder meets the following requirements:

- The encoding time and dynamic control latency requirements as specified in Sections 6.1.5, 6.1.11, 6.1.15 and 6.1.16 are satisfied.
- The encoder follows 1-in-1-out behavior.
- The encoder generates syntax correct bitstream.
- The PSNR between the decoded and the original must be $\geq 50 \text{ dB}$.

6.2.8.2. Random conferencing test

The test runs four HW encoder/decoder pair. For each encoder, input and output video format (e.g. resolution, frame rate, profile, and level) for each pair changes at every 5 – 20 seconds. The encoded frames are immediately looped to the paired decoder but the output textures are discarded. The test may exercise LTR and slice control if supported by the HW encoder. It is expected the encoder meets the following requirements:

- The encoding time and dynamic control latency requirements as specified in Sections 6.1.5, 6.1.11, 6.1.15 and 6.1.16 are satisfied.
- The encoders follow 1-in-1-out behavior

- The encoders generate syntax correct bitstream
- The PSNR between the decoded and the original must be ≥ 50 dB.

6.3. Premium Logo Requirements

In order to qualify for the premium logo the encoder needs to meet the **premium quality requirements** for UCConfig Mode 0 and 1 with test scenarios specified in Section 6.2 and quality bars specified in Section 6.4.2. The premium logo encoders are expected to achieve higher video quality than standard logo encoders.

6.4. Quality Conformance Bars

This section lists the reference bars for bitstreams (and all the extractable sub-bitstreams) considered in the Skype for Business Standard and Premium requirements. The encoder must assure all the bitstreams corresponding to a particular test scope (for example, Standard Logo requirements for UCConfig Mode 1) have a higher average PSNR, higher minimum PSNR, and higher R-D performance than the reference values listed below in order to meet the requirements. Failure to meet one metric in any bitstream will lead to the failure of test. In addition, for constant QP tests, all the extractable sub-bitstreams also need to pass the PSNR test. The sub-bitstream verification is not required for Constant Rate Control mode due to difficulty in measuring an accurate PSNR in the event of frame drops at higher temporal layers.

6.4.1. Standard Logo Requirements

Table 32: Standard Logo Requirement Set for UCConfig Mode 0 (Constant QP, Single Stream)

Test Bitstream	Min PSNR	R-D Curve Samples	
		kbps	PSNR
OS_HIMOTION16_9_30_1080p_1_QP26	39.81	11472.44	40.58
OS_HIMOTION16_9_30_1080p_1_QP30	37.36	6381.83	38.19
OS_HIMOTION16_9_30_1080p_1_QP34	34.78	3569.87	35.65
OS_HIMOTION16_9_30_1080p_1_QP38	31.89	2039.30	32.88
OS_HIMOTION16_9_30_720p_1_QP26	38.50	6400.95	39.29
OS_HIMOTION16_9_30_720p_1_QP30	35.69	3599.54	36.61
OS_HIMOTION16_9_30_720p_1_QP34	32.88	2008.84	33.91
OS_HIMOTION16_9_30_720p_1_QP38	29.97	1115.55	31.08
OS_HIMOTION16_9_30_540p_1_QP26	37.75	5004.77	38.50
OS_HIMOTION16_9_30_540p_1_QP30	34.70	2898.15	35.63
OS_HIMOTION16_9_30_540p_1_QP34	31.65	1596.82	32.74
OS_HIMOTION16_9_30_540p_1_QP38	28.57	828.61	29.78
OS_HIMOTION16_9_30_480p_1_QP26	37.50	4353.38	38.23
OS_HIMOTION16_9_30_480p_1_QP30	34.35	2569.46	35.26
OS_HIMOTION16_9_30_480p_1_QP34	31.23	1420.03	32.33
OS_HIMOTION16_9_30_480p_1_QP38	28.09	715.12	29.30

Microsoft Skype for Business H.264 Video Encoder Specification

OS_HIMOTION16_9_30_360p_1_QP26	37.42	2549.79	38.17
OS_HIMOTION16_9_30_360p_1_QP30	34.12	1553.29	35.06
OS_HIMOTION16_9_30_360p_1_QP34	30.92	884.55	32.01
OS_HIMOTION16_9_30_360p_1_QP38	27.79	453.26	28.89
OS_HIMOTION16_9_15_270p_1_QP26	37.26	854.96	37.94
OS_HIMOTION16_9_15_270p_1_QP30	33.97	535.94	34.72
OS_HIMOTION16_9_15_270p_1_QP34	30.78	311.45	31.68
OS_HIMOTION16_9_15_270p_1_QP38	27.68	161.68	28.58
OS_HIMOTION16_9_15_240p_1_QP26	36.97	754.53	37.62
OS_HIMOTION16_9_15_240p_1_QP30	33.64	476.15	34.40
OS_HIMOTION16_9_15_240p_1_QP34	30.35	275.82	31.25
OS_HIMOTION16_9_15_240p_1_QP38	27.21	136.69	28.14
OS_HIMOTION16_9_15_180p_1_QP26	36.74	445.18	37.40
OS_HIMOTION16_9_15_180p_1_QP30	33.39	280.59	34.11
OS_HIMOTION16_9_15_180p_1_QP34	30.21	162.78	31.02
OS_HIMOTION16_9_15_180p_1_QP38	27.17	85.60	27.95
OS_HIMOTION4_3_30_VGA_1_QP26	37.70	2143.94	38.79
OS_HIMOTION4_3_30_VGA_1_QP30	34.77	1229.16	36.02
OS_HIMOTION4_3_30_VGA_1_QP34	32.07	680.72	33.34
OS_HIMOTION4_3_30_VGA_1_QP38	29.52	367.61	30.66
OS_HIMOTION4_3_15_424x320_1_QP26	38.38	497.42	39.21
OS_HIMOTION4_3_15_424x320_1_QP30	35.71	310.91	36.52
OS_HIMOTION4_3_15_424x320_1_QP34	33.10	195.37	33.84
OS_HIMOTION4_3_15_424x320_1_QP38	30.42	122.70	31.03
OS_HIMOTION4_3_15_QVGA_1_QP26	37.97	319.93	38.69
OS_HIMOTION4_3_15_QVGA_1_QP30	35.24	203.38	35.87
OS_HIMOTION4_3_15_QVGA_1_QP34	32.65	129.08	33.16
OS_HIMOTION4_3_15_QVGA_1_QP38	29.68	79.94	30.26
OS_HIMOTION4_3_15_212x160_1_QP26	37.25	178.75	37.82
OS_HIMOTION4_3_15_212x160_1_QP30	34.33	116.04	34.87
OS_HIMOTION4_3_15_212x160_1_QP34	31.49	74.29	31.95
OS_HIMOTION4_3_15_212x160_1_QP38	28.51	45.89	29.08
OS_LOWMOTION16_9_30_720p_1_QP26	39.15	3310.51	38.87
OS_LOWMOTION16_9_30_720p_1_QP30	36.22	1317.89	36.01
OS_LOWMOTION16_9_30_720p_1_QP34	33.40	528.31	33.26
OS_LOWMOTION16_9_30_720p_1_QP38	30.62	246.43	30.51
OS_LOWMOTION16_9_30_360p_1_QP26	38.10	1137.09	38.43
OS_LOWMOTION16_9_30_360p_1_QP30	34.99	552.41	35.28

Microsoft Skype for Business H.264 Video Encoder Specification

OS_LOWMOTION16_9_30_360p_1_QP34	32.19	231.97	32.44
OS_LOWMOTION16_9_30_360p_1_QP38	29.64	95.42	29.91
OS_LOWMOTION16_9_15_240p_1_QP26	37.90	180.43	38.00
OS_LOWMOTION16_9_15_240p_1_QP30	34.97	81.99	35.07
OS_LOWMOTION16_9_15_240p_1_QP34	32.35	38.53	32.41
OS_LOWMOTION16_9_15_240p_1_QP38	29.76	20.38	29.81
OS_LOWMOTION16_9_15_180p_1_QP26	37.98	84.37	38.26
OS_LOWMOTION16_9_15_180p_1_QP30	35.14	43.66	35.39
OS_LOWMOTION16_9_15_180p_1_QP34	32.39	24.33	32.66
OS_LOWMOTION16_9_15_180p_1_QP38	29.55	14.66	29.88
OS_HANDHELD3_4_30_480x640_1_QP26	40.23	643.53	40.85
OS_HANDHELD3_4_30_480x640_1_QP30	37.77	335.90	38.56
OS_HANDHELD3_4_30_480x640_1_QP34	35.12	203.31	36.12
OS_HANDHELD3_4_30_480x640_1_QP38	32.11	145.62	33.37
OS_HANDHELD3_4_15_320x424_1_QP26	39.38	267.34	40.44
OS_HANDHELD3_4_15_320x424_1_QP30	36.92	157.47	38.10
OS_HANDHELD3_4_15_320x424_1_QP34	34.26	101.52	35.51
OS_HANDHELD3_4_15_320x424_1_QP38	31.35	69.80	32.60
OS_HANDHELD3_4_15_240x320_1_QP26	38.74	148.99	39.81
OS_HANDHELD3_4_15_240x320_1_QP30	36.13	86.84	37.36
OS_HANDHELD3_4_15_240x320_1_QP34	33.41	54.72	34.69
OS_HANDHELD3_4_15_240x320_1_QP38	30.49	36.80	31.81
OS_HANDHELD3_4_15_160x212_1_QP26	37.88	90.89	38.99
OS_HANDHELD3_4_15_160x212_1_QP30	35.17	54.10	36.38
OS_HANDHELD3_4_15_160x212_1_QP34	32.52	33.91	33.72
OS_HANDHELD3_4_15_160x212_1_QP38	29.61	22.56	30.88
OS_HANDHELD9_16_30_540x960_1_QP26	37.30	2284.07	38.12
OS_HANDHELD9_16_30_540x960_1_QP30	35.12	1028.26	35.98
OS_HANDHELD9_16_30_540x960_1_QP34	32.96	530.74	33.82
OS_HANDHELD9_16_30_540x960_1_QP38	30.62	316.48	31.28
OS_HANDHELD9_16_30_480x848_1_QP26	37.03	1842.44	38.08
OS_HANDHELD9_16_30_480x848_1_QP30	34.78	824.86	35.87
OS_HANDHELD9_16_30_480x848_1_QP34	32.59	426.21	33.68
OS_HANDHELD9_16_30_480x848_1_QP38	30.26	256.59	31.17
OS_HANDHELD9_16_30_360x640_1_QP26	36.39	1506.89	37.33
OS_HANDHELD9_16_30_360x640_1_QP30	33.78	646.82	34.89
OS_HANDHELD9_16_30_360x640_1_QP34	31.59	314.14	32.66
OS_HANDHELD9_16_30_360x640_1_QP38	29.33	179.86	30.30

Microsoft Skype for Business H.264 Video Encoder Specification

OS_HANDHELD9_16_15_270x480_1_QP26	37.42	344.03	37.86
OS_HANDHELD9_16_15_270x480_1_QP30	34.78	184.56	35.29
OS_HANDHELD9_16_15_270x480_1_QP34	32.41	108.04	32.82
OS_HANDHELD9_16_15_270x480_1_QP38	29.81	68.92	30.20
OS_HANDHELD9_16_15_240x424_1_QP26	37.53	282.50	38.14
OS_HANDHELD9_16_15_240x424_1_QP30	34.91	155.72	35.56
OS_HANDHELD9_16_15_240x424_1_QP34	32.46	90.25	33.08
OS_HANDHELD9_16_15_240x424_1_QP38	29.89	55.41	30.47
OS_HANDHELD9_16_15_180x320_1_QP26	36.89	209.97	37.48
OS_HANDHELD9_16_15_180x320_1_QP30	34.00	109.34	34.75
OS_HANDHELD9_16_15_180x320_1_QP34	31.59	61.82	32.25
OS_HANDHELD9_16_15_180x320_1_QP38	29.18	37.89	29.71
OS_LOWLIGHT16_9_15_720p_1_QP26	39.69	3776.77	40.12
OS_LOWLIGHT16_9_15_720p_1_QP30	37.74	1273.13	38.40
OS_LOWLIGHT16_9_15_720p_1_QP34	35.53	456.96	36.79
OS_LOWLIGHT16_9_15_720p_1_QP38	32.34	192.02	34.46
OS_LOWLIGHT16_9_15_360p_1_QP26	37.91	831.09	38.51
OS_LOWLIGHT16_9_15_360p_1_QP30	35.88	240.33	36.74
OS_LOWLIGHT16_9_15_360p_1_QP34	33.55	107.93	34.77
OS_LOWLIGHT16_9_15_360p_1_QP38	30.60	63.22	32.30
OS_LOWLIGHT16_9_15_240p_1_QP26	38.38	167.29	39.26
OS_LOWLIGHT16_9_15_240p_1_QP30	35.86	83.30	36.93
OS_LOWLIGHT16_9_15_240p_1_QP34	33.09	49.76	34.34
OS_LOWLIGHT16_9_15_240p_1_QP38	30.03	30.62	31.51
OS_LOWLIGHT16_9_15_180p_1_QP26	37.63	133.71	38.46
OS_LOWLIGHT16_9_15_180p_1_QP30	34.95	65.95	35.96
OS_LOWLIGHT16_9_15_180p_1_QP34	32.15	38.65	33.30
OS_LOWLIGHT16_9_15_180p_1_QP38	29.04	23.26	30.46
OS_2PEOPLE16_9_30_720p_1_QP26	40.58	1135.10	40.83
OS_2PEOPLE16_9_30_720p_1_QP30	38.46	563.42	38.72
OS_2PEOPLE16_9_30_720p_1_QP34	36.31	317.80	36.51
OS_2PEOPLE16_9_30_720p_1_QP38	33.87	197.74	34.05
OS_2PEOPLE16_9_30_360p_1_QP26	39.54	388.51	39.66
OS_2PEOPLE16_9_30_360p_1_QP30	37.09	204.47	37.15
OS_2PEOPLE16_9_30_360p_1_QP34	34.63	118.66	34.60
OS_2PEOPLE16_9_30_360p_1_QP38	32.12	74.52	32.08
OS_2PEOPLE16_9_15_240p_1_QP26	39.06	153.21	39.51
OS_2PEOPLE16_9_15_240p_1_QP30	36.40	86.87	36.81

Microsoft Skype for Business H.264 Video Encoder Specification

OS_2PEOPLE16_9_15_240p_1_QP34	33.74	50.71	34.08
OS_2PEOPLE16_9_15_240p_1_QP38	31.11	29.99	31.50
OS_2PEOPLE16_9_15_180p_1_QP26	38.64	106.16	39.07
OS_2PEOPLE16_9_15_180p_1_QP30	35.90	60.44	36.29
OS_2PEOPLE16_9_15_180p_1_QP34	33.16	35.44	33.52
OS_2PEOPLE16_9_15_180p_1_QP38	30.50	20.87	30.96
OS_PANO20_3_15_1920x288_1_QP26	40.37	568.03	40.62
OS_PANO20_3_15_1920x288_1_QP30	37.88	302.36	38.18
OS_PANO20_3_15_1920x288_1_QP34	35.10	170.50	35.51
OS_PANO20_3_15_1920x288_1_QP38	32.39	97.29	32.86
OS_PANO20_3_15_1280x192_1_QP26	39.29	334.41	39.54
OS_PANO20_3_15_1280x192_1_QP30	36.56	182.24	36.86
OS_PANO20_3_15_1280x192_1_QP34	33.73	100.63	34.10
OS_PANO20_3_15_1280x192_1_QP38	30.93	54.33	31.38
OS_PANO20_3_15_960x144_1_QP26	38.51	242.62	38.76
OS_PANO20_3_15_960x144_1_QP30	35.64	135.92	35.94
OS_PANO20_3_15_960x144_1_QP34	32.70	74.31	33.12
OS_PANO20_3_15_960x144_1_QP38	29.88	38.68	30.33

Table 33: Standard Logo Requirement Set for UCConfig Mode 0 LTR (Constant QP, Single Stream) (Windows 8.1 only)

Test Bitstream	Min PSNR	R-D Curve Samples		LTR Frame Only R-D	
		kbps	PSNR	kbps	PSNR
OS_HIMOTION16_9_30_1080p_1_QP26_LTR	39.72	12045.55	40.55	959.7557	40.51
OS_HIMOTION16_9_30_1080p_1_QP30_LTR	37.2	6789.85	38.14	654.2556	38
OS_HIMOTION16_9_30_1080p_1_QP34_LTR	34.6	3850.21	35.61	444.4074	35.47
OS_HIMOTION16_9_30_1080p_1_QP38_LTR	31.78	2220.18	32.88	291.4462	32.78
OS_HIMOTION16_9_30_720p_1_QP26_LTR	38.39	6715.48	39.26	560.1727	39.15
OS_HIMOTION16_9_30_720p_1_QP30_LTR	35.57	3823.72	36.59	383.0495	36.46
OS_HIMOTION16_9_30_720p_1_QP34_LTR	32.8	2161.22	33.94	259.8723	33.86
OS_HIMOTION16_9_30_720p_1_QP38_LTR	29.96	1214.96	31.14	170.8263	31.11
OS_HIMOTION16_9_30_540p_1_QP26_LTR	37.65	5204.14	38.47	391.7312	38.37
OS_HIMOTION16_9_30_540p_1_QP30_LTR	34.63	3042.52	35.63	269.3867	35.54
OS_HIMOTION16_9_30_540p_1_QP34_LTR	31.61	1699.55	32.77	181.6798	32.77
OS_HIMOTION16_9_30_540p_1_QP38_LTR	28.58	895.19	29.86	118.1845	29.96
OS_HIMOTION16_9_30_480p_1_QP26_LTR	37.41	4513.3	38.2	328.7897	38.14
OS_HIMOTION16_9_30_480p_1_QP30_LTR	34.28	2688.21	35.27	227.1	35.2
OS_HIMOTION16_9_30_480p_1_QP34_LTR	31.21	1503.34	32.37	153.0219	32.39

Microsoft Skype for Business H.264 Video Encoder Specification

OS_HIMOTION16_9_30_480p_1_QP38_LTR	28.15	771.72	29.37	99.16155	29.52
OS_HIMOTION16_9_30_360p_1_QP26_LTR	37.36	2644.49	38.17	196.8373	38.07
OS_HIMOTION16_9_30_360p_1_QP30_LTR	34.1	1622.15	35.09	138.1858	35.01
OS_HIMOTION16_9_30_360p_1_QP34_LTR	30.92	934.37	32.07	93.51255	32.08
OS_HIMOTION16_9_30_360p_1_QP38_LTR	27.88	486.15	28.99	60.65577	29.14
OS_HIMOTION16_9_15_270p_1_QP26_LTR	37.22	900.25	37.96	111.8894	37.9
OS_HIMOTION16_9_15_270p_1_QP30_LTR	33.96	569.77	34.78	77.59374	34.71
OS_HIMOTION16_9_15_270p_1_QP34_LTR	30.79	336.3	31.74	51.56437	31.76
OS_HIMOTION16_9_15_270p_1_QP38_LTR	27.76	178.53	28.67	32.52018	28.8
OS_HIMOTION16_9_15_240p_1_QP26_LTR	36.94	789.94	37.62	93.87147	37.6
OS_HIMOTION16_9_15_240p_1_QP30_LTR	33.65	503.26	34.44	65.16838	34.41
OS_HIMOTION16_9_15_240p_1_QP34_LTR	30.39	296.43	31.31	43.0585	31.32
OS_HIMOTION16_9_15_240p_1_QP38_LTR	27.3	150.57	28.24	26.22588	28.39
OS_HIMOTION16_9_15_180p_1_QP26_LTR	36.77	467.63	37.43	56.53377	37.41
OS_HIMOTION16_9_15_180p_1_QP30_LTR	33.42	297.16	34.18	39.23755	34.15
OS_HIMOTION16_9_15_180p_1_QP34_LTR	30.28	175.51	31.06	26.21331	31.07
OS_HIMOTION16_9_15_180p_1_QP38_LTR	27.28	94.41	28.07	16.53042	28.16
OS_HIMOTION4_3_30_VGA_1_QP26_LTR	37.7	2227.31	38.78	162.9439	38.84
OS_HIMOTION4_3_30_VGA_1_QP30_LTR	34.77	1283.31	36.06	104.4041	36.14
OS_HIMOTION4_3_30_VGA_1_QP34_LTR	32.07	715.98	33.42	65.06026	33.53
OS_HIMOTION4_3_30_VGA_1_QP38_LTR	29.52	388.83	30.77	39.41033	30.91
OS_HIMOTION4_3_15_424x320_1_QP26_LTR	38.38	526.96	39.22	66.46679	39.18
OS_HIMOTION4_3_15_424x320_1_QP30_LTR	35.71	331.3	36.6	44.08993	36.57
OS_HIMOTION4_3_15_424x320_1_QP34_LTR	33.16	209.2	33.92	29.20964	33.92
OS_HIMOTION4_3_15_424x320_1_QP38_LTR	30.57	131.66	31.22	19.06976	31.27
OS_HIMOTION4_3_15_QVGA_1_QP26_LTR	37.97	339.23	38.73	43.46384	38.67
OS_HIMOTION4_3_15_QVGA_1_QP30_LTR	35.25	216.71	35.96	29.11274	35.93
OS_HIMOTION4_3_15_QVGA_1_QP34_LTR	32.74	137.88	33.31	19.23334	33.32
OS_HIMOTION4_3_15_QVGA_1_QP38_LTR	29.83	85.83	30.42	12.67778	30.5
OS_HIMOTION4_3_15_212x160_1_QP26_LTR	37.26	189.57	37.81	24.60958	37.73
OS_HIMOTION4_3_15_212x160_1_QP30_LTR	34.45	123.5	35.01	16.8506	34.95
OS_HIMOTION4_3_15_212x160_1_QP34_LTR	31.64	79.22	32.11	11.37711	32.09
OS_HIMOTION4_3_15_212x160_1_QP38_LTR	28.67	49.24	29.31	7.339444	29.34
OS_LOWMOTION16_9_30_720p_1_QP26_LTR	39.02	3492.36	38.83	277.9172	38.72
OS_LOWMOTION16_9_30_720p_1_QP30_LTR	36.13	1443.13	35.98	159.787	35.9
OS_LOWMOTION16_9_30_720p_1_QP34_LTR	33.37	607.54	33.26	93.63626	33.19
OS_LOWMOTION16_9_30_720p_1_QP38_LTR	30.63	292.7	30.51	54.10871	30.43
OS_LOWMOTION16_9_30_360p_1_QP26_LTR	37.96	1200.62	38.35	100.2409	38.25

Microsoft Skype for Business H.264 Video Encoder Specification

OS_LOWMOTION16_9_30_360p_1_QP30_LTR	34.92	594.14	35.21	58.48006	35.22
OS_LOWMOTION16_9_30_360p_1_QP34_LTR	32.11	255.67	32.37	31.49587	32.4
OS_LOWMOTION16_9_30_360p_1_QP38_LTR	29.54	108.04	29.82	17.27082	29.86
OS_LOWMOTION16_9_15_240p_1_QP26_LTR	37.76	202.93	37.88	34.28716	37.81
OS_LOWMOTION16_9_15_240p_1_QP30_LTR	34.82	96.33	34.94	19.60358	34.91
OS_LOWMOTION16_9_15_240p_1_QP34_LTR	32.2	47.06	32.3	11.39912	32.28
OS_LOWMOTION16_9_15_240p_1_QP38_LTR	29.65	24.82	29.72	6.770103	29.72
OS_LOWMOTION16_9_15_180p_1_QP26_LTR	37.85	98.18	38.15	19.58741	38.04
OS_LOWMOTION16_9_15_180p_1_QP30_LTR	34.95	52.32	35.22	12.0464	35.16
OS_LOWMOTION16_9_15_180p_1_QP34_LTR	32.25	29.54	32.53	7.632819	32.47
OS_LOWMOTION16_9_15_180p_1_QP38_LTR	29.44	17.52	29.75	4.777096	29.69
OS_HANDHELD3_4_30_480x640_1_QP26_LTR	40.23	692.73	40.87	76.74517	40.63
OS_HANDHELD3_4_30_480x640_1_QP30_LTR	37.73	367.38	38.58	46.28961	38.36
OS_HANDHELD3_4_30_480x640_1_QP34_LTR	35.09	223.91	36.12	30.46575	35.92
OS_HANDHELD3_4_30_480x640_1_QP38_LTR	32.08	158.68	33.39	21.45987	33.22
OS_HANDHELD3_4_15_320x424_1_QP26_LTR	39.31	292.47	40.43	48.14354	40.22
OS_HANDHELD3_4_15_320x424_1_QP30_LTR	36.85	173.6	38.07	31.19448	37.88
OS_HANDHELD3_4_15_320x424_1_QP34_LTR	34.18	112.47	35.46	21.33796	35.26
OS_HANDHELD3_4_15_320x424_1_QP38_LTR	31.33	76.59	32.59	14.59592	32.43
OS_HANDHELD3_4_15_240x320_1_QP26_LTR	38.75	163.95	39.8	28.55226	39.56
OS_HANDHELD3_4_15_240x320_1_QP30_LTR	36.09	96.5	37.34	18.64546	37.09
OS_HANDHELD3_4_15_240x320_1_QP34_LTR	33.4	61.31	34.67	12.42841	34.45
OS_HANDHELD3_4_15_240x320_1_QP38_LTR	30.43	40.87	31.76	8.397047	31.58
OS_HANDHELD3_4_15_160x212_1_QP26_LTR	37.93	98.57	38.99	16.1059	38.81
OS_HANDHELD3_4_15_160x212_1_QP30_LTR	35.15	59.63	36.37	10.84724	36.17
OS_HANDHELD3_4_15_160x212_1_QP34_LTR	32.49	37.32	33.72	7.202289	33.54
OS_HANDHELD3_4_15_160x212_1_QP38_LTR	29.54	24.79	30.85	4.73428	30.61
OS_HANDHELD9_16_30_540x960_1_QP26_LTR	37.38	2389.73	38.13	264.5618	37.49
OS_HANDHELD9_16_30_540x960_1_QP30_LTR	35.17	1098.36	36	146.9367	35.31
OS_HANDHELD9_16_30_540x960_1_QP34_LTR	33	574.93	33.84	87.20811	33.21
OS_HANDHELD9_16_30_540x960_1_QP38_LTR	30.63	342.33	31.32	51.8474	30.76
OS_HANDHELD9_16_30_480x848_1_QP26_LTR	37.07	1933.12	38.09	210.7723	37.63
OS_HANDHELD9_16_30_480x848_1_QP30_LTR	34.81	881.87	35.89	117.8491	35.38
OS_HANDHELD9_16_30_480x848_1_QP34_LTR	32.63	460.7	33.72	69.91468	33.23
OS_HANDHELD9_16_30_480x848_1_QP38_LTR	30.28	278.47	31.2	43.39138	30.73
OS_HANDHELD9_16_30_360x640_1_QP26_LTR	36.41	1565.38	37.34	143.4506	36.97
OS_HANDHELD9_16_30_360x640_1_QP30_LTR	33.8	684.76	34.91	81.0841	34.55
OS_HANDHELD9_16_30_360x640_1_QP34_LTR	31.62	337.09	32.71	48.55701	32.35

Microsoft Skype for Business H.264 Video Encoder Specification

OS_HANDHELD9_16_30_360x640_1_QP38_LTR	29.34	193.73	30.38	29.60164	29.97
OS_HANDHELD9_16_15_270x480_1_QP26_LTR	37.43	376.52	37.87	65.18139	37.73
OS_HANDHELD9_16_15_270x480_1_QP30_LTR	34.81	205.54	35.32	41.72647	35.2
OS_HANDHELD9_16_15_270x480_1_QP34_LTR	32.42	121.16	32.87	26.72367	32.7
OS_HANDHELD9_16_15_270x480_1_QP38_LTR	29.83	77.64	30.21	17.33967	29.98
OS_HANDHELD9_16_15_240x424_1_QP26_LTR	37.54	308.71	38.15	53.06574	38.04
OS_HANDHELD9_16_15_240x424_1_QP30_LTR	34.92	172.7	35.58	33.89923	35.48
OS_HANDHELD9_16_15_240x424_1_QP34_LTR	32.48	101.04	33.12	21.44854	32.96
OS_HANDHELD9_16_15_240x424_1_QP38_LTR	29.89	62.43	30.47	13.44363	30.24
OS_HANDHELD9_16_15_180x320_1_QP26_LTR	36.89	228.58	37.47	36.98364	37.38
OS_HANDHELD9_16_15_180x320_1_QP30_LTR	34	121.17	34.77	23.56627	34.71
OS_HANDHELD9_16_15_180x320_1_QP34_LTR	31.59	69.74	32.28	15.0748	32.17
OS_HANDHELD9_16_15_180x320_1_QP38_LTR	29.19	43.25	29.71	9.535933	29.51
OS_LOWLIGHT16_9_15_720p_1_QP26_LTR	39.67	3865.93	40.12	339.3263	40.27
OS_LOWLIGHT16_9_15_720p_1_QP30_LTR	37.71	1342.54	38.34	140.3706	38.46
OS_LOWLIGHT16_9_15_720p_1_QP34_LTR	35.47	505.68	36.69	73.44861	36.73
OS_LOWLIGHT16_9_15_720p_1_QP38_LTR	32.38	220.43	34.41	38.98421	34.4
OS_LOWLIGHT16_9_15_360p_1_QP26_LTR	37.9	869.37	38.46	91.73152	38.46
OS_LOWLIGHT16_9_15_360p_1_QP30_LTR	35.82	271.73	36.62	41.64755	36.58
OS_LOWLIGHT16_9_15_360p_1_QP34_LTR	33.46	124.95	34.65	24.42663	34.59
OS_LOWLIGHT16_9_15_360p_1_QP38_LTR	30.56	72.6	32.26	15.05351	32.23
OS_LOWLIGHT16_9_15_240p_1_QP26_LTR	38.28	188.49	39.13	31.43582	38.98
OS_LOWLIGHT16_9_15_240p_1_QP30_LTR	35.78	96.75	36.85	19.33195	36.72
OS_LOWLIGHT16_9_15_240p_1_QP34_LTR	33.05	57.6	34.28	12.27135	34.2
OS_LOWLIGHT16_9_15_240p_1_QP38_LTR	30.12	35.23	31.57	7.614431	31.55
OS_LOWLIGHT16_9_15_180p_1_QP26_LTR	37.51	149.59	38.28	23.903	38.16
OS_LOWLIGHT16_9_15_180p_1_QP30_LTR	34.88	75.61	35.86	14.32463	35.73
OS_LOWLIGHT16_9_15_180p_1_QP34_LTR	32.14	44.45	33.28	9.203073	33.21
OS_LOWLIGHT16_9_15_180p_1_QP38_LTR	29.08	26.6	30.52	5.670458	30.5
OS_2PEOPLE16_9_30_720p_1_QP26_LTR	40.61	1264.15	40.81	155.9561	40.73
OS_2PEOPLE16_9_30_720p_1_QP30_LTR	38.5	639.61	38.74	93.09914	38.68
OS_2PEOPLE16_9_30_720p_1_QP34_LTR	36.38	364.69	36.57	57.98422	36.55
OS_2PEOPLE16_9_30_720p_1_QP38_LTR	33.96	228.37	34.13	37.09496	34.17
OS_2PEOPLE16_9_30_360p_1_QP26_LTR	39.57	430.71	39.62	56.7857	39.48
OS_2PEOPLE16_9_30_360p_1_QP30_LTR	37.15	231.6	37.11	35.37568	37
OS_2PEOPLE16_9_30_360p_1_QP34_LTR	34.68	134.92	34.63	22.27937	34.61
OS_2PEOPLE16_9_30_360p_1_QP38_LTR	32.13	84.65	32.11	14.33117	32.16
OS_2PEOPLE16_9_15_240p_1_QP26_LTR	39.02	172.9	39.42	33.11584	39.32

OS_2PEOPLE16_9_15_240p_1_QP30_LTR	36.34	99.66	36.74	20.98612	36.68
OS_2PEOPLE16_9_15_240p_1_QP34_LTR	33.76	58.21	34.08	13.05745	34.06
OS_2PEOPLE16_9_15_240p_1_QP38_LTR	31.16	34.4	31.55	7.95032	31.59
OS_2PEOPLE16_9_15_180p_1_QP26_LTR	38.57	119.26	38.97	23.04375	38.85
OS_2PEOPLE16_9_15_180p_1_QP30_LTR	35.84	68.81	36.18	14.42913	36.1
OS_2PEOPLE16_9_15_180p_1_QP34_LTR	33.2	40.54	33.5	9.074969	33.49
OS_2PEOPLE16_9_15_180p_1_QP38_LTR	30.56	23.87	30.96	5.461492	30.99
OS_PANO20_3_15_1920x288_1_QP26_LTR	40.25	637.93	40.49	105.2354	40.39
OS_PANO20_3_15_1920x288_1_QP30_LTR	37.79	347.97	38.07	67.76006	37.98
OS_PANO20_3_15_1920x288_1_QP34_LTR	34.99	200.11	35.42	43.59006	35.36
OS_PANO20_3_15_1920x288_1_QP38_LTR	32.29	115.56	32.78	26.98371	32.77
OS_PANO20_3_15_1280x192_1_QP26_LTR	39.19	372.77	39.43	62.80309	39.34
OS_PANO20_3_15_1280x192_1_QP30_LTR	36.45	207.66	36.77	40.71864	36.71
OS_PANO20_3_15_1280x192_1_QP34_LTR	33.7	117.45	34.03	25.95125	34.01
OS_PANO20_3_15_1280x192_1_QP38_LTR	30.88	64.67	31.33	15.58869	31.34
OS_PANO20_3_15_960x144_1_QP26_LTR	38.43	268.97	38.65	44.19899	38.58
OS_PANO20_3_15_960x144_1_QP30_LTR	35.55	153.55	35.87	28.90172	35.84
OS_PANO20_3_15_960x144_1_QP34_LTR	32.65	85.48	33.06	18.19984	33.05
OS_PANO20_3_15_960x144_1_QP38_LTR	29.84	45.12	30.27	10.83348	30.3

Table 34: Standard Logo Requirement Set for UCConfig Mode 0 (Constant Rate Control, Single Stream)

Test Bitstream	PSNR
OS_HIMOTION16_9_30_1080p_1_RC500ms2500Kbps	32.83
OS_HIMOTION16_9_30_1080p_1_RC1000ms2500Kbps	33.58
OS_HIMOTION16_9_30_720p_1_RC500ms1200Kbps	29.70
OS_HIMOTION16_9_30_720p_1_RC1000ms1200Kbps	30.46
OS_HIMOTION16_9_30_360p_1_RC500ms500Kbps	28.25
OS_HIMOTION16_9_30_360p_1_RC1000ms500Kbps	28.71
OS_HIMOTION16_9_15_240p_1_RC500ms250Kbps	30.69
OS_HIMOTION16_9_15_240p_1_RC1000ms250Kbps	30.82
OS_HIMOTION16_9_15_180p_1_RC500ms150Kbps	30.53
OS_HIMOTION16_9_15_180p_1_RC1000ms150Kbps	30.67
OS_HANDHELD3_4_30_480x640_1_RC500ms500Kbps	39.82
OS_HANDHELD3_4_30_480x640_1_RC1000ms500Kbps	39.82
OS_HANDHELD3_4_15_240x320_1_RC500ms250Kbps	41.32
OS_HANDHELD3_4_15_240x320_1_RC1000ms250Kbps	41.34

Table 35: Standard Logo Requirement Set for UCConfig Mode 0 (Constant QP, Simulcast Streams)

Test Bitstream	Min PSNR	R-D Curve Samples	
		Kbps	PSNR
OMM_HIMOTION16_9_30_720p_1_QP26	38.50	6400.96	39.29
OMM_HIMOTION16_9_30_720p_1_QP30	35.69	3599.55	36.61
OMM_HIMOTION16_9_30_720p_1_QP34	32.88	2008.85	33.91
OMM_HIMOTION16_9_30_720p_1_QP38	29.97	1115.56	31.08
OMM_HIMOTION16_9_15_180p_1_QP30	32.93	295.88	33.84
OMM_HIMOTION16_9_15_180p_1_QP34	30.06	175.19	30.99
OMM_HIMOTION16_9_15_180p_1_QP38	27.18	96.07	28.06
OMM_HIMOTION16_9_15_180p_1_QP42	24.62	55.02	25.57
OMM_HANDHELD3_4_30_480x640_1_QP26	40.23	643.54	40.85
OMM_HANDHELD3_4_30_480x640_1_QP30	37.77	335.91	38.56
OMM_HANDHELD3_4_30_480x640_1_QP34	35.12	203.32	36.12
OMM_HANDHELD3_4_30_480x640_1_QP38	32.11	145.63	33.37
OMM_HANDHELD3_4_15_240x320_1_QP30	36.38	67.22	37.24
OMM_HANDHELD3_4_15_240x320_1_QP34	33.48	43.14	34.58
OMM_HANDHELD3_4_15_240x320_1_QP38	30.52	29.95	31.73
OMM_HANDHELD3_4_15_240x320_1_QP42	27.87	22.48	29.26

It should be noted that the column TID in Table 36 refers to the value of H.264 syntax element temporal_id associated with the highest temporal layer in the bitstream (or sub-bitstream).

Table 36: Standard Logo Requirement Set for UCConfig Mode 1 (Constant QP, Single Stream)

Test bitstream	TID	Min PSNR	R-D Curve Samples	
			Kbps	PSNR
1S_HIMOTION16_9_30_720p_2_QP[26,29]	0	38.51	3867.04	39.33
	1	37.20	5349.15	38.67
1S_HIMOTION16_9_30_720p_2_QP[30,33]	0	35.73	2280.48	36.68
	1	34.63	3007.86	36.10
1S_HIMOTION16_9_30_720p_2_QP[34,37]	0	32.95	1328.42	33.99
	1	32.12	1721.19	33.51
1S_HIMOTION16_9_30_720p_2_QP[38,41]	0	30.08	752.77	31.23
	1	29.33	968.54	30.79
1S_HIMOTION16_9_30_360p_2_QP[26,29]	0	37.44	1488.62	38.22
	1	35.83	2147.20	37.47
1S_HIMOTION16_9_30_360p_2_QP[30,33]	0	34.21	937.70	35.13

Microsoft Skype for Business H.264 Video Encoder Specification

	1	32.71	1278.16	34.41
1S_HIMOTION16_9_30_360p_2_QP[34,37]	0	31.05	558.62	32.12
	1	29.86	724.17	31.50
1S_HIMOTION16_9_30_360p_2_QP[38,41]	0	27.89	300.68	29.06
	1	27.08	382.42	28.58
1S_HIMOTION16_9_15_240p_2_QP[26,29]	0	37.02	430.08	37.74
	1	35.21	647.77	36.90
1S_HIMOTION16_9_15_240p_2_QP[30,33]	0	33.70	281.27	34.52
	1	32.01	401.69	33.71
1S_HIMOTION16_9_15_240p_2_QP[34,37]	0	30.47	171.22	31.42
	1	29.08	229.50	30.69
1S_HIMOTION16_9_15_240p_2_QP[38,41]	0	27.29	90.63	28.31
	1	26.32	116.51	27.76
1S_LOWMOTION16_9_30_720p_2_QP[26,29]	0	39.15	1769.40	39.39
	1	37.65	2197.78	38.53
1S_LOWMOTION16_9_30_720p_2_QP[30,33]	0	36.26	746.19	36.53
	1	35.13	856.64	35.90
1S_LOWMOTION16_9_30_720p_2_QP[34,37]	0	33.46	311.47	33.79
	1	32.67	363.42	33.31
1S_LOWMOTION16_9_30_720p_2_QP[38,41]	0	30.68	151.48	31.02
	1	29.99	185.23	30.57
1S_LOWMOTION16_9_30_360p_2_QP[26,29]	0	38.19	618.84	38.47
	1	36.63	802.88	37.87
1S_LOWMOTION16_9_30_360p_2_QP[30,33]	0	35.02	307.80	35.33
	1	33.80	376.66	34.90
1S_LOWMOTION16_9_30_360p_2_QP[34,37]	0	32.22	131.72	32.47
	1	31.36	160.54	32.22
1S_LOWMOTION16_9_30_360p_2_QP[38,41]	0	29.66	57.14	29.93
	1	29.24	74.30	29.77
1S_LOWMOTION16_9_15_240p_2_QP[26,29]	0	38.00	109.86	38.21
	1	36.67	139.05	37.79
1S_LOWMOTION16_9_15_240p_2_QP[30,33]	0	35.01	52.36	35.27
	1	34.12	64.88	34.99
1S_LOWMOTION16_9_15_240p_2_QP[34,37]	0	32.39	25.58	32.62
	1	31.77	32.44	32.45
1S_LOWMOTION16_9_15_240p_2_QP[38,41]	0	29.78	13.60	30.00
	1	29.39	18.15	29.87
1S_LOWLIGHT16_9_15_720p_2_QP[26,29]	0	39.75	1746.69	40.15

Microsoft Skype for Business H.264 Video Encoder Specification

	1	38.34	2368.89	39.53
1S_LOWLIGHT16_9_15_720p_2_QP[30,33]	0	37.79	604.31	38.41
	1	36.76	791.86	38.03
1S_LOWLIGHT16_9_15_720p_2_QP[34,37]	0	35.53	234.89	36.76
	1	34.87	323.19	36.50
1S_LOWLIGHT16_9_15_720p_2_QP[38,41]	0	32.40	106.28	34.50
	1	31.97	152.44	34.25
1S_LOWLIGHT16_9_15_360p_2_QP[26,29]	0	37.96	413.79	38.51
	1	36.78	530.81	38.06
1S_LOWLIGHT16_9_15_360p_2_QP[30,33]	0	35.95	138.08	36.71
	1	35.10	180.60	36.44
1S_LOWLIGHT16_9_15_360p_2_QP[34,37]	0	33.64	65.64	34.79
	1	33.00	90.99	34.56
1S_LOWLIGHT16_9_15_360p_2_QP[38,41]	0	30.76	38.39	32.34
	1	30.27	54.81	32.12
1S_LOWLIGHT16_9_15_240p_2_QP[26,29]	0	38.42	100.17	39.20
	1	37.44	133.17	38.92
1S_LOWLIGHT16_9_15_240p_2_QP[30,33]	0	35.88	52.57	36.94
	1	35.04	70.88	36.67
1S_LOWLIGHT16_9_15_240p_2_QP[34,37]	0	33.17	31.44	34.41
	1	32.46	43.24	34.17
1S_LOWLIGHT16_9_15_240p_2_QP[38,41]	0	30.17	19.19	31.62
	1	29.63	26.78	31.40
1S_2PEOPLE16_9_30_720p_2_QP[26,29]	0	40.55	668.23	41.30
	1	39.99	841.26	40.80
1S_2PEOPLE16_9_30_720p_2_QP[30,33]	0	38.47	350.09	39.23
	1	37.99	435.19	38.76
1S_2PEOPLE16_9_30_720p_2_QP[34,37]	0	36.38	199.79	37.06
	1	35.91	254.99	36.61
1S_2PEOPLE16_9_30_720p_2_QP[38,41]	0	34.01	122.94	34.65
	1	33.59	159.69	34.22
1S_2PEOPLE16_9_30_360p_2_QP[26,29]	0	39.56	247.32	40.15
	1	38.94	310.73	39.85
1S_2PEOPLE16_9_30_360p_2_QP[30,33]	0	37.15	135.37	37.68
	1	36.66	169.27	37.42
1S_2PEOPLE16_9_30_360p_2_QP[34,37]	0	34.69	78.84	35.16
	1	34.34	101.73	34.95
1S_2PEOPLE16_9_30_360p_2_QP[38,41]	0	32.11	48.55	32.62

Microsoft Skype for Business H.264 Video Encoder Specification

	1	31.82	65.24	32.45
1S_2PEOPLE16_9_15_240p_2_QP[26,29]	0	39.09	101.60	39.54
	1	38.24	133.70	39.13
1S_2PEOPLE16_9_15_240p_2_QP[30,33]	0	36.42	58.98	36.85
	1	35.74	76.65	36.51
1S_2PEOPLE16_9_15_240p_2_QP[34,37]	0	33.78	34.59	34.18
	1	33.22	45.33	33.90
1S_2PEOPLE16_9_15_240p_2_QP[38,41]	0	31.24	19.91	31.58
	1	30.65	26.70	31.36
1S_HIMOTION4_3_30_VGA_1_QP[26,29]	0	37.70	1398.45	38.90
	1	36.54	1968.30	38.22
1S_HIMOTION4_3_30_VGA_1_QP[30,33]	0	34.81	832.72	36.13
	1	33.91	1129.99	35.56
1S_HIMOTION4_3_30_VGA_1_QP[34,37]	0	32.11	479.15	33.46
	1	31.46	642.96	32.99
1S_HIMOTION4_3_30_VGA_1_QP[38,41]	0	29.62	265.48	30.85
	1	28.98	357.60	30.44
1S_HIMOTION4_3_15_QVGA_1_QP[26,29]	0	37.97	206.60	38.84
	1	37.14	306.24	38.25
1S_HIMOTION4_3_15_QVGA_1_QP[30,33]	0	35.22	134.47	36.05
	1	34.47	196.20	35.52
1S_HIMOTION4_3_15_QVGA_1_QP[34,37]	0	32.76	87.36	33.30
	1	31.87	126.46	32.83
1S_HIMOTION4_3_15_QVGA_1_QP[38,41]	0	29.91	55.01	30.46
	1	29.01	78.81	30.02
1S_HANDHELD3_4_30_480x640_1_QP[26,29]	0	40.13	442.45	40.78
	1	39.30	559.29	40.37
1S_HANDHELD3_4_30_480x640_1_QP[30,33]	0	37.77	232.64	38.54
	1	37.03	299.51	38.19
1S_HANDHELD3_4_30_480x640_1_QP[34,37]	0	35.20	138.05	36.18
	1	34.54	189.85	35.83
1S_HANDHELD3_4_30_480x640_1_QP[38,41]	0	32.22	97.57	33.45
	1	31.52	138.26	33.08
1S_HANDHELD3_4_15_240x320_1_QP[26,29]	0	38.75	102.84	39.85
	1	37.74	137.96	39.31
1S_HANDHELD3_4_15_240x320_1_QP[30,33]	0	36.19	61.97	37.41
	1	35.25	82.99	36.89
1S_HANDHELD3_4_15_240x320_1_QP[34,37]	0	33.42	39.24	34.78

	1	32.64	54.33	34.30
1S_HANDHELD3_4_15_240x320_1_QP[38,41]	0	30.61	26.35	31.91
	1	29.76	37.30	31.45
1S_HANDHELD9_16_30_540x960_2_QP[26,29]	0	37.25	1419.13	38.31
	1	36.50	1795.88	37.81
1S_HANDHELD9_16_30_540x960_2_QP[30,33]	0	35.05	640.29	36.15
	1	34.59	812.15	35.77
1S_HANDHELD9_16_30_540x960_2_QP[34,37]	0	32.95	324.89	34.01
	1	32.52	427.46	33.67
1S_HANDHELD9_16_30_540x960_2_QP[38,41]	0	30.63	189.28	31.56
	1	30.07	259.74	31.17
1S_HANDHELD9_16_30_360x640_2_QP[26,29]	0	36.46	868.45	37.38
	1	35.07	1105.06	36.72
1S_HANDHELD9_16_30_360x640_2_QP[30,33]	0	33.77	392.80	34.93
	1	33.18	497.08	34.50
1S_HANDHELD9_16_30_360x640_2_QP[34,37]	0	31.61	194.80	32.71
	1	31.18	256.86	32.37
1S_HANDHELD9_16_30_360x640_2_QP[38,41]	0	29.34	110.47	30.33
	1	28.78	151.54	29.96
1S_HANDHELD9_16_15_240x424_2_QP[26,29]	0	37.59	169.67	38.22
	1	36.46	226.04	37.69
1S_HANDHELD9_16_15_240x424_2_QP[30,33]	0	35.00	95.37	35.66
	1	34.16	127.51	35.23
1S_HANDHELD9_16_15_240x424_2_QP[34,37]	0	32.56	56.29	33.16
	1	31.84	77.09	32.78
1S_HANDHELD9_16_15_240x424_2_QP[38,41]	0	29.99	34.33	30.50
	1	29.15	48.21	30.12

Note: the reference corresponding to the enhancement layer refers to the sub-bitstream that consists of the enhancement layer and all its dependent layers.

Table 37: Standard Logo Requirement Set for UCConfig Mode 1 (Constant QP, Single Stream) (Windows 8.1 only)

Test bitstream	R-D Curve Samples		LTR Frame Only R-D	
	TID	Min PSNR	Kbps	PSNR
1S_HIMOTION16_9_30_720p_2_QP[26,29]_LTR	0	38.39	4100.00	39.30
	1	37.14	5582.69	38.64

Microsoft Skype for Business H.264 Video Encoder Specification

1S_HIMOTION16_9_30_720p_2_QP[30,33]_LTR	0	35.60	2448.36	36.66	361.89	36.62
	1	34.54	3173.85	36.08	-	-
1S_HIMOTION16_9_30_720p_2_QP[34,37]_LTR	0	32.89	1447.15	34.01	242.29	33.99
	1	32.07	1838.50	33.53	-	-
1S_HIMOTION16_9_30_720p_2_QP[38,41]_LTR	0	30.05	829.50	31.27	154.63	31.28
	1	29.31	1044.48	30.84	-	-
1S_HIMOTION16_9_30_360p_2_QP[26,29]_LTR	0	37.38	1563.42	38.21	193.56	38.18
	1	35.78	2222.02	37.46	-	-
1S_HIMOTION16_9_30_360p_2_QP[30,33]_LTR	0	34.19	993.27	35.16	135.21	35.11
	1	32.71	1332.84	34.43	-	-
1S_HIMOTION16_9_30_360p_2_QP[34,37]_LTR	0	31.08	598.60	32.16	91.17	32.17
	1	29.83	763.74	31.54	-	-
1S_HIMOTION16_9_30_360p_2_QP[38,41]_LTR	0	27.96	327.53	29.13	57.39	29.26
	1	27.10	408.94	28.65	-	-
1S_HIMOTION16_9_15_240p_2_QP[26,29]_LTR	0	36.96	458.15	37.70	92.52	37.71
	1	35.19	676.01	36.86	-	-
1S_HIMOTION16_9_15_240p_2_QP[30,33]_LTR	0	33.71	302.22	34.52	64.31	34.52
	1	32.02	422.55	33.72	-	-
1S_HIMOTION16_9_15_240p_2_QP[34,37]_LTR	0	30.52	186.79	31.42	42.44	31.45
	1	29.10	244.90	30.68	-	-
1S_HIMOTION16_9_15_240p_2_QP[38,41]_LTR	0	27.42	101.35	28.33	25.30	28.43
	1	26.36	127.18	27.77	-	-
1S_LOWMOTION16_9_30_720p_2_QP[26,29]_LTR	0	39.03	1915.37	39.34	260.11	39.28
	1	37.56	2349.14	38.49	-	-
1S_LOWMOTION16_9_30_720p_2_QP[30,33]_LTR	0	36.12	852.23	36.48	147.00	36.44
	1	35.03	965.90	35.85	-	-
1S_LOWMOTION16_9_30_720p_2_QP[34,37]_LTR	0	33.38	378.93	33.76	83.46	33.73
	1	32.61	431.30	33.27	-	-
1S_LOWMOTION16_9_30_720p_2_QP[38,41]_LTR	0	30.61	189.20	30.99	46.49	30.95
	1	29.95	223.34	30.53	-	-

Microsoft Skype for Business H.264 Video Encoder Specification

1S_LOWMOTION16_9_30_360p_2_QP[26,29]_LTR	0	38.06	665.87	38.38	91.72	38.32
	1	36.59	849.83	37.79	-	-
1S_LOWMOTION16_9_30_360p_2_QP[30,33]_LTR	0	34.94	338.75	35.24	52.84	35.27
	1	33.75	408.00	34.81	-	-
1S_LOWMOTION16_9_30_360p_2_QP[34,37]_LTR	0	32.20	150.37	32.41	27.49	32.46
	1	31.33	179.24	32.16	-	-
1S_LOWMOTION16_9_30_360p_2_QP[38,41]_LTR	0	29.54	66.92	29.87	14.62	29.93
	1	29.18	84.22	29.71	-	-
1S_LOWMOTION16_9_15_240p_2_QP[26,29]_LTR	0	37.84	126.54	38.09	33.16	38.05
	1	36.63	155.84	37.67	-	-
1S_LOWMOTION16_9_15_240p_2_QP[30,33]_LTR	0	34.85	62.94	35.15	18.63	35.14
	1	34.08	75.56	34.88	-	-
1S_LOWMOTION16_9_15_240p_2_QP[34,37]_LTR	0	32.23	31.81	32.50	10.51	32.49
	1	31.71	38.69	32.33	-	-
1S_LOWMOTION16_9_15_240p_2_QP[38,41]_LTR	0	29.67	17.12	29.96	5.99	29.96
	1	29.37	21.69	29.83	-	-
1S_LOWLIGHT16_9_15_720p_2_QP[26,29]_LTR	0	39.74	1810.77	40.15	299.73	40.29
	1	38.32	2435.45	39.51	-	-
1S_LOWLIGHT16_9_15_720p_2_QP[30,33]_LTR	0	37.76	653.53	38.36	124.01	38.48
	1	36.73	841.78	37.97	-	-
1S_LOWLIGHT16_9_15_720p_2_QP[34,37]_LTR	0	35.50	266.55	36.67	62.63	36.74
	1	34.86	356.09	36.40	-	-
1S_LOWLIGHT16_9_15_720p_2_QP[38,41]_LTR	0	32.51	122.33	34.43	31.80	34.45
	1	32.05	169.16	34.17	-	-
1S_LOWLIGHT16_9_15_360p_2_QP[26,29]_LTR	0	37.92	444.21	38.46	83.69	38.48
	1	36.71	561.87	38.00	-	-
1S_LOWLIGHT16_9_15_360p_2_QP[30,33]_LTR	0	35.84	158.69	36.58	38.00	36.58
	1	35.01	201.52	36.31	-	-
1S_LOWLIGHT16_9_15_360p_2_QP[34,37]_LTR	0	33.63	76.96	34.68	21.03	34.66
	1	32.97	102.32	34.44	-	-

Microsoft Skype for Business H.264 Video Encoder Specification

1S_LOWLIGHT16_9_15_360p_2_QP[38,41]_LTR	0	30.80	44.50	32.26	12.52	32.26
	1	30.31	61.11	32.05	-	-
1S_LOWLIGHT16_9_15_240p_2_QP[26,29]_LTR	0	38.39	113.41	39.06	27.59	38.99
	1	37.42	146.45	38.79	-	-
1S_LOWLIGHT16_9_15_240p_2_QP[30,33]_LTR	0	35.86	60.97	36.86	16.33	36.78
	1	35.03	79.29	36.60	-	-
1S_LOWLIGHT16_9_15_240p_2_QP[34,37]_LTR	0	33.15	36.19	34.35	10.05	34.31
	1	32.48	48.03	34.11	-	-
1S_LOWLIGHT16_9_15_240p_2_QP[38,41]_LTR	0	30.25	21.94	31.65	6.07	31.65
	1	29.62	29.50	31.43	-	-
1S_2PEOPLE16_9_30_720p_2_QP[26,29]_LTR	0	40.53	768.78	41.26	139.63	41.24
	1	39.97	941.31	40.75	-	-
1S_2PEOPLE16_9_30_720p_2_QP[30,33]_LTR	0	38.43	408.87	39.20	81.62	39.19
	1	37.95	493.50	38.73	-	-
1S_2PEOPLE16_9_30_720p_2_QP[34,37]_LTR	0	36.37	234.94	37.05	48.83	37.08
	1	35.90	290.23	36.61	-	-
1S_2PEOPLE16_9_30_720p_2_QP[38,41]_LTR	0	33.99	143.77	34.64	30.07	34.70
	1	33.58	180.53	34.21	-	-
1S_2PEOPLE16_9_30_360p_2_QP[26,29]_LTR	0	39.55	283.80	40.08	53.71	39.98
	1	38.94	346.81	39.78	-	-
1S_2PEOPLE16_9_30_360p_2_QP[30,33]_LTR	0	37.13	158.91	37.61	33.06	37.54
	1	36.61	192.79	37.35	-	-
1S_2PEOPLE16_9_30_360p_2_QP[34,37]_LTR	0	34.78	92.26	35.16	20.02	35.15
	1	34.41	115.09	34.95	-	-
1S_2PEOPLE16_9_30_360p_2_QP[38,41]_LTR	0	32.00	55.78	32.56	12.11	32.60
	1	31.79	72.42	32.40	-	-
1S_2PEOPLE16_9_15_240p_2_QP[26,29]_LTR	0	39.09	116.40	39.47	31.89	39.41
	1	38.20	148.31	39.07	-	-
1S_2PEOPLE16_9_15_240p_2_QP[30,33]_LTR	0	36.36	68.51	36.77	19.76	36.74
	1	35.67	86.08	36.44	-	-

Microsoft Skype for Business H.264 Video Encoder Specification

1S_2PEOPLE16_9_15_240p_2_QP[34,37] _LTR	0	33.81	40.43	34.17	11.94	34.19
	1	33.21	51.05	33.90	-	-
1S_2PEOPLE16_9_15_240p_2_QP[38,41] _LTR	0	31.27	23.29	31.58	6.97	31.62
	1	30.67	30.18	31.36	-	-
1S_HIMOTION4_3_30_VGA_1_QP[26,29] _LTR	0	37.70	1459.97	38.91	162.38	39.00
	1	36.52	2028.74	38.21	-	-
1S_HIMOTION4_3_30_VGA_1_QP[30,33] _LTR	0	34.81	874.03	36.16	103.51	36.23
	1	33.92	1170.51	35.58	-	-
1S_HIMOTION4_3_30_VGA_1_QP[34,37] _LTR	0	32.11	506.51	33.53	64.61	33.61
	1	31.48	669.34	33.05	-	-
1S_HIMOTION4_3_30_VGA_1_QP[38,41] _LTR	0	29.64	283.09	30.93	39.17	31.04
	1	29.05	374.98	30.52	-	-
1S_HIMOTION4_3_15_QVGA_1_QP[26,29] _LTR	0	37.99	220.46	38.87	42.92	38.90
	1	37.16	319.76	38.27	-	-
1S_HIMOTION4_3_15_QVGA_1_QP[30,33] _LTR	0	35.24	144.21	36.15	28.79	36.19
	1	34.49	205.87	35.61	-	-
1S_HIMOTION4_3_15_QVGA_1_QP[34,37] _LTR	0	32.82	94.34	33.41	19.34	33.47
	1	31.95	133.43	32.93	-	-
1S_HIMOTION4_3_15_QVGA_1_QP[38,41] _LTR	0	30.02	59.44	30.62	12.62	30.70
	1	29.12	83.20	30.17	-	-
1S_HANDHELD3_4_30_480x640_1_QP[26,29] _LTR	0	40.14	488.08	40.79	76.40	40.68
	1	39.27	605.34	40.37	-	-
1S_HANDHELD3_4_30_480X640_1_QP[30,33] _LTR	0	37.74	262.28	38.53	45.88	38.40
	1	37.01	329.22	38.18	-	-
1S_HANDHELD3_4_30_480X640_1_QP[34,37] _LTR	0	35.13	156.55	36.17	29.34	36.03
	1	34.52	208.14	35.82	-	-
1S_HANDHELD3_4_30_480X640_1_QP[38,41] _LTR	0	32.17	109.28	33.44	20.33	33.31
	1	31.50	149.58	33.07	-	-
1S_HANDHELD3_4_15_240x320_1_QP[26,29] _LTR	0	38.65	114.04	39.83	28.84	39.69
	1	37.75	149.18	39.30	-	-

Microsoft Skype for Business H.264 Video Encoder Specification

1S_HANDHELD3_4_15_240x320_1_QP[30,33]_LTR	0	36.06	70.18	37.34	19.04	37.21
	1	35.21	91.05	36.84	-	-
1S_HANDHELD3_4_15_240x320_1_QP[34,37]_LTR	0	33.38	44.25	34.73	12.33	34.61
	1	32.65	59.15	34.25	-	-
1S_HANDHELD3_4_15_240x320_1_QP[38,41]_LTR	0	30.54	29.69	31.86	8.20	31.79
	1	29.72	40.58	31.40	-	-
1S_HANDHELD9_16_30_540x960_2_QP[26,29]_LTR	0	37.33	1513.92	38.31	250.26	37.76
	1	36.50	1892.80	37.80	-	-
1S_HANDHELD9_16_30_540x960_2_QP[30,33]_LTR	0	35.10	701.64	36.15	133.60	35.55
	1	34.58	874.54	35.77	-	-
1S_HANDHELD9_16_30_540x960_2_QP[34,37]_LTR	0	32.98	361.30	34.01	74.25	33.45
	1	32.52	464.62	33.67	-	-
1S_HANDHELD9_16_30_540x960_2_QP[38,41]_LTR	0	30.62	211.21	31.56	43.96	31.06
	1	30.07	281.94	31.17	-	-
1S_HANDHELD9_16_30_360x640_2_QP[26,29]_LTR	0	36.49	922.33	37.38	138.85	37.04
	1	35.07	1160.77	36.72	-	-
1S_HANDHELD9_16_30_360x640_2_QP[30,33]_LTR	0	33.78	428.21	34.94	77.48	34.62
	1	33.17	533.17	34.51	-	-
1S_HANDHELD9_16_30_360x640_2_QP[34,37]_LTR	0	31.64	216.59	32.74	44.79	32.41
	1	31.19	278.59	32.40	-	-
1S_HANDHELD9_16_30_360x640_2_QP[38,41]_LTR	0	29.37	123.77	30.36	26.22	30.00
	1	28.81	164.79	29.99	-	-
1S_HANDHELD9_16_15_240x424_2_QP[26,29]_LTR	0	37.59	192.09	38.21	51.04	38.14
	1	36.45	248.37	37.67	-	-
1S_HANDHELD9_16_15_240x424_2_QP[30,33]_LTR	0	35.00	109.99	35.64	31.88	35.58
	1	34.16	142.22	35.22	-	-
1S_HANDHELD9_16_15_240x424_2_QP[34,37]_LTR	0	32.55	65.58	33.11	19.77	33.01

	1	31.80	86.38	32.73	-	-
1S_ HANDHELD9_16_15_240x424_2_QP[38, 41]_LTR	0					
		29.99	40.15	30.41	11.79	30.26
	1	29.14	54.11	30.04	-	-

Table 38: Standard Logo Requirement Set for UCConfig Mode 1 (Constant Rate Control, Single Stream)

Test Bitstream	PSNR
1S_HIMOTION16_9_30_1080p_2_RC500ms[1500,2500]Kbps	22.39
1S_HIMOTION16_9_30_1080p_2_RC1000ms[1500,2500]Kbps	22.39
1S_HIMOTION16_9_30_720p_2_RC500ms[800,1200]Kbps	22.09
1S_HIMOTION16_9_30_720p_2_RC1000ms[800,1200]Kbps	22.09
1S_HIMOTION16_9_30_360p_2_RC500ms[300,500]Kbps	22.26
1S_HIMOTION16_9_30_360p_2_RC1000ms[300,500]Kbps	22.26
1S_HIMOTION16_9_15_240p_2_RC500ms[180,250]Kbps	24.32
1S_HIMOTION16_9_15_240p_2_RC1000ms[180,250]Kbps	24.32
1S_HANDHELD3_4_30_480x640_1_RC500ms[300,500]Kbps	27.57
1S_HANDHELD3_4_30_480x640_1_RC1000ms[300,500]Kbps	27.57
1S_HANDHELD3_4_15_240x320_1_RC500ms[180,250]Kbps	27.30
1S_HANDHELD3_4_15_240x320_1_RC1000ms[180,520]Kbps	27.30

Table 39: Standard Logo Requirement Set for UCConfig Mode 1 (Constant QP, Simulcast Streams)

Test bitstreams	R-D Curve Samples			
	TID	Min PSNR	Kbps	PSNR
1MM_HIMOTION16_9_30_720p_2_QP26	0	38.51	3867.05	39.33
	1	38.49	6755.99	39.29
1MM_HIMOTION16_9_30_720p_2_QP30	0	35.73	2280.49	36.68
	1	35.70	3844.57	36.64
1MM_HIMOTION16_9_30_720p_2_QP34	0	32.95	1328.43	33.99
	1	32.94	2166.57	33.95
1MM_HIMOTION16_9_30_720p_2_QP38	0	30.08	752.78	31.23
	1	30.08	1199.62	31.19
1MM_HIMOTION16_9_15_180p_1_QP30	0	32.91	189.23	34.07
	1	32.92	331.09	33.99
1MM_HIMOTION16_9_15_180p_1_QP34	0	30.19	117.57	31.18
	1	30.12	200.21	31.10
1MM_HIMOTION16_9_15_180p_1_QP38	0	27.34	67.18	28.26
	1	27.29	111.39	28.20

1MM_HIMOTION16_9_15_180p_1_QP42	0	24.90	39.06	25.75
	1	32.91	189.23	34.07
1MM_HANDHELD3_4_30_480x640_1_QP26	0	40.14	395.37	40.77
	1	40.15	669.20	40.79
1MM_HANDHELD3_4_30_480x640_1_QP30	0	37.78	208.07	38.54
	1	37.75	352.03	38.56
1MM_HANDHELD3_4_30_480x640_1_QP34	0	35.23	124.10	36.19
	1	35.20	211.05	36.18
1MM_HANDHELD3_4_30_480x640_1_QP38	0	32.22	86.93	33.46
	1	32.22	148.74	33.44
1MM_HANDHELD3_4_15_240x320_1_QP30	0	36.43	47.51	37.25
	1	36.41	79.08	37.25
1MM_HANDHELD3_4_15_240x320_1_QP34	0	33.47	30.24	34.64
	1	33.50	50.23	34.62
1MM_HANDHELD3_4_15_240x320_1_QP38	0	30.62	20.87	31.79
	1	30.59	34.96	31.78
1MM_HANDHELD3_4_15_240x320_1_QP42	0	28.08	15.20	29.36
	1	28.00	25.78	29.33

Table 40: Standard Logo Requirement Set for UCConfig Mode 1 (Constant QP, Single Stream) (Windows 8.1 only)

Test bitstream	R-D Curve Samples			
	TID	Min PSNR	Kbps	PSNR
1S_HIMOTION16_9_30_1080p_2_QP[26,29,30]	0	39.72	4122.92	40.73
	1	38.59	5996.44	40.05
	2	38.08	8343.60	39.48
1S_HIMOTION16_9_30_1080p_2_QP[29,32,33]	0	37.91	2808.13	38.95
	1	36.84	4028.86	38.27
	2	36.37	5373.94	37.76
1S_HIMOTION16_9_30_1080p_2_QP[32,35,36]	0	35.93	1988.92	37.03
	1	35.03	2776.13	36.42
	2	34.48	3590.63	35.92
1S_HIMOTION16_9_30_1080p_2_QP[35,38,39]	0	33.99	1388.34	35.16
	1	33.09	1891.86	34.54
	2	32.61	2457.47	34.09
1S_HIMOTION16_9_30_720p_2_QP[26,29,30]	0	38.42	2460.05	39.43
	1	37.18	3544.51	38.71
	2	36.61	4852.94	38.12

1S_HIMOTION16_9_30_720p_2_QP[29,32,33]	0	36.40	1694.83	37.47
	1	35.21	2393.88	36.77
	2	34.72	3147.50	36.24
1S_HIMOTION16_9_30_720p_2_QP[32,35,36]	0	34.27	1191.14	35.43
	1	33.29	1630.83	34.80
	2	32.77	2076.39	34.30
1S_HIMOTION16_9_30_720p_2_QP[35,38,39]	0	32.22	823.22	33.45
	1	31.33	1098.43	32.84
	2	30.86	1398.72	32.41
1S_HIMOTION16_9_30_360p_2_QP[26,29,30]	0	37.41	926.92	38.34
	1	35.79	1379.23	37.51
	2	35.12	1962.75	36.82
1S_HIMOTION16_9_30_360p_2_QP[29,32,33]	0	35.06	670.05	36.06
	1	33.42	969.94	35.23
	2	32.79	1322.08	34.56
1S_HIMOTION16_9_30_360p_2_QP[32,35,36]	0	32.65	481.85	33.76
	1	31.11	666.47	32.96
	2	30.46	863.43	32.33
1S_HIMOTION16_9_30_360p_2_QP[35,38,39]	0	30.25	328.84	31.47
	1	28.92	436.00	30.74
	2	28.39	556.09	30.23
1S_HANDHELD3_4_30_480x640_1_QP[26,29,30]	0	40.04	310.93	40.75
	1	38.94	402.91	40.22
	2	38.65	515.75	39.87
1S_HANDHELD3_4_30_480x640_1_QP[29,32,33]	0	38.29	193.27	39.10
	1	37.37	251.16	38.61
	2	36.99	325.22	38.29
1S_HANDHELD3_4_30_480x640_1_QP[32,35,36]	0	36.31	127.18	37.31
	1	35.61	170.21	36.89
	2	35.16	228.13	36.55
1S_HANDHELD3_4_30_480x640_1_QP[35,38,39]	0	35.59	92.55	34.54
	1	33.63	126.44	35.13
	2	33.23	176.66	34.78

Table 41: Standard Logo Requirement Set for UCConfig Mode 1 LTR (Constant QP, Single Stream) (Windows 8.1 only)

Test bitstream	R-D Curve Samples	LTR Frame Only R-D
----------------	-------------------	--------------------

	TID	Min PSNR	Kbps	PSNR	Kbps	PSNR
1S_HIMOTION16_9_30_1080p_2_QP[26,29,30]_LTR	0	40.16	8435.73	40.90	1669.40	40.99
	1	38.84	12135.16	40.27	-	-
	2	38.44	16841.31	39.79	-	-
1S_HIMOTION16_9_30_1080p_2_QP[29,32,33]_LTR	0	38.28	5730.96	39.07	1204.92	39.14
	1	37.06	8119.60	38.49	-	-
	2	36.75	10793.65	38.09	-	-
1S_HIMOTION16_9_30_1080p_2_QP[32,35,36]_LTR	0	36.37	4031.44	37.20	896.95	37.25
	1	35.28	5557.47	36.69	-	-
	2	34.95	7174.61	36.32	-	-
1S_HIMOTION16_9_30_1080p_2_QP[35,38,39]_LTR	0	34.44	2787.90	35.31	649.37	35.36
	1	33.42	3755.58	34.83	-	-
	2	33.16	4870.20	34.52	-	-
1S_HIMOTION16_9_30_720p_2_QP[26,29,30]_LTR	0	38.77	4936.68	39.54	1003.57	39.59
	1	37.44	7041.89	38.90	-	-
	2	36.99	9619.50	38.41	-	-
1S_HIMOTION16_9_30_720p_2_QP[29,32,33]_LTR	0	36.72	3393.32	37.53	727.95	37.55
	1	35.48	4741.38	36.94	-	-
	2	35.11	6213.57	36.51	-	-
1S_HIMOTION16_9_30_720p_2_QP[32,35,36]_LTR	0	34.68	2377.65	35.51	539.17	35.53
	1	33.55	3217.95	34.98	-	-
	2	33.20	4080.25	34.61	-	-
1S_HIMOTION16_9_30_720p_2_QP[35,38,39]_LTR	0	32.64	1630.75	33.48	389.73	33.51
	1	31.67	2151.00	33.02	-	-
	2	31.38	2725.94	32.72	-	-
1S_HIMOTION16_9_30_360p_2_QP[26,29,30]_LTR	0	37.64	1828.03	38.34	363.49	38.36
	1	36.08	2697.63	37.63	-	-
	2	35.54	3834.02	37.05	-	-
1S_HIMOTION16_9_30_360p_2_QP[29,32,33]_LTR	0	35.26	1316.26	36.01	272.66	36.03
	1	33.78	1891.55	35.33	-	-
	2	33.30	2573.64	34.80	-	-

1S_HIMOTION16_9_30_360p_2_QP[32,35,36]_LTR	0	32.96	943.75	33.74	204.67	33.77
	1	31.54	1294.16	33.09	-	-
	2	31.05	1668.74	32.58	-	-
1S_HIMOTION16_9_30_360p_2_QP[35,38,39]_LTR	0	30.71	641.61	31.50	147.21	31.55
	1	29.36	842.95	30.91	-	-
	2	28.97	1064.85	30.51	-	-
1S_HANDHELD3_4_30_480x640_1_QP[26,29,30]_LTR	0	40.24	712.59	41.46	164.87	41.43
	1	39.28	935.51	40.92	-	-
	2	39.03	1188.13	40.58	-	-
1S_HANDHELD3_4_30_480X640_1_QP[29,32,33]_LTR	0	38.58	449.58	39.88	110.38	39.83
	1	37.81	587.74	39.40	-	-
	2	37.51	750.21	39.12	-	-
1S_HANDHELD3_4_30_480X640_1_QP[32,35,36]_LTR	0	36.91	295.07	38.28	76.72	38.25
	1	36.36	393.56	37.90	-	-
	2	35.99	513.97	37.64	-	-
1S_HANDHELD3_4_30_480X640_1_QP[35,38,39]_LTR	0	35.24	210.46	36.79	54.87	36.73
	1	34.78	284.18	36.42	-	-
	2	34.39	385.00	36.16	-	-

Table 42: Standard Logo Requirement Set for UCConfig Mode 1 (Constant Rate Control, Single Stream) (Windows 8.1 only)

Test Bitstream	PSNR
1S_HIMOTION16_9_30_720p_2_RC500ms[800,1000,1200]Kbps	28.85
1S_HIMOTION16_9_30_720p_2_RC1000ms[800,1000,1200]Kbps	28.93
1S_HIMOTION16_9_30_360p_2_RC500ms[300,400,500]Kbps	27.77
1S_HIMOTION16_9_30_360p_2_RC1000ms[300,400,500]Kbps	28.09
1S_HANDHELD3_4_30_480x640_1_RC500ms[300,400,500]Kbps	39.00
1S_HANDHELD3_4_30_480x640_1_RC1000ms[300,400,500]Kbps	39.15

Table 43: Standard Logo Requirement Set for UCConfig Mode 1 (Constant QP, Simulcast Streams) (Windows 8.1 only)

Test bitstreams	R-D Curve Samples			
	TID	Min PSNR	Kbps	PSNR
1M_HIMOTION16_9_30_720p_2_QP26	0	38.42	2460.05	39.43
	1	38.50	4327.96	39.37
	2	38.47	7207.83	39.31

Microsoft Skype for Business H.264 Video Encoder Specification

1M_HIMOTION16_9_30_720p_2_QP29	0	36.40	1694.83	37.47
	1	36.46	2914.87	37.40
	2	36.42	4681.96	37.33
1M_HIMOTION16_9_30_720p_2_QP32	0	34.27	1191.14	35.43
	1	34.31	1998.51	35.35
	2	34.28	3103.13	35.28
1M_HIMOTION16_9_30_720p_2_QP35	0	32.22	823.22	33.45
	1	32.27	1348.74	33.37
	2	32.26	2031.97	33.30
1M_HIMOTION16_9_30_360p_2_QP30	0	34.27	600.76	35.29
	1	34.26	1054.55	35.22
	2	34.20	1720.94	35.16
1M_HIMOTION16_9_30_360p_2_QP33	0	31.91	420.73	33.07
	1	31.90	722.99	32.99
	2	31.84	1145.97	32.90
1M_HIMOTION16_9_30_360p_2_QP36	0	29.46	282.29	30.72
	1	29.45	473.17	30.64
	2	29.43	727.04	30.56
1M_HIMOTION16_9_30_360p_2_QP39	0	27.31	190.65	28.67
	1	27.37	311.87	28.59
	2	27.34	470.77	28.52
1M_HIMOTION16_9_15_180p_1_QP34	0	30.35	119.20	31.36
	1	30.32	203.73	31.28
1M_HIMOTION16_9_15_180p_1_QP37	0	28.16	80.34	29.21
	1	28.16	134.45	29.14
1M_HIMOTION16_9_15_180p_1_QP40	0	26.11	51.65	27.05
	1	26.04	85.29	26.98
1M_HIMOTION16_9_15_180p_1_QP43	0	24.37	35.37	25.23
	1	24.34	57.97	25.17
1M_HANDHELD3_4_30_480x640_1_QP26	0	40.08	273.13	40.75
	1	40.09	460.76	40.75
	2	40.10	736.49	40.78
1M_HANDHELD3_4_30_480x640_1_QP29	0	38.31	168.80	39.10
	1	38.34	281.28	39.10
	2	38.33	445.52	39.11
1M_HANDHELD3_4_30_480x640_1_QP32	0	36.39	111.42	37.33
	1	36.40	183.54	37.32
	2	36.40	291.54	37.32

1M_HANDHELD3_4_30_480x640_1_QP35	0	34.57	79.95	35.59
	1	34.55	132.15	35.57
	2	34.55	211.63	35.57
1M_HANDHELD3_4_15_320x424_2_QP30	0	37.07	78.97	37.92
	1	37.09	136.69	37.92
1M_HANDHELD3_4_15_320x424_2_QP33	0	35.18	55.88	36.10
	1	35.17	97.52	36.09
1M_HANDHELD3_4_15_320x424_2_QP36	0	32.90	41.99	34.05
	1	32.90	74.62	34.03
1M_HANDHELD3_4_15_320x424_2_QP39	0	30.97	33.70	32.09
	1	30.88	61.07	32.07
1M_HANDHELD3_4_15_240x320_1_QP34	0	33.47	30.24	34.64
	1	33.50	50.23	34.62
1M_HANDHELD3_4_15_240x320_1_QP37	0	31.58	23.03	32.70
	1	31.58	38.73	32.69
1M_HANDHELD3_4_15_240x320_1_QP40	0	29.30	17.71	30.57
	1	29.30	29.68	30.56
1M_HANDHELD3_4_15_240x320_1_QP43	0	27.57	14.61	28.85
	1	27.55	24.90	28.83

6.4.2. Premium Logo Requirements

Table 44: Premium Logo Requirement Set for UCConfig Mode 0 (Constant QP, Single Stream)

Test Bitstream	Min PSNR	R-D Curve Samples	
		kbps	PSNR
OS_HIMOTION16_9_30_1080p_1_QP26	40.32	11368.70	41.06
OS_HIMOTION16_9_30_1080p_1_QP30	37.89	6274.36	38.68
OS_HIMOTION16_9_30_1080p_1_QP34	35.40	3451.46	36.22
OS_HIMOTION16_9_30_1080p_1_QP38	32.65	1931.08	33.52
OS_HIMOTION16_9_30_720p_1_QP26	38.99	6153.72	39.73
OS_HIMOTION16_9_30_720p_1_QP30	36.22	3427.15	37.04
OS_HIMOTION16_9_30_720p_1_QP34	33.46	1884.24	34.36
OS_HIMOTION16_9_30_720p_1_QP38	30.59	1015.72	31.58
OS_HIMOTION16_9_30_540p_1_QP26	38.19	4810.66	38.91
OS_HIMOTION16_9_30_540p_1_QP30	35.22	2771.24	36.03
OS_HIMOTION16_9_30_540p_1_QP34	32.28	1514.22	33.17
OS_HIMOTION16_9_30_540p_1_QP38	29.22	761.39	30.24

Microsoft Skype for Business H.264 Video Encoder Specification

OS_HIMOTION16_9_30_480p_1_QP26	37.89	4159.97	38.61
OS_HIMOTION16_9_30_480p_1_QP30	34.86	2440.08	35.65
OS_HIMOTION16_9_30_480p_1_QP34	31.87	1345.15	32.75
OS_HIMOTION16_9_30_480p_1_QP38	28.75	657.44	29.77
OS_HIMOTION16_9_30_360p_1_QP26	37.79	2433.48	38.50
OS_HIMOTION16_9_30_360p_1_QP30	34.56	1470.58	35.37
OS_HIMOTION16_9_30_360p_1_QP34	31.51	828.27	32.39
OS_HIMOTION16_9_30_360p_1_QP38	28.36	408.17	29.32
OS_HIMOTION16_9_15_270p_1_QP26	37.48	829.54	38.16
OS_HIMOTION16_9_15_270p_1_QP30	34.24	521.30	34.98
OS_HIMOTION16_9_15_270p_1_QP34	31.18	305.03	31.98
OS_HIMOTION16_9_15_270p_1_QP38	28.02	155.75	28.94
OS_HIMOTION16_9_15_240p_1_QP26	37.16	736.93	37.84
OS_HIMOTION16_9_15_240p_1_QP30	33.87	467.05	34.60
OS_HIMOTION16_9_15_240p_1_QP34	30.78	274.66	31.59
OS_HIMOTION16_9_15_240p_1_QP38	27.64	137.46	28.49
OS_HIMOTION16_9_15_180p_1_QP26	36.88	442.75	37.56
OS_HIMOTION16_9_15_180p_1_QP30	33.62	280.76	34.31
OS_HIMOTION16_9_15_180p_1_QP34	30.52	164.03	31.30
OS_HIMOTION16_9_15_180p_1_QP38	27.49	83.77	28.27
OS_HIMOTION4_3_30_VGA_1_QP26	38.31	2068.57	39.47
OS_HIMOTION4_3_30_VGA_1_QP30	35.36	1192.48	36.70
OS_HIMOTION4_3_30_VGA_1_QP34	32.66	664.65	34.09
OS_HIMOTION4_3_30_VGA_1_QP38	30.10	355.57	31.48
OS_HIMOTION4_3_15_424x320_1_QP26	38.83	492.53	39.48
OS_HIMOTION4_3_15_424x320_1_QP30	36.10	305.35	36.75
OS_HIMOTION4_3_15_424x320_1_QP34	33.56	189.07	34.18
OS_HIMOTION4_3_15_424x320_1_QP38	30.90	114.90	31.43
OS_HIMOTION4_3_15_QVGA_1_QP26	38.39	313.50	38.89
OS_HIMOTION4_3_15_QVGA_1_QP30	35.60	198.67	36.05
OS_HIMOTION4_3_15_QVGA_1_QP34	33.02	125.40	33.40
OS_HIMOTION4_3_15_QVGA_1_QP38	30.20	76.57	30.60
OS_HIMOTION4_3_15_212x160_1_QP26	37.68	168.20	38.08
OS_HIMOTION4_3_15_212x160_1_QP30	34.67	108.34	35.03
OS_HIMOTION4_3_15_212x160_1_QP34	31.87	68.67	32.25
OS_HIMOTION4_3_15_212x160_1_QP38	28.95	41.60	29.32
OS_LOWMOTION16_9_30_720p_1_QP26	39.69	3377.90	39.93
OS_LOWMOTION16_9_30_720p_1_QP30	36.81	1384.57	37.12

Microsoft Skype for Business H.264 Video Encoder Specification

OS_LOWMOTION16_9_30_720p_1_QP34	34.05	536.25	34.44
OS_LOWMOTION16_9_30_720p_1_QP38	31.25	225.34	31.73
OS_LOWMOTION16_9_30_360p_1_QP26	38.81	1110.13	39.05
OS_LOWMOTION16_9_30_360p_1_QP30	35.66	546.72	35.93
OS_LOWMOTION16_9_30_360p_1_QP34	32.82	227.62	33.12
OS_LOWMOTION16_9_30_360p_1_QP38	30.16	78.90	30.50
OS_LOWMOTION16_9_15_240p_1_QP26	38.54	185.30	38.79
OS_LOWMOTION16_9_15_240p_1_QP30	35.58	83.25	35.84
OS_LOWMOTION16_9_15_240p_1_QP34	32.96	37.13	33.20
OS_LOWMOTION16_9_15_240p_1_QP38	30.39	17.85	30.60
OS_LOWMOTION16_9_15_180p_1_QP26	38.46	83.18	38.75
OS_LOWMOTION16_9_15_180p_1_QP30	35.68	41.20	35.92
OS_LOWMOTION16_9_15_180p_1_QP34	32.99	21.61	33.22
OS_LOWMOTION16_9_15_180p_1_QP38	30.22	11.81	30.49
OS_HANDHELD3_4_30_480x640_1_QP26	40.54	792.96	41.64
OS_HANDHELD3_4_30_480x640_1_QP30	38.29	408.84	39.47
OS_HANDHELD3_4_30_480x640_1_QP34	36.11	232.96	37.44
OS_HANDHELD3_4_30_480x640_1_QP38	33.77	151.98	35.19
OS_HANDHELD3_4_15_320x424_1_QP26	39.87	267.44	40.91
OS_HANDHELD3_4_15_320x424_1_QP30	37.50	150.60	38.68
OS_HANDHELD3_4_15_320x424_1_QP34	35.13	90.62	36.43
OS_HANDHELD3_4_15_320x424_1_QP38	32.50	57.70	33.92
OS_HANDHELD3_4_15_240x320_1_QP26	39.19	152.25	40.28
OS_HANDHELD3_4_15_240x320_1_QP30	36.75	86.76	37.91
OS_HANDHELD3_4_15_240x320_1_QP34	34.21	52.36	35.53
OS_HANDHELD3_4_15_240x320_1_QP38	31.63	33.31	32.99
OS_HANDHELD3_4_15_160x212_1_QP26	38.38	95.75	39.48
OS_HANDHELD3_4_15_160x212_1_QP30	35.75	54.50	36.89
OS_HANDHELD3_4_15_160x212_1_QP34	33.24	32.24	34.41
OS_HANDHELD3_4_15_160x212_1_QP38	30.57	19.71	31.85
OS_HANDHELD9_16_30_540x960_1_QP26	37.75	2153.44	38.75
OS_HANDHELD9_16_30_540x960_1_QP30	35.54	941.35	36.66
OS_HANDHELD9_16_30_540x960_1_QP34	33.53	473.99	34.70
OS_HANDHELD9_16_30_540x960_1_QP38	31.47	273.58	32.62
OS_HANDHELD9_16_30_480x848_1_QP26	37.60	1761.25	38.52
OS_HANDHELD9_16_30_480x848_1_QP30	35.27	765.90	36.34
OS_HANDHELD9_16_30_480x848_1_QP34	33.19	383.15	34.32
OS_HANDHELD9_16_30_480x848_1_QP38	31.05	221.22	32.20

Microsoft Skype for Business H.264 Video Encoder Specification

OS_HANDHELD9_16_30_360x640_1_QP26	37.04	1503.61	37.84
OS_HANDHELD9_16_30_360x640_1_QP30	34.42	633.78	35.41
OS_HANDHELD9_16_30_360x640_1_QP34	32.15	287.85	33.24
OS_HANDHELD9_16_30_360x640_1_QP38	29.99	154.26	31.12
OS_HANDHELD9_16_15_270x480_1_QP26	37.93	352.86	38.57
OS_HANDHELD9_16_15_270x480_1_QP30	35.21	182.41	36.00
OS_HANDHELD9_16_15_270x480_1_QP34	32.80	101.54	33.64
OS_HANDHELD9_16_15_270x480_1_QP38	30.39	61.22	31.29
OS_HANDHELD9_16_15_240x424_1_QP26	38.02	292.24	38.67
OS_HANDHELD9_16_15_240x424_1_QP30	35.34	156.59	36.08
OS_HANDHELD9_16_15_240x424_1_QP34	32.93	89.88	33.72
OS_HANDHELD9_16_15_240x424_1_QP38	30.56	54.00	31.38
OS_HANDHELD9_16_15_180x320_1_QP26	37.56	219.96	38.07
OS_HANDHELD9_16_15_180x320_1_QP30	34.57	111.93	35.29
OS_HANDHELD9_16_15_180x320_1_QP34	32.12	60.78	32.86
OS_HANDHELD9_16_15_180x320_1_QP38	29.81	35.55	30.52
OS_LOWLIGHT16_9_15_720p_1_QP26	40.05	4398.64	40.48
OS_LOWLIGHT16_9_15_720p_1_QP30	38.05	1600.70	38.69
OS_LOWLIGHT16_9_15_720p_1_QP34	36.27	473.08	37.19
OS_LOWLIGHT16_9_15_720p_1_QP38	34.28	187.19	35.48
OS_LOWLIGHT16_9_15_360p_1_QP26	38.20	963.00	38.86
OS_LOWLIGHT16_9_15_360p_1_QP30	36.24	264.03	37.08
OS_LOWLIGHT16_9_15_360p_1_QP34	34.31	103.19	35.28
OS_LOWLIGHT16_9_15_360p_1_QP38	32.02	56.21	33.10
OS_LOWLIGHT16_9_15_240p_1_QP26	38.65	174.99	39.57
OS_LOWLIGHT16_9_15_240p_1_QP30	36.31	83.04	37.33
OS_LOWLIGHT16_9_15_240p_1_QP34	33.84	47.97	34.95
OS_LOWLIGHT16_9_15_240p_1_QP38	31.10	28.61	32.28
OS_LOWLIGHT16_9_15_180p_1_QP26	37.87	136.57	38.80
OS_LOWLIGHT16_9_15_180p_1_QP30	35.28	65.82	36.29
OS_LOWLIGHT16_9_15_180p_1_QP34	32.74	36.51	33.77
OS_LOWLIGHT16_9_15_180p_1_QP38	29.98	21.10	31.11
OS_2PEOPLE16_9_30_720p_1_QP26	41.27	1233.05	41.98
OS_2PEOPLE16_9_30_720p_1_QP30	39.13	607.67	39.87
OS_2PEOPLE16_9_30_720p_1_QP34	37.13	340.73	37.78
OS_2PEOPLE16_9_30_720p_1_QP38	34.95	208.36	35.49
OS_2PEOPLE16_9_30_360p_1_QP26	40.25	408.87	40.86
OS_2PEOPLE16_9_30_360p_1_QP30	37.79	212.42	38.33

OS_2PEOPLE16_9_30_360p_1_QP34	35.38	120.42	35.79
OS_2PEOPLE16_9_30_360p_1_QP38	32.88	70.91	33.23
OS_2PEOPLE16_9_15_240p_1_QP26	39.74	145.87	40.14
OS_2PEOPLE16_9_15_240p_1_QP30	37.04	80.43	37.36
OS_2PEOPLE16_9_15_240p_1_QP34	34.37	46.62	34.73
OS_2PEOPLE16_9_15_240p_1_QP38	31.71	26.83	32.09
OS_2PEOPLE16_9_15_180p_1_QP26	39.33	97.86	39.70
OS_2PEOPLE16_9_15_180p_1_QP30	36.45	54.96	36.85
OS_2PEOPLE16_9_15_180p_1_QP34	33.69	31.71	34.11
OS_2PEOPLE16_9_15_180p_1_QP38	30.98	18.11	31.42
OS_PANO20_3_15_1920x288_1_QP26	40.64	567.27	40.91
OS_PANO20_3_15_1920x288_1_QP30	38.18	296.30	38.50
OS_PANO20_3_15_1920x288_1_QP34	35.71	163.43	36.03
OS_PANO20_3_15_1920x288_1_QP38	33.11	91.15	33.47
OS_PANO20_3_15_1280x192_1_QP26	39.59	331.78	39.84
OS_PANO20_3_15_1280x192_1_QP30	36.91	178.83	37.19
OS_PANO20_3_15_1280x192_1_QP34	34.26	97.23	34.60
OS_PANO20_3_15_1280x192_1_QP38	31.47	51.39	31.85
OS_PANO20_3_15_960x144_1_QP26	38.81	239.34	39.09
OS_PANO20_3_15_960x144_1_QP30	36.00	131.82	36.29
OS_PANO20_3_15_960x144_1_QP34	33.23	71.07	33.58
OS_PANO20_3_15_960x144_1_QP38	30.43	36.00	30.80

Table 45: Premium Logo Requirement Set for UCConfig Mode 0 LTR (Constant QP, Single Stream) (Windows 8.1 only)

Test Bitstream	Min PSNR	R-D Curve Samples		LTR Frame Only R-D	
		kbps	PSNR	kbps	PSNR
OS_HIMOTION16_9_30_1080p_1_QP26_LTR	40.23	11941.81	41.03	951.49	40.99
OS_HIMOTION16_9_30_1080p_1_QP30_LTR	37.73	6682.38	38.63	643.90	38.49
OS_HIMOTION16_9_30_1080p_1_QP34_LTR	35.22	3731.80	36.18	430.74	36.04
OS_HIMOTION16_9_30_1080p_1_QP38_LTR	32.54	2111.96	33.52	277.24	33.42
OS_HIMOTION16_9_30_720p_1_QP26_LTR	38.88	6468.25	39.70	539.55	39.59
OS_HIMOTION16_9_30_720p_1_QP30_LTR	36.10	3651.33	37.02	365.78	36.89
OS_HIMOTION16_9_30_720p_1_QP34_LTR	33.38	2036.62	34.39	244.89	34.31
OS_HIMOTION16_9_30_720p_1_QP38_LTR	30.58	1115.13	31.64	156.79	31.61
OS_HIMOTION16_9_30_540p_1_QP26_LTR	38.09	5010.03	38.88	377.12	38.78
OS_HIMOTION16_9_30_540p_1_QP30_LTR	35.15	2915.61	36.03	258.15	35.94
OS_HIMOTION16_9_30_540p_1_QP34_LTR	32.24	1616.95	33.20	172.85	33.20

Microsoft Skype for Business H.264 Video Encoder Specification

OS_HIMOTION16_9_30_540p_1_QP38_LTR	29.23	827.97	30.32	109.31	30.42
OS_HIMOTION16_9_30_480p_1_QP26_LTR	37.80	4319.89	38.58	314.70	38.52
OS_HIMOTION16_9_30_480p_1_QP30_LTR	34.79	2558.83	35.66	216.17	35.59
OS_HIMOTION16_9_30_480p_1_QP34_LTR	31.85	1428.46	32.79	145.40	32.81
OS_HIMOTION16_9_30_480p_1_QP38_LTR	28.81	714.04	29.84	91.75	29.99
OS_HIMOTION16_9_30_360p_1_QP26_LTR	37.73	2528.18	38.50	188.18	38.40
OS_HIMOTION16_9_30_360p_1_QP30_LTR	34.54	1539.44	35.40	131.14	35.32
OS_HIMOTION16_9_30_360p_1_QP34_LTR	31.51	878.09	32.45	87.88	32.46
OS_HIMOTION16_9_30_360p_1_QP38_LTR	28.45	441.06	29.42	55.03	29.57
OS_HIMOTION16_9_15_270p_1_QP26_LTR	37.44	874.83	38.18	108.73	38.12
OS_HIMOTION16_9_15_270p_1_QP30_LTR	34.23	555.13	35.04	75.60	34.97
OS_HIMOTION16_9_15_270p_1_QP34_LTR	31.19	329.88	32.04	50.58	32.06
OS_HIMOTION16_9_15_270p_1_QP38_LTR	28.10	172.60	29.03	31.44	29.16
OS_HIMOTION16_9_15_240p_1_QP26_LTR	37.13	772.34	37.84	91.78	37.82
OS_HIMOTION16_9_15_240p_1_QP30_LTR	33.88	494.16	34.64	63.99	34.61
OS_HIMOTION16_9_15_240p_1_QP34_LTR	30.82	295.27	31.65	42.89	31.66
OS_HIMOTION16_9_15_240p_1_QP38_LTR	27.73	151.34	28.59	26.36	28.74
OS_HIMOTION16_9_15_180p_1_QP26_LTR	36.91	465.20	37.59	56.24	37.57
OS_HIMOTION16_9_15_180p_1_QP30_LTR	33.65	297.33	34.38	39.26	34.35
OS_HIMOTION16_9_15_180p_1_QP34_LTR	30.59	176.76	31.34	26.40	31.35
OS_HIMOTION16_9_15_180p_1_QP38_LTR	27.60	92.58	28.39	16.21	28.48
OS_HIMOTION4_3_30_VGA_1_QP26_LTR	38.31	2151.94	39.46	157.43	39.52
OS_HIMOTION4_3_30_VGA_1_QP30_LTR	35.36	1246.63	36.74	101.42	36.82
OS_HIMOTION4_3_30_VGA_1_QP34_LTR	32.66	699.91	34.17	63.60	34.28
OS_HIMOTION4_3_30_VGA_1_QP38_LTR	30.10	376.79	31.59	38.19	31.73
OS_HIMOTION4_3_15_424x320_1_QP26_LTR	38.83	522.07	39.49	65.85	39.45
OS_HIMOTION4_3_15_424x320_1_QP30_LTR	36.10	325.74	36.83	43.35	36.80
OS_HIMOTION4_3_15_424x320_1_QP34_LTR	33.62	202.90	34.26	28.33	34.26
OS_HIMOTION4_3_15_424x320_1_QP38_LTR	31.05	123.86	31.62	17.94	31.67
OS_HIMOTION4_3_15_QVGA_1_QP26_LTR	38.39	332.80	38.93	42.64	38.87
OS_HIMOTION4_3_15_QVGA_1_QP30_LTR	35.61	212.00	36.14	28.48	36.11
OS_HIMOTION4_3_15_QVGA_1_QP34_LTR	33.11	134.20	33.55	18.72	33.56
OS_HIMOTION4_3_15_QVGA_1_QP38_LTR	30.35	82.46	30.76	12.18	30.84
OS_HIMOTION4_3_15_212x160_1_QP26_LTR	37.69	179.02	38.07	23.24	37.99
OS_HIMOTION4_3_15_212x160_1_QP30_LTR	34.79	115.80	35.17	15.80	35.11
OS_HIMOTION4_3_15_212x160_1_QP34_LTR	32.02	73.60	32.41	10.57	32.39
OS_HIMOTION4_3_15_212x160_1_QP38_LTR	29.11	44.95	29.55	6.70	29.58
OS_LOWMOTION16_9_30_720p_1_QP26_LTR	39.56	3559.75	39.89	283.28	39.78

Microsoft Skype for Business H.264 Video Encoder Specification

OS_LOWMOTION16_9_30_720p_1_QP30_LTR	36.72	1509.81	37.09	167.17	37.01
OS_LOWMOTION16_9_30_720p_1_QP34_LTR	34.02	615.48	34.44	94.86	34.37
OS_LOWMOTION16_9_30_720p_1_QP38_LTR	31.26	271.61	31.73	50.21	31.65
OS_LOWMOTION16_9_30_360p_1_QP26_LTR	38.67	1173.66	38.97	97.99	38.87
OS_LOWMOTION16_9_30_360p_1_QP30_LTR	35.59	588.45	35.86	57.92	35.87
OS_LOWMOTION16_9_30_360p_1_QP34_LTR	32.74	251.32	33.05	30.96	33.08
OS_LOWMOTION16_9_30_360p_1_QP38_LTR	30.06	91.52	30.41	14.63	30.45
OS_LOWMOTION16_9_15_240p_1_QP26_LTR	38.40	207.80	38.67	35.11	38.60
OS_LOWMOTION16_9_15_240p_1_QP30_LTR	35.43	97.59	35.71	19.86	35.68
OS_LOWMOTION16_9_15_240p_1_QP34_LTR	32.81	45.66	33.09	11.06	33.07
OS_LOWMOTION16_9_15_240p_1_QP38_LTR	30.28	22.29	30.51	6.08	30.51
OS_LOWMOTION16_9_15_180p_1_QP26_LTR	38.33	96.99	38.64	19.35	38.53
OS_LOWMOTION16_9_15_180p_1_QP30_LTR	35.49	49.86	35.75	11.48	35.69
OS_LOWMOTION16_9_15_180p_1_QP34_LTR	32.85	26.82	33.09	6.93	33.03
OS_LOWMOTION16_9_15_180p_1_QP38_LTR	30.11	14.67	30.36	4.00	30.30
OS_HANDHELD3_4_30_480x640_1_QP26_LTR	40.54	842.16	41.66	93.30	41.42
OS_HANDHELD3_4_30_480x640_1_QP30_LTR	38.25	440.32	39.49	55.48	39.27
OS_HANDHELD3_4_30_480x640_1_QP34_LTR	36.08	253.56	37.44	34.50	37.24
OS_HANDHELD3_4_30_480x640_1_QP38_LTR	33.74	165.04	35.21	22.32	35.04
OS_HANDHELD3_4_15_320x424_1_QP26_LTR	39.80	292.57	40.90	48.16	40.69
OS_HANDHELD3_4_15_320x424_1_QP30_LTR	37.43	166.73	38.65	29.96	38.46
OS_HANDHELD3_4_15_320x424_1_QP34_LTR	35.05	101.57	36.38	19.27	36.18
OS_HANDHELD3_4_15_320x424_1_QP38_LTR	32.48	64.49	33.91	12.29	33.75
OS_HANDHELD3_4_15_240x320_1_QP26_LTR	39.20	167.21	40.27	29.12	40.03
OS_HANDHELD3_4_15_240x320_1_QP30_LTR	36.71	96.42	37.89	18.63	37.64
OS_HANDHELD3_4_15_240x320_1_QP34_LTR	34.20	58.95	35.51	11.95	35.29
OS_HANDHELD3_4_15_240x320_1_QP38_LTR	31.57	37.38	32.94	7.68	32.76
OS_HANDHELD3_4_15_160x212_1_QP26_LTR	38.43	103.43	39.48	16.90	39.30
OS_HANDHELD3_4_15_160x212_1_QP30_LTR	35.73	60.03	36.88	10.92	36.68
OS_HANDHELD3_4_15_160x212_1_QP34_LTR	33.21	35.65	34.41	6.88	34.23
OS_HANDHELD3_4_15_160x212_1_QP38_LTR	30.50	21.94	31.82	4.19	31.58
OS_HANDHELD9_16_30_540x960_1_QP26_LTR	37.83	2259.10	38.76	250.10	38.12
OS_HANDHELD9_16_30_540x960_1_QP30_LTR	35.59	1011.45	36.68	135.31	35.99
OS_HANDHELD9_16_30_540x960_1_QP34_LTR	33.57	518.18	34.72	78.60	34.09
OS_HANDHELD9_16_30_540x960_1_QP38_LTR	31.48	299.43	32.66	45.35	32.10
OS_HANDHELD9_16_30_480x848_1_QP26_LTR	37.64	1851.93	38.53	201.92	38.07
OS_HANDHELD9_16_30_480x848_1_QP30_LTR	35.30	822.91	36.36	109.97	35.85
OS_HANDHELD9_16_30_480x848_1_QP34_LTR	33.23	417.64	34.36	63.38	33.87

Microsoft Skype for Business H.264 Video Encoder Specification

OS_HANDHELD9_16_30_480x848_1_QP38_LTR	31.07	243.10	32.23	37.88	31.76
OS_HANDHELD9_16_30_360x640_1_QP26_LTR	37.06	1562.10	37.85	143.15	37.48
OS_HANDHELD9_16_30_360x640_1_QP30_LTR	34.44	671.72	35.43	79.54	35.07
OS_HANDHELD9_16_30_360x640_1_QP34_LTR	32.18	310.80	33.29	44.77	32.93
OS_HANDHELD9_16_30_360x640_1_QP38_LTR	30.00	168.13	31.20	25.69	30.79
OS_HANDHELD9_16_15_270x480_1_QP26_LTR	37.94	385.35	38.58	66.71	38.44
OS_HANDHELD9_16_15_270x480_1_QP30_LTR	35.24	203.39	36.03	41.29	35.91
OS_HANDHELD9_16_15_270x480_1_QP34_LTR	32.81	114.66	33.69	25.29	33.52
OS_HANDHELD9_16_15_270x480_1_QP38_LTR	30.41	69.94	31.30	15.62	31.07
OS_HANDHELD9_16_15_240x424_1_QP26_LTR	38.03	318.45	38.68	54.74	38.57
OS_HANDHELD9_16_15_240x424_1_QP30_LTR	35.35	173.57	36.10	34.07	36.00
OS_HANDHELD9_16_15_240x424_1_QP34_LTR	32.95	100.67	33.76	21.37	33.60
OS_HANDHELD9_16_15_240x424_1_QP38_LTR	30.56	61.02	31.38	13.14	31.15
OS_HANDHELD9_16_15_180x320_1_QP26_LTR	37.56	238.57	38.06	38.60	37.97
OS_HANDHELD9_16_15_180x320_1_QP30_LTR	34.57	123.76	35.31	24.07	35.25
OS_HANDHELD9_16_15_180x320_1_QP34_LTR	32.12	68.70	32.89	14.85	32.78
OS_HANDHELD9_16_15_180x320_1_QP38_LTR	29.82	40.91	30.52	9.02	30.32
OS_LOWLIGHT16_9_15_720p_1_QP26_LTR	40.03	4487.80	40.48	393.91	40.63
OS_LOWLIGHT16_9_15_720p_1_QP30_LTR	38.02	1670.11	38.63	174.62	38.75
OS_LOWLIGHT16_9_15_720p_1_QP34_LTR	36.21	521.80	37.09	75.79	37.13
OS_LOWLIGHT16_9_15_720p_1_QP38_LTR	34.32	215.60	35.43	38.13	35.42
OS_LOWLIGHT16_9_15_360p_1_QP26_LTR	38.19	1001.28	38.81	105.65	38.81
OS_LOWLIGHT16_9_15_360p_1_QP30_LTR	36.18	295.43	36.96	45.28	36.92
OS_LOWLIGHT16_9_15_360p_1_QP34_LTR	34.22	120.21	35.16	23.50	35.10
OS_LOWLIGHT16_9_15_360p_1_QP38_LTR	31.98	65.59	33.06	13.60	33.03
OS_LOWLIGHT16_9_15_240p_1_QP26_LTR	38.55	196.19	39.44	32.72	39.29
OS_LOWLIGHT16_9_15_240p_1_QP30_LTR	36.23	96.49	37.25	19.28	37.12
OS_LOWLIGHT16_9_15_240p_1_QP34_LTR	33.80	55.81	34.89	11.89	34.81
OS_LOWLIGHT16_9_15_240p_1_QP38_LTR	31.19	33.22	32.34	7.18	32.32
OS_LOWLIGHT16_9_15_180p_1_QP26_LTR	37.75	152.45	38.62	24.36	38.50
OS_LOWLIGHT16_9_15_180p_1_QP30_LTR	35.21	75.48	36.19	14.30	36.06
OS_LOWLIGHT16_9_15_180p_1_QP34_LTR	32.73	42.31	33.75	8.76	33.68
OS_LOWLIGHT16_9_15_180p_1_QP38_LTR	30.02	24.44	31.17	5.21	31.15
OS_2PEOPLE16_9_30_720p_1_QP26_LTR	41.30	1362.10	41.96	168.04	41.88
OS_2PEOPLE16_9_30_720p_1_QP30_LTR	39.17	683.86	39.89	99.54	39.83
OS_2PEOPLE16_9_30_720p_1_QP34_LTR	37.20	387.62	37.84	61.63	37.82
OS_2PEOPLE16_9_30_720p_1_QP38_LTR	35.04	238.99	35.57	38.82	35.61
OS_2PEOPLE16_9_30_360p_1_QP26_LTR	40.28	451.07	40.82	59.47	40.68

OS_2PEOPLE16_9_30_360p_1_QP30_LTR	37.85	239.55	38.29	36.59	38.18
OS_2PEOPLE16_9_30_360p_1_QP34_LTR	35.43	136.68	35.82	22.57	35.80
OS_2PEOPLE16_9_30_360p_1_QP38_LTR	32.89	81.04	33.26	13.72	33.31
OS_2PEOPLE16_9_15_240p_1_QP26_LTR	39.70	165.56	40.05	31.71	39.95
OS_2PEOPLE16_9_15_240p_1_QP30_LTR	36.98	93.22	37.29	19.63	37.23
OS_2PEOPLE16_9_15_240p_1_QP34_LTR	34.39	54.12	34.73	12.14	34.71
OS_2PEOPLE16_9_15_240p_1_QP38_LTR	31.76	31.24	32.14	7.22	32.18
OS_2PEOPLE16_9_15_180p_1_QP26_LTR	39.26	110.96	39.60	21.44	39.48
OS_2PEOPLE16_9_15_180p_1_QP30_LTR	36.39	63.33	36.74	13.28	36.66
OS_2PEOPLE16_9_15_180p_1_QP34_LTR	33.73	36.81	34.09	8.24	34.08
OS_2PEOPLE16_9_15_180p_1_QP38_LTR	31.04	21.11	31.42	4.83	31.45
OS_PANO20_3_15_1920x288_1_QP26_LTR	40.52	637.17	40.78	105.11	40.68
OS_PANO20_3_15_1920x288_1_QP30_LTR	38.09	341.91	38.39	66.58	38.30
OS_PANO20_3_15_1920x288_1_QP34_LTR	35.60	193.04	35.94	42.05	35.88
OS_PANO20_3_15_1920x288_1_QP38_LTR	33.01	109.42	33.39	25.55	33.38
OS_PANO20_3_15_1280x192_1_QP26_LTR	39.49	370.14	39.73	62.36	39.64
OS_PANO20_3_15_1280x192_1_QP30_LTR	36.80	204.25	37.10	40.05	37.04
OS_PANO20_3_15_1280x192_1_QP34_LTR	34.23	114.05	34.53	25.20	34.51
OS_PANO20_3_15_1280x192_1_QP38_LTR	31.42	61.73	31.80	14.88	31.81
OS_PANO20_3_15_960x144_1_QP26_LTR	38.73	265.69	38.98	43.66	38.91
OS_PANO20_3_15_960x144_1_QP30_LTR	35.91	149.45	36.22	28.13	36.19
OS_PANO20_3_15_960x144_1_QP34_LTR	33.18	82.24	33.52	17.51	33.51
OS_PANO20_3_15_960x144_1_QP38_LTR	30.39	42.44	30.74	10.19	30.77

Table 46: Premium Logo Requirement Set for UCConfig Mode 0 (Constant Rate Control, Single Stream)

Test Bitstream	PSNR
OS_HIMOTION16_9_30_1080p_1_RC500ms2500Kbps	32.80
OS_HIMOTION16_9_30_1080p_1_RC1000ms2500Kbps	33.76
OS_HIMOTION16_9_30_720p_1_RC500ms1200Kbps	29.55
OS_HIMOTION16_9_30_720p_1_RC1000ms1200Kbps	30.21
OS_HIMOTION16_9_30_360p_1_RC500ms500Kbps	28.43
OS_HIMOTION16_9_30_360p_1_RC1000ms500Kbps	28.82
OS_HIMOTION16_9_15_240p_1_RC500ms250Kbps	31.15
OS_HIMOTION16_9_15_240p_1_RC1000ms250Kbps	31.22
OS_HIMOTION16_9_15_180p_1_RC500ms150Kbps	30.88
OS_HIMOTION16_9_15_180p_1_RC1000ms150Kbps	31.03
OS_HANDHELD3_4_30_480x640_1_RC500ms500Kbps	40.29
OS_HANDHELD3_4_30_480x640_1_RC1000ms500Kbps	40.28
OS_HANDHELD3_4_15_240x320_1_RC500ms250Kbps	41.66

OS_HANDHELD3_4_15_240x320_1_RC1000ms250Kbps	41.70
---	-------

Table 47: Premium Logo Requirement Set for UCConfig Mode 0 (Constant QP, Simulcast Streams)

Test Bitstream	Min PSNR	R-D Curve Samples	
		Kbps	PSNR
OMM_HIMOTION16_9_30_720p_1_QP26	38.99	6153.72	39.73
OMM_HIMOTION16_9_30_720p_1_QP30	36.22	3427.15	37.04
OMM_HIMOTION16_9_30_720p_1_QP34	33.46	1884.24	34.36
OMM_HIMOTION16_9_30_720p_1_QP38	30.59	1015.72	31.58
OMM_HIMOTION16_9_15_180p_1_QP30	33.62	280.76	34.31
OMM_HIMOTION16_9_15_180p_1_QP34	30.52	164.03	31.30
OMM_HIMOTION16_9_15_180p_1_QP38	27.49	83.77	28.27
OMM_HIMOTION16_9_15_180p_1_QP42	24.95	45.19	25.78
OMM_HANDHELD3_4_30_480x640_1_QP26	40.54	792.96	41.64
OMM_HANDHELD3_4_30_480x640_1_QP30	38.29	408.84	39.47
OMM_HANDHELD3_4_30_480x640_1_QP34	36.11	232.96	37.44
OMM_HANDHELD3_4_30_480x640_1_QP38	33.77	151.98	35.19
OMM_HANDHELD3_4_15_240x320_1_QP30	36.75	86.76	37.91
OMM_HANDHELD3_4_15_240x320_1_QP34	34.21	52.36	35.53
OMM_HANDHELD3_4_15_240x320_1_QP38	31.63	33.31	32.99
OMM_HANDHELD3_4_15_240x320_1_QP42	29.26	23.24	30.68

It should be noted that the column TID in Table 36 refers to the value of H.264 syntax element temporal_id associated with the highest temporal layer in the bitstream (or sub-bitstream).

Table 48: Premium Logo Requirement Set for UCConfig Mode 1 (Constant QP, Single Stream)

Test bitstream	TID	Min PSNR	R-D Curve Samples	
			Kbps	PSNR
1S_HIMOTION16_9_30_720p_2_QP[26,29]	0	38.90	3626.21	39.63
	1	37.65	5044.87	39.04
1S_HIMOTION16_9_30_720p_2_QP[30,33]	0	36.16	2099.05	36.95
	1	35.12	2787.70	36.46
1S_HIMOTION16_9_30_720p_2_QP[34,37]	0	33.42	1192.71	34.30
	1	32.65	1555.98	33.91
1S_HIMOTION16_9_30_720p_2_QP[38,41]	0	30.61	653.46	31.54
	1	30.05	848.69	31.23
1S_HIMOTION16_9_30_360p_2_QP[26,29]	0	37.71	1371.43	38.43
	1	36.27	1988.75	37.76

Microsoft Skype for Business H.264 Video Encoder Specification

1S_HIMOTION16_9_30_360p_2_QP[30,33]	0	34.51	849.19	35.32
	1	33.21	1166.20	34.71
1S_HIMOTION16_9_30_360p_2_QP[34,37]	0	31.49	496.20	32.39
	1	30.41	642.03	31.85
1S_HIMOTION16_9_30_360p_2_QP[38,41]	0	28.38	257.63	29.35
	1	27.70	323.66	28.99
1S_HIMOTION16_9_15_240p_2_QP[26,29]	0	37.14	415.50	37.78
	1	35.50	625.61	37.04
1S_HIMOTION16_9_15_240p_2_QP[30,33]	0	33.87	270.22	34.57
	1	32.40	388.81	33.89
1S_HIMOTION16_9_15_240p_2_QP[34,37]	0	30.80	165.41	31.58
	1	29.45	223.75	30.96
1S_HIMOTION16_9_15_240p_2_QP[38,41]	0	27.69	88.06	28.56
	1	26.71	113.31	28.10
1S_LOWMOTION16_9_30_720p_2_QP[26,29]	0	39.66	1780.15	39.89
	1	38.25	2259.44	39.29
1S_LOWMOTION16_9_30_720p_2_QP[30,33]	0	36.83	766.62	37.10
	1	35.76	892.01	36.73
1S_LOWMOTION16_9_30_720p_2_QP[34,37]	0	34.05	316.22	34.42
	1	33.44	368.17	34.25
1S_LOWMOTION16_9_30_720p_2_QP[38,41]	0	31.27	139.32	31.73
	1	31.00	171.52	31.64
1S_LOWMOTION16_9_30_360p_2_QP[26,29]	0	38.78	592.30	39.02
	1	37.25	776.17	38.48
1S_LOWMOTION16_9_30_360p_2_QP[30,33]	0	35.66	297.07	35.92
	1	34.46	365.04	35.55
1S_LOWMOTION16_9_30_360p_2_QP[34,37]	0	32.80	127.74	33.11
	1	32.08	152.59	32.91
1S_LOWMOTION16_9_30_360p_2_QP[38,41]	0	30.16	48.03	30.45
	1	29.92	59.86	30.36
1S_LOWMOTION16_9_15_240p_2_QP[26,29]	0	38.53	109.81	38.75
	1	37.23	139.53	38.35
1S_LOWMOTION16_9_15_240p_2_QP[30,33]	0	35.57	52.16	35.79
	1	34.68	64.34	35.54
1S_LOWMOTION16_9_15_240p_2_QP[34,37]	0	32.93	24.93	33.17
	1	32.45	31.07	33.03
1S_LOWMOTION16_9_15_240p_2_QP[38,41]	0	30.35	12.69	30.55
	1	30.06	16.42	30.46

Microsoft Skype for Business H.264 Video Encoder Specification

1S_LOWLIGHT16_9_15_720p_2_QP[26,29]	0	40.09	1984.48	40.50
	1	38.65	2740.14	39.85
1S_LOWLIGHT16_9_15_720p_2_QP[30,33]	0	38.11	703.03	38.68
	1	37.05	901.56	38.29
1S_LOWLIGHT16_9_15_720p_2_QP[34,37]	0	36.37	225.03	37.16
	1	35.67	308.65	36.97
1S_LOWLIGHT16_9_15_720p_2_QP[38,41]	0	34.38	97.90	35.50
	1	33.88	142.17	35.35
1S_LOWLIGHT16_9_15_360p_2_QP[26,29]	0	38.26	460.49	38.83
	1	37.04	588.90	38.37
1S_LOWLIGHT16_9_15_360p_2_QP[30,33]	0	36.29	141.26	37.03
	1	35.49	181.33	36.79
1S_LOWLIGHT16_9_15_360p_2_QP[34,37]	0	34.35	60.09	35.24
	1	33.75	81.90	35.07
1S_LOWLIGHT16_9_15_360p_2_QP[38,41]	0	32.11	33.02	33.13
	1	31.51	45.92	32.97
1S_LOWLIGHT16_9_15_240p_2_QP[26,29]	0	38.57	98.83	39.51
	1	37.75	131.41	39.27
1S_LOWLIGHT16_9_15_240p_2_QP[30,33]	0	36.25	49.78	37.23
	1	35.50	67.43	37.03
1S_LOWLIGHT16_9_15_240p_2_QP[34,37]	0	33.88	29.28	34.94
	1	33.23	40.33	34.76
1S_LOWLIGHT16_9_15_240p_2_QP[38,41]	0	31.36	17.79	32.41
	1	30.76	24.67	32.24
1S_2PEOPLE16_9_30_720p_2_QP[26,29]	0	41.21	730.79	41.91
	1	40.80	928.59	41.66
1S_2PEOPLE16_9_30_720p_2_QP[30,33]	0	39.07	377.19	39.81
	1	38.80	479.59	39.61
1S_2PEOPLE16_9_30_720p_2_QP[34,37]	0	37.07	214.74	37.75
	1	36.83	280.39	37.57
1S_2PEOPLE16_9_30_720p_2_QP[38,41]	0	34.95	128.94	35.47
	1	34.67	171.37	35.31
1S_2PEOPLE16_9_30_360p_2_QP[26,29]	0	40.24	256.46	40.81
	1	39.74	324.96	40.54
1S_2PEOPLE16_9_30_360p_2_QP[30,33]	0	37.78	138.63	38.28
	1	37.42	174.14	38.07
1S_2PEOPLE16_9_30_360p_2_QP[34,37]	0	35.31	79.77	35.77
	1	35.01	101.67	35.60

Microsoft Skype for Business H.264 Video Encoder Specification

1S_2PEOPLE16_9_30_360p_2_QP[38,41]	0	32.95	46.91	33.28
	1	32.55	60.19	33.12
1S_2PEOPLE16_9_15_240p_2_QP[26,29]	0	39.70	95.20	40.05
	1	38.92	124.86	39.69
1S_2PEOPLE16_9_15_240p_2_QP[30,33]	0	37.01	54.38	37.33
	1	36.34	70.60	37.05
1S_2PEOPLE16_9_15_240p_2_QP[34,37]	0	34.33	31.68	34.66
	1	33.81	41.41	34.44
1S_2PEOPLE16_9_15_240p_2_QP[38,41]	0	31.75	18.23	32.12
	1	31.25	23.96	31.93
1S_HIMOTION4_3_30_VGA_1_QP[26,29]	0	38.30	1362.93	39.43
	1	37.13	1931.05	38.83
1S_HIMOTION4_3_30_VGA_1_QP[30,33]	0	35.35	817.27	36.70
	1	34.46	1118.46	36.20
1S_HIMOTION4_3_30_VGA_1_QP[34,37]	0	32.62	472.41	34.13
	1	32.08	635.16	33.73
1S_HIMOTION4_3_30_VGA_1_QP[38,41]	0	30.08	258.73	31.54
	1	29.67	348.35	31.23
1S_HIMOTION4_3_15_QVGA_1_QP[26,29]	0	38.34	210.97	38.83
	1	37.41	308.75	38.35
1S_HIMOTION4_3_15_QVGA_1_QP[30,33]	0	35.57	137.15	36.02
	1	34.81	197.99	35.61
1S_HIMOTION4_3_15_QVGA_1_QP[34,37]	0	32.98	88.33	33.38
	1	32.25	126.50	33.01
1S_HIMOTION4_3_15_QVGA_1_QP[38,41]	0	30.18	54.78	30.61
	1	29.49	77.60	30.27
1S_HANDHELD3_4_30_480x640_1_QP[26,29]	0	40.38	554.39	41.50
	1	39.74	710.95	41.10
1S_HANDHELD3_4_30_480X640_1_QP[30,33]	0	38.18	290.71	39.40
	1	37.65	375.23	39.08
1S_HANDHELD3_4_30_480X640_1_QP[34,37]	0	36.05	166.58	37.38
	1	35.56	224.56	37.10
1S_HANDHELD3_4_30_480X640_1_QP[38,41]	0	33.73	107.36	35.17
	1	33.22	149.72	34.89
1S_HANDHELD3_4_15_240x320_1_QP[26,29]	0	39.17	105.15	40.22
	1	38.19	140.98	39.76
1S_HANDHELD3_4_15_240x320_1_QP[30,33]	0	36.69	61.43	37.86
	1	35.88	82.45	37.48

Microsoft Skype for Business H.264 Video Encoder Specification

1S_HANDHELD3_4_15_240x320_1_QP[34,37]	0	34.18	37.99	35.46
	1	33.55	52.16	35.15
1S_HANDHELD3_4_15_240x320_1_QP[38,41]	0	31.52	24.22	32.91
	1	31.04	34.20	32.62
1S_HANDHELD9_16_30_540x960_2_QP[26,29]	0	37.68	1281.46	38.69
	1	37.01	1616.85	38.27
1S_HANDHELD9_16_30_540x960_2_QP[30,33]	0	35.45	558.56	36.61
	1	35.20	709.21	36.35
1S_HANDHELD9_16_30_540x960_2_QP[34,37]	0	33.44	277.69	34.68
	1	33.36	365.73	34.49
1S_HANDHELD9_16_30_540x960_2_QP[38,41]	0	31.41	157.41	32.61
	1	31.33	217.31	32.44
1S_HANDHELD9_16_30_360x640_2_QP[26,29]	0	37.02	823.11	37.82
	1	35.74	1055.76	37.23
1S_HANDHELD9_16_30_360x640_2_QP[30,33]	0	34.44	364.17	35.41
	1	33.82	456.99	35.07
1S_HANDHELD9_16_30_360x640_2_QP[34,37]	0	32.14	171.27	33.25
	1	31.96	223.91	33.05
1S_HANDHELD9_16_30_360x640_2_QP[38,41]	0	29.95	92.33	31.15
	1	29.84	126.32	30.99
1S_HANDHELD9_16_15_240x424_2_QP[26,29]	0	38.06	171.07	38.67
	1	36.95	226.62	38.19
1S_HANDHELD9_16_15_240x424_2_QP[30,33]	0	35.38	94.32	36.09
	1	34.75	125.97	35.77
1S_HANDHELD9_16_15_240x424_2_QP[34,37]	0	32.97	55.03	33.74
	1	32.65	75.31	33.50
1S_HANDHELD9_16_15_240x424_2_QP[38,41]	0	30.55	33.01	31.41
	1	30.23	46.42	31.18

Note: the reference corresponding to the enhancement layer refers to the sub-bitstream that consists of the enhancement layer and all its dependent layers.

Table 49: Premium Logo Requirement Set for UCConfig Mode 1 (Constant QP, Single Stream) (Windows 8.1 only)

Test bitstream	R-D Curve Samples		LTR Frame Only R-D	
	TID	Min PSNR	Kbps	PSNR
1S_HIMOTION16_9_30_720p_2_QP[26,29]_LTR	0	38.78	3859.17	39.60
	1	37.59	5278.41	39.01

Microsoft Skype for Business H.264 Video Encoder Specification

1S_HIMOTION16_9_30_720p_2_QP[30,33]_LTR	0	36.03	2266.93	36.93	335.07	36.89
	1	35.03	2953.69	36.44	-	-
1S_HIMOTION16_9_30_720p_2_QP[34,37]_LTR	0	33.36	1311.44	34.32	219.57	34.30
	1	32.60	1673.29	33.93	-	-
1S_HIMOTION16_9_30_720p_2_QP[38,41]_LTR	0	30.58	730.19	31.58	136.12	31.59
	1	30.03	924.63	31.28	-	-
1S_HIMOTION16_9_30_360p_2_QP[26,29]_LTR	0	37.65	1446.23	38.42	179.05	38.39
	1	36.22	2063.57	37.75	-	-
1S_HIMOTION16_9_30_360p_2_QP[30,33]_LTR	0	34.49	904.76	35.35	123.16	35.30
	1	33.21	1220.88	34.73	-	-
1S_HIMOTION16_9_30_360p_2_QP[34,37]_LTR	0	31.52	536.18	32.43	81.66	32.44
	1	30.38	681.60	31.89	-	-
1S_HIMOTION16_9_30_360p_2_QP[38,41]_LTR	0	28.45	284.48	29.42	49.85	29.55
	1	27.72	350.18	29.06	-	-
1S_HIMOTION16_9_15_240p_2_QP[26,29]_LTR	0	37.08	443.57	37.74	89.58	37.75
	1	35.48	653.85	37.00	-	-
1S_HIMOTION16_9_15_240p_2_QP[30,33]_LTR	0	33.88	291.17	34.57	61.96	34.57
	1	32.41	409.67	33.90	-	-
1S_HIMOTION16_9_15_240p_2_QP[34,37]_LTR	0	30.85	180.98	31.58	41.12	31.61
	1	29.47	239.15	30.95	-	-
1S_HIMOTION16_9_15_240p_2_QP[38,41]_LTR	0	27.82	98.78	28.58	24.66	28.68
	1	26.75	123.98	28.11	-	-
1S_LOWMOTION16_9_30_720p_2_QP[26,29]_LTR	0	39.54	1926.12	39.84	261.57	39.78
	1	38.16	2410.80	39.25	-	-
1S_LOWMOTION16_9_30_720p_2_QP[30,33]_LTR	0	36.69	872.66	37.05	150.52	37.01
	1	35.66	1001.27	36.68	-	-
1S_LOWMOTION16_9_30_720p_2_QP[34,37]_LTR	0	33.97	383.68	34.39	84.51	34.36
	1	33.38	436.05	34.21	-	-
1S_LOWMOTION16_9_30_720p_2_QP[38,41]_LTR	0	31.20	177.04	31.70	43.50	31.66
	1	30.96	209.63	31.60	-	-
1S_LOWMOTION16_9_30_360p_2_QP[26,29]_LTR	0	38.65	639.33	38.93	88.06	38.87
	1	37.21	823.12	38.40	-	-
1S_LOWMOTION16_9_30_360p_2_QP[30,33]_LTR	0	35.58	328.02	35.83	51.17	35.86
	1	34.41	396.38	35.46	-	-

Microsoft Skype for Business H.264 Video Encoder Specification

1S_LOWMOTION16_9_30_360p_2_QP[34,37]_LTR	0	32.78	146.39	33.05	26.76	33.10
	1	32.05	171.29	32.85	-	-
1S_LOWMOTION16_9_30_360p_2_QP[38,41]_LTR	0	30.04	57.81	30.39	12.63	30.45
	1	29.86	69.78	30.30	-	-
1S_LOWMOTION16_9_15_240p_2_QP[26,29]_LTR	0	38.37	126.49	38.63	33.15	38.59
	1	37.19	156.32	38.23	-	-
1S_LOWMOTION16_9_15_240p_2_QP[30,33]_LTR	0	35.41	62.74	35.67	18.57	35.66
	1	34.64	75.02	35.43	-	-
1S_LOWMOTION16_9_15_240p_2_QP[34,37]_LTR	0	32.77	31.16	33.05	10.30	33.04
	1	32.39	37.32	32.91	-	-
1S_LOWMOTION16_9_15_240p_2_QP[38,41]_LTR	0	30.24	16.21	30.51	5.67	30.51
	1	30.04	19.96	30.42	-	-
1S_LOWLIGHT16_9_15_720p_2_QP[26,29]_LTR	0	40.08	2048.56	40.50	339.09	40.64
	1	38.63	2806.70	39.83	-	-
1S_LOWLIGHT16_9_15_720p_2_QP[30,33]_LTR	0	38.08	752.25	38.63	142.74	38.75
	1	37.02	951.48	38.23	-	-
1S_LOWLIGHT16_9_15_720p_2_QP[34,37]_LTR	0	36.34	256.69	37.07	60.31	37.14
	1	35.66	341.55	36.87	-	-
1S_LOWLIGHT16_9_15_720p_2_QP[38,41]_LTR	0	34.49	113.95	35.43	29.62	35.45
	1	33.96	158.89	35.27	-	-
1S_LOWLIGHT16_9_15_360p_2_QP[26,29]_LTR	0	38.22	490.91	38.78	92.49	38.80
	1	36.97	619.96	38.31	-	-
1S_LOWLIGHT16_9_15_360p_2_QP[30,33]_LTR	0	36.18	161.87	36.90	38.76	36.90
	1	35.40	202.25	36.66	-	-
1S_LOWLIGHT16_9_15_360p_2_QP[34,37]_LTR	0	34.34	71.41	35.13	19.51	35.11
	1	33.72	93.23	34.95	-	-
1S_LOWLIGHT16_9_15_360p_2_QP[38,41]_LTR	0	32.15	39.13	33.05	11.01	33.05
	1	31.55	52.22	32.90	-	-
1S_LOWLIGHT16_9_15_240p_2_QP[26,29]_LTR	0	38.54	112.07	39.37	27.26	39.30
	1	37.73	144.69	39.14	-	-
1S_LOWLIGHT16_9_15_240p_2_QP[30,33]_LTR	0	36.23	58.18	37.15	15.58	37.07
	1	35.49	75.84	36.96	-	-
1S_LOWLIGHT16_9_15_240p_2_QP[34,37]_LTR	0	33.86	34.03	34.88	9.45	34.84
	1	33.25	45.12	34.70	-	-
1S_LOWLIGHT16_9_15_240p_2_QP[38,41]_LTR	0	31.44	20.54	32.44	5.68	32.44

Microsoft Skype for Business H.264 Video Encoder Specification

	1	30.75	27.39	32.27	-	-
1S_2PEOPLE16_9_30_720p_2_QP[26,29]_LTR	0	41.19	831.34	41.87	150.99	41.85
	1	40.78	1028.64	41.61	-	-
1S_2PEOPLE16_9_30_720p_2_QP[30,33]_LTR	0	39.03	435.97	39.78	87.03	39.77
	1	38.76	537.90	39.58	-	-
1S_2PEOPLE16_9_30_720p_2_QP[34,37]_LTR	0	37.06	249.89	37.74	51.94	37.77
	1	36.82	315.63	37.57	-	-
1S_2PEOPLE16_9_30_720p_2_QP[38,41]_LTR	0	34.93	149.77	35.46	31.33	35.52
	1	34.66	192.21	35.30	-	-
1S_2PEOPLE16_9_30_360p_2_QP[26,29]_LTR	0	40.23	292.94	40.74	55.44	40.64
	1	39.74	361.04	40.47	-	-
1S_2PEOPLE16_9_30_360p_2_QP[30,33]_LTR	0	37.76	162.17	38.21	33.74	38.14
	1	37.37	197.66	38.00	-	-
1S_2PEOPLE16_9_30_360p_2_QP[34,37]_LTR	0	35.40	93.19	35.77	20.22	35.76
	1	35.08	115.03	35.60	-	-
1S_2PEOPLE16_9_30_360p_2_QP[38,41]_LTR	0	32.84	54.14	33.22	11.75	33.26
	1	32.52	67.37	33.07	-	-
1S_2PEOPLE16_9_15_240p_2_QP[26,29]_LTR	0	39.70	110.00	39.98	30.14	39.92
	1	38.88	139.47	39.63	-	-
1S_2PEOPLE16_9_15_240p_2_QP[30,33]_LTR	0	36.95	63.91	37.25	18.43	37.22
	1	36.27	80.03	36.98	-	-
1S_2PEOPLE16_9_15_240p_2_QP[34,37]_LTR	0	34.36	37.52	34.65	11.08	34.67
	1	33.80	47.13	34.44	-	-
1S_2PEOPLE16_9_15_240p_2_QP[38,41]_LTR	0	31.78	21.61	32.12	6.47	32.16
	1	31.27	27.44	31.93	-	-
1S_HIMOTION4_3_30_VGA_1_QP[26,29]_LTR	0	38.30	1424.45	39.44	158.43	39.53
	1	37.11	1991.49	38.82	-	-
1S_HIMOTION4_3_30_VGA_1_QP[30,33]_LTR	0	35.35	858.58	36.73	101.68	36.80
	1	34.47	1158.98	36.22	-	-
1S_HIMOTION4_3_30_VGA_1_QP[34,37]_LTR	0	32.62	499.77	34.20	63.75	34.28
	1	32.10	661.54	33.79	-	-
1S_HIMOTION4_3_30_VGA_1_QP[38,41]_LTR	0	30.10	276.34	31.62	38.24	31.73
	1	29.74	365.73	31.31	-	-
1S_HIMOTION4_3_15_QVGA_1_QP[26,29]_LTR	0	38.36	224.83	38.86	43.77	38.89
	1	37.43	322.27	38.37	-	-
1S_HIMOTION4_3_15_QVGA_1_QP[30,33]_LTR	0	35.59	146.89	36.12	29.33	36.16
	1	34.83	207.66	35.70	-	-
1S_HIMOTION4_3_15_QVGA_1_QP[34,37]_LTR	0	33.04	95.31	33.49	19.54	33.55

Microsoft Skype for Business H.264 Video Encoder Specification

	1	32.33	133.47	33.11	-	-
1S_HIMOTION4_3_15_QVGA_1_QP[38,41]_LTR	0	30.29	59.21	30.77	12.57	30.85
	1	29.60	81.99	30.42	-	-
1S_HANDHELD3_4_30_480x640_1_QP[26,29]_LTR	0	40.39	600.02	41.51	93.92	41.40
	1	39.71	757.00	41.10	-	-
1S_HANDHELD3_4_30_480X640_1_QP[30,33]_LTR	0	38.15	320.35	39.39	56.04	39.26
	1	37.63	404.94	39.07	-	-
1S_HANDHELD3_4_30_480X640_1_QP[34,37]_LTR	0	35.98	185.08	37.37	34.69	37.23
	1	35.54	242.85	37.09	-	-
1S_HANDHELD3_4_30_480X640_1_QP[38,41]_LTR	0	33.68	119.07	35.16	22.15	35.03
	1	33.20	161.04	34.88	-	-
1S_HANDHELD3_4_15_240x320_1_QP[26,29]_LTR	0	39.07	116.35	40.20	29.42	40.06
	1	38.20	152.20	39.75	-	-
1S_HANDHELD3_4_15_240x320_1_QP[30,33]_LTR	0	36.56	69.64	37.79	18.89	37.66
	1	35.84	90.51	37.43	-	-
1S_HANDHELD3_4_15_240x320_1_QP[34,37]_LTR	0	34.14	43.00	35.41	11.98	35.29
	1	33.56	56.98	35.10	-	-
1S_HANDHELD3_4_15_240x320_1_QP[38,41]_LTR	0	31.45	27.56	32.86	7.61	32.79
	1	31.00	37.48	32.57	-	-
1S_HANDHELD9_16_30_540x960_2_QP[26,29]_LTR	0	37.76	1376.25	38.69	227.50	38.14
	1	37.01	1713.77	38.26	-	-
1S_HANDHELD9_16_30_540x960_2_QP[30,33]_LTR	0	35.50	619.91	36.61	118.04	36.01
	1	35.19	771.60	36.35	-	-
1S_HANDHELD9_16_30_540x960_2_QP[34,37]_LTR	0	33.47	314.10	34.68	64.55	34.12
	1	33.36	402.89	34.49	-	-
1S_HANDHELD9_16_30_540x960_2_QP[38,41]_LTR	0	31.40	179.34	32.61	37.33	32.11
	1	31.33	239.51	32.44	-	-
1S_HANDHELD9_16_30_360x640_2_QP[26,29]_LTR	0	37.05	876.99	37.82	132.02	37.48
	1	35.74	1111.47	37.23	-	-
1S_HANDHELD9_16_30_360x640_2_QP[30,33]_LTR	0	34.45	399.58	35.42	72.30	35.10

	1	33.81	493.08	35.08	-	-
1S_ HANDHELD9_16_30_360x640_2_QP[34,37]_LTR	0	32.17	193.06	33.28	39.92	32.95
	1	31.97	245.64	33.08	-	-
1S_ HANDHELD9_16_30_360x640_2_QP[38,41]_LTR	0	29.98	105.63	31.18	22.38	30.82
	1	29.87	139.57	31.02	-	-
1S_HANDHELD9_16_15_240x424_2_QP[26,29]_LTR	0	38.06	193.49	38.66	51.41	38.59
	1	36.94	248.95	38.17	-	-
1S_HANDHELD9_16_15_240x424_2_QP[30,33]_LTR	0	35.38	108.94	36.07	31.58	36.01
	1	34.75	140.68	35.76	-	-
1S_ HANDHELD9_16_15_240x424_2_QP[34,37]_LTR	0	32.96	64.32	33.69	19.39	33.59
	1	32.61	84.60	33.45	-	-
1S_ HANDHELD9_16_15_240x424_2_QP[38,41]_LTR	0	30.55	38.83	31.32	11.40	31.17
	1	30.22	52.32	31.10	-	-

Table 50: Premium Logo Requirement Set for UCConfig Mode 1 (Constant Rate Control, Single Stream)

Test Bitstream	PSNR
1S_HIMOTION16_9_30_1080p_2_RC500ms[1500,2500]Kbps	22.29
1S_HIMOTION16_9_30_1080p_2_RC1000ms[1500,2500]Kbps	22.29
1S_HIMOTION16_9_30_720p_2_RC500ms[800,1200]Kbps	21.95
1S_HIMOTION16_9_30_720p_2_RC1000ms[800,1200]Kbps	21.95
1S_HIMOTION16_9_30_360p_2_RC500ms[300,500]Kbps	22.11
1S_HIMOTION16_9_30_360p_2_RC1000ms[300,500]Kbps	22.11
1S_HIMOTION16_9_15_240p_2_RC500ms[180,250]Kbps	24.20
1S_HIMOTION16_9_15_240p_2_RC1000ms[180,250]Kbps	24.20
1S_HANDHELD3_4_30_480x640_1_RC500ms[300,500]Kbps	27.74
1S_HANDHELD3_4_30_480x640_1_RC1000ms[300,500]Kbps	27.74
1S_HANDHELD3_4_15_240x320_1_RC500ms[180,250]Kbps	27.52
1S_HANDHELD3_4_15_240x320_1_RC1000ms[180,520]Kbps	27.52

Table 51: Premium Logo Requirement Set for UCConfig Mode 1 (Constant QP, Simulcast Streams)

Test bitstreams	R-D Curve Samples			
	TID	Min PSNR	Kbps	PSNR
1MM_HIMOTION16_9_30_720p_2_QP26	0	38.90	3626.21	39.63
	1	38.93	6460.55	39.65

1MM_HIMOTION16_9_30_720p_2_QP30	0	36.16	2099.05	36.95
	1	36.17	3631.59	36.97
1MM_HIMOTION16_9_30_720p_2_QP34	0	33.42	1192.71	34.30
	1	33.42	2007.27	34.31
1MM_HIMOTION16_9_30_720p_2_QP38	0	30.61	653.46	31.54
	1	30.62	1081.05	31.55
1MM_HIMOTION16_9_15_180p_1_QP30	0	33.64	178.24	34.32
	1	33.65	316.50	34.32
1MM_HIMOTION16_9_15_180p_1_QP34	0	30.58	109.92	31.30
	1	30.56	190.50	31.30
1MM_HIMOTION16_9_15_180p_1_QP38	0	27.51	60.05	28.30
	1	27.52	101.19	28.29
1MM_HIMOTION16_9_15_180p_1_QP42	0	25.02	33.24	25.78
	1	25.02	55.47	25.78
1MM_HANDHELD3_4_30_480x640_1_QP26	0	40.36	465.83	41.49
	1	40.42	788.17	41.53
1MM_HANDHELD3_4_30_480x640_1_QP30	0	38.16	237.61	39.40
	1	38.19	400.73	39.43
1MM_HANDHELD3_4_30_480x640_1_QP34	0	36.05	134.44	37.41
	1	36.08	227.51	37.43
1MM_HANDHELD3_4_30_480x640_1_QP38	0	33.77	84.59	35.20
	1	33.75	145.46	35.21
1MM_HANDHELD3_4_15_240x320_1_QP30	0	36.69	61.43	37.86
	1	36.70	103.98	37.87
1MM_HANDHELD3_4_15_240x320_1_QP34	0	34.18	37.99	35.46
	1	34.21	63.81	35.48
1MM_HANDHELD3_4_15_240x320_1_QP38	0	31.52	24.22	32.91
	1	31.55	40.98	32.93
1MM_HANDHELD3_4_15_240x320_1_QP42	0	29.17	16.87	30.59
	1	29.15	28.67	30.60

Table 52: Premium Logo Requirement Set for UCConfig Mode 1 (Constant QP, Single Stream)

Test bitstream	R-D Curve Samples			
	TID	Min PSNR	Kbps	PSNR
1S_HIMOTION16_9_30_1080p_2_QP[26,29,30]	0	40.20	4038.72	40.90
	1	38.91	5860.28	40.27
	2	38.49	8214.01	39.79

Microsoft Skype for Business H.264 Video Encoder Specification

1S_HIMOTION16_9_30_1080p_2_QP[29,32,33]	0	38.33	2704.62	39.07
	1	37.13	3869.83	38.49
	2	36.80	5197.28	38.09
1S_HIMOTION16_9_30_1080p_2_QP[32,35,36]	0	36.39	1867.82	37.20
	1	35.33	2607.01	36.69
	2	34.97	3409.33	36.32
1S_HIMOTION16_9_30_1080p_2_QP[35,38,39]	0	34.44	1267.66	35.31
	1	33.44	1733.58	34.83
	2	33.18	2281.87	34.52
1S_HIMOTION16_9_30_720p_2_QP[26,29,30]	0	38.85	2312.40	39.54
	1	37.50	3333.41	38.90
	2	37.05	4601.60	38.41
1S_HIMOTION16_9_30_720p_2_QP[29,32,33]	0	36.78	1569.42	37.53
	1	35.53	2219.34	36.94
	2	35.17	2939.19	36.51
1S_HIMOTION16_9_30_720p_2_QP[32,35,36]	0	34.68	1083.81	35.51
	1	33.60	1485.95	34.98
	2	33.22	1904.36	34.61
1S_HIMOTION16_9_30_720p_2_QP[35,38,39]	0	32.60	728.92	33.48
	1	31.66	976.04	33.02
	2	31.38	1251.68	32.72
1S_HIMOTION16_9_30_360p_2_QP[26,29,30]	0	37.66	847.84	38.34
	1	36.11	1265.47	37.63
	2	35.57	1818.38	37.05
1S_HIMOTION16_9_30_360p_2_QP[29,32,33]	0	35.29	603.98	36.01
	1	33.82	879.60	35.33
	2	33.31	1209.48	34.80
1S_HIMOTION16_9_30_360p_2_QP[32,35,36]	0	32.90	427.15	33.74
	1	31.53	593.48	33.09
	2	31.05	772.06	32.58
1S_HIMOTION16_9_30_360p_2_QP[35,38,39]	0	30.62	285.77	31.50
	1	29.35	380.09	30.91
	2	28.98	482.15	30.51
1S_HANDHELD3_4_30_480x640_1_QP[26,29,30]	0	40.27	368.27	41.46
	1	39.33	498.87	40.92
	2	39.06	638.48	40.58
1S_HANDHELD3_4_30_480x640_1_QP[29,32,33]	0	38.64	230.04	39.88
	1	37.81	310.71	39.40

	2	37.53	399.27	39.12
1S_HANDHELD3_4_30_480X640_1_QP[32,35,36]	0	36.91	148.88	38.28
	1	36.35	204.72	37.90
	2	35.98	267.52	37.64
1S_HANDHELD3_4_30_480X640_1_QP[35,38,39]	0	35.35	104.24	36.79
	1	34.81	144.28	36.42
	2	34.42	194.72	36.16

Table 53: Premium Logo Requirement Set for UCConfig Mode 1 LTR (Constant QP, Single Stream) (Windows 8.1 only)

Test bitstream			R-D Curve Samples		LTR Frame Only R-D	
	TID	Min PSNR	Kbps	PSNR	Kbps	PSNR
1S_HIMOTION16_9_30_1080p_2_QP[26,29,30]_LTR	0	40.16	4312.81	40.87	853.49	40.96
	1	38.84	6138.72	40.24	-	-
	2	38.44	8497.71	39.76	-	-
1S_HIMOTION16_9_30_1080p_2_QP[29,32,33]_LTR	0	38.28	2922.83	39.04	614.52	39.11
	1	37.06	4090.74	38.46	-	-
	2	36.75	5419.71	38.06	-	-
1S_HIMOTION16_9_30_1080p_2_QP[32,35,36]_LTR	0	36.37	2042.52	37.18	454.44	37.23
	1	35.28	2781.34	36.66	-	-
	2	34.95	3583.98	36.29	-	-
1S_HIMOTION16_9_30_1080p_2_QP[35,38,39]_LTR	0	34.44	1399.56	35.30	325.99	35.35
	1	33.42	1863.72	34.81	-	-
	2	33.16	2412.73	34.50	-	-
1S_HIMOTION16_9_30_720p_2_QP[26,29,30]_LTR	0	38.77	2476.63	39.52	503.47	39.57
	1	37.44	3497.38	38.88	-	-
	2	36.99	4766.56	38.38	-	-
1S_HIMOTION16_9_30_720p_2_QP[29,32,33]_LTR	0	36.72	1698.49	37.52	364.37	37.54
	1	35.48	2347.50	36.92	-	-
	2	35.11	3066.07	36.50	-	-
1S_HIMOTION16_9_30_720p_2_QP[32,35,36]_LTR	0	34.68	1186.51	35.51	269.06	35.53
	1	33.55	1587.12	34.98	-	-
	2	33.20	2003.86	34.61	-	-
1S_HIMOTION16_9_30_720p_2_QP[35,38,39]_LTR	0	32.64	807.53	33.52	192.99	33.55
	1	31.67	1052.57	33.05	-	-
	2	31.38	1327.22	32.75	-	-
1S_HIMOTION16_9_30_360p_2_QP[26,29,30]_LTR	0	37.64	901.11	38.35	179.18	38.37

	1	36.08	1318.40	37.62	-	-
	2	35.54	1871.27	37.04	-	-
1S_HIMOTION16_9_30_360p_2_QP[29,32,33]_LTR	0	35.26	646.21	36.03	133.86	36.05
	1	33.78	921.61	35.35	-	-
	2	33.30	1251.56	34.81	-	-
1S_HIMOTION16_9_30_360p_2_QP[32,35,36]_LTR	0	32.96	461.90	33.78	100.17	33.81
	1	31.54	627.69	33.12	-	-
	2	31.05	805.31	32.61	-	-
1S_HIMOTION16_9_30_360p_2_QP[35,38,39]_LTR	0	30.71	312.77	31.55	71.76	31.60
	1	29.36	406.95	30.95	-	-
	2	28.97	508.76	30.54	-	-
1S_HANDHELD3_4_30_480x640_1_QP[26,29,30]_LTR	0	40.24	401.66	41.45	92.93	41.42
	1	39.28	532.60	40.91	-	-
	2	39.03	672.38	40.56	-	-
1S_HANDHELD3_4_30_480x640_1_QP[29,32,33]_LTR	0	38.58	256.31	39.88	62.93	39.83
	1	37.81	336.58	39.39	-	-
	2	37.51	424.99	39.11	-	-
1S_HANDHELD3_4_30_480x640_1_QP[32,35,36]_LTR	0	36.91	167.89	38.27	43.65	38.24
	1	36.36	223.35	37.88	-	-
	2	35.99	285.84	37.63	-	-
1S_HANDHELD3_4_30_480x640_1_QP[35,38,39]_LTR	0	35.24	117.91	36.77	30.74	36.71
	1	34.78	157.74	36.39	-	-
	2	34.39	208.34	36.14	-	-

Table 54: Premium Logo Requirement Set for UCConfig Mode 1 (Constant Rate Control, Single Stream)

Test Bitstream	PSNR
1S_HIMOTION16_9_30_720p_2_RC500ms[800,1000,1200]Kbps	28.61
1S_HIMOTION16_9_30_720p_2_RC1000ms[800,1000,1200]Kbps	28.82
1S_HIMOTION16_9_30_360p_2_RC500ms[300,400,500]Kbps	27.60
1S_HIMOTION16_9_30_360p_2_RC1000ms[300,400,500]Kbps	28.16
1S_HANDHELD3_4_30_480x640_1_RC500ms[300,400,500]Kbps	39.68
1S_HANDHELD3_4_30_480x640_1_RC1000ms[300,400,500]Kbps	39.75

Table 55: Premium Logo Requirement Set for UCConfig Mode 1 (Constant QP, Simulcast Streams)

Test bitstreams	R-D Curve Samples			
	TID	Min PSNR	Kbps	PSNR
1M_HIMOTION16_9_30_720p_2_QP26	0	38.85	2312.40	39.54
	1	38.85	4121.38	39.55

Microsoft Skype for Business H.264 Video Encoder Specification

	2	38.88	6980.40	39.59
1M_HIMOTION16_9_30_720p_2_QP29	0	36.78	1569.42	37.53
	1	36.79	2737.71	37.54
	2	36.81	4493.57	37.58
1M_HIMOTION16_9_30_720p_2_QP32	0	34.68	1083.81	35.51
	1	34.68	1854.32	35.52
	2	34.69	2956.78	35.54
1M_HIMOTION16_9_30_720p_2_QP35	0	32.60	728.92	33.48
	1	32.60	1224.02	33.49
	2	32.63	1905.51	33.51
1M_HIMOTION16_9_30_360p_2_QP30	0	34.45	545.82	35.24
	1	34.47	965.21	35.26
	2	34.49	1612.49	35.29
1M_HIMOTION16_9_30_360p_2_QP33	0	32.23	374.87	33.07
	1	32.24	652.32	33.08
	2	32.24	1063.39	33.08
1M_HIMOTION16_9_30_360p_2_QP36	0	29.94	246.53	30.81
	1	29.92	420.55	30.80
	2	29.90	665.70	30.79
1M_HIMOTION16_9_30_360p_2_QP39	0	27.75	161.02	28.73
	1	27.75	269.75	28.71
	2	27.73	418.90	28.71
1M_HIMOTION16_9_15_180p_1_QP34	0	30.58	109.92	31.30
	1	30.56	190.50	31.30
1M_HIMOTION16_9_15_180p_1_QP37	0	28.35	72.82	29.18
	1	28.35	123.64	29.17
1M_HIMOTION16_9_15_180p_1_QP40	0	26.29	45.19	27.06
	1	26.30	75.66	27.05
1M_HIMOTION16_9_15_180p_1_QP43	0	24.57	29.88	25.36
	1	24.58	49.87	25.36
1M_HANDHELD3_4_30_480x640_1_QP26	0	40.23	308.47	41.44
	1	40.29	538.77	41.45
	2	40.34	861.92	41.50
1M_HANDHELD3_4_30_480x640_1_QP29	0	38.62	188.80	39.87
	1	38.64	325.53	39.88
	2	38.69	516.77	39.91
1M_HANDHELD3_4_30_480x640_1_QP32	0	36.91	119.74	38.28
	1	36.95	205.31	38.29

	2	36.97	325.09	38.31
1M_HANDHELD3_4_30_480x640_1_QP35	0	35.33	83.17	36.79
	1	35.38	141.82	36.80
	2	35.40	225.90	36.83
1M_HANDHELD3_4_15_320x424_2_QP30	0	37.44	88.51	38.62
	1	37.45	151.28	38.63
1M_HANDHELD3_4_15_320x424_2_QP33	0	35.65	60.31	36.94
	1	35.66	103.03	36.96
1M_HANDHELD3_4_15_320x424_2_QP36	0	33.77	42.32	35.15
	1	33.77	72.46	35.17
1M_HANDHELD3_4_15_320x424_2_QP39	0	31.99	30.94	33.41
	1	32.01	53.51	33.43
1M_HANDHELD3_4_15_240x320_1_QP34	0	34.18	37.99	35.46
	1	34.21	63.81	35.48
1M_HANDHELD3_4_15_240x320_1_QP37	0	32.32	27.98	33.69
	1	32.34	47.11	33.70
1M_HANDHELD3_4_15_240x320_1_QP40	0	30.36	20.21	31.76
	1	30.39	34.17	31.77
1M_HANDHELD3_4_15_240x320_1_QP43	0	28.85	15.79	30.28
	1	28.82	26.94	30.29

7. Device-Specific Requirements

7.1. Hardware Media Foundation Transform (HMFT)

All the conforming HMFTs must follow the requirements specified in *The Hardware Encoder Requirements and Guidelines* and the additional requirements described in this section.

7.1.1. General Requirement

- HMFT must support low latency mode. Each `METTransformHasInput` must be followed by a `METTransformHaveOutput` regardless of whether the next input frame is delivered to HMFT (one-in-one-out behavior).
- HMFT must support multiple `SetInputType()` between the delivery of two consecutive input frames. HMFT must apply the last input type call.
- HMFT must support the creation of multiple HMFT instances in order to support simulcast streams (for premium program only).
- HMFT must assure that the encoding time is within 33ms except that one frame may be encoded within 66ms in every 10 second. The encoding time is defined as the time interval between `ProcessInput` and `METTransformHaveOutput`.

7.1.2. Dynamic Controls

- **CODECAPI_AVEncVideoForceKeyFrame**
Skype for Business requires the generation of a SPS NAL unit, PPS NAL unit and IDR frame.
- **CODECAPI_AVEncVideoTemporalLayerCount**
Skype for Business requires that the addition or deletion of a temporal enhancement layer must not introduce an IDR frame when SPS is not changed. The encoder must wait until a base layer frame before applying the new temporal pattern.
- **CODECAPI_AVEncMPVGOPSize**
Skype for Business requires the encoder to support infinite GoP size (i.e. 0xFFFFFFFF) in Windows 8.1. Per Windows 8.1 HCK requirement, when this attribute is set to 0xFFFFFFFF, the encoder must apply CODECAPI_AVEncVideoForceKeyFrame and CODECAPI_AVEncVideoTemporalLayerCount in the next base layer (instead of in the next frame that is a multiple of $2^{\text{max_layer}} - 1$ where max_layer is the max supported temporal layer count).
- **CODECAPI_AVEncCommonLowLatency**
Skype for Business requires the support of low latency mode.
- **CODECAPI_AVEncMPVDefaultBPictureCount**
Skype for Business requires the support of disabling B pictures.
- **CODECAPI_AVEncVideoEncodeQP**
Skype for Business requires the support of per-frame QP control via this property and CODECAPI_AVEncVideoSelectLayer. Before using CODECAPI_AVEncVideoEncodeQP, CODECAPI_AVEncCommonRateControlMode must be first set to eAVEncCommonRateControlMode_Quality. Once applied, the QP value of a layer shall remain unchanged until another SetValue request comes in.
- **CODECAPI_AVEncVideoSelectLayer**
This property specifies which layer the CODECAPI_AVEncVideoEncodeQP SetValue() applies to. The default value is 0 (i.e. the base layer).
- **CODECAPI_AVEncMPVProfile**
Skype for Business requires the support of eAVEncH264VProfile_UCConstrainedHigh and eAVEncH264VProfile_ConstrainedBase.
- **CODECAPI_AVEncSliceControlMode (Windows 8.1 only)**
Skype for Business requires the support of mode 2 (MB rows per slice). When mode 1 (size in bits per slice) is supported, encoders must generate slice size within -10% error range. For example, if the application requires 1200 bytes per slice, encoders must generate slices between 1080 bytes and 1200 bytes (except the size of the last slice of a frame can be smaller than 1080 bytes).
- **MF_MT_FRAME_SIZE**
Skype for Business requires the support of dynamic resolution change via this attribute as the input to IMFMediaType.

- **MF_VIDEO_MAX_MB_PER_SEC (Windows 8.1 only)**

Skype for Business requires the support of encoding capability query via this attribute as the output from `IMFMediaType`.

7.2. H.264 USB Camera

H.264 USB cameras must follow the additional requirements described in this section

7.2.1. General Requirement

- H.264 USB cameras must follow the multiplex rules defined in UCConfig Spec order to support simulcast streams (for premium program only).
- H.264 USB cameras must support `IMFMediaType` with all combinations of key/value pairs described below:

Key	Value
<code>MF_MT_MPEG2_PROFILE</code>	<code>eAVEncH264VProfile_ConstrainedBase</code> and <code>eAVEncH264VProfile_ConstrainedHigh</code>
<code>MF_MT_H264_SUPPORTED_RATE_CONTROL_MODES</code>	The 4 th least significant bit is 1 ¹⁷
<code>MF_MT_H264_SUPPORTED_SYNC_FRAME_TYPES</code>	The least significant bit is 1 ¹⁸ .
<code>MF_MT_H264_SVC_CAPABILITIES</code>	The least significant three bits is larger than or equal to 1 for standard program, and larger than or equal to 2 for premium program. ¹⁹
<code>MF_MT_FRAME_SIZE</code> , <code>MF_MT_FRAME_RATE</code>	Resolution/frame rate pairs defined in Table 9 and Table 10 must be supported.

7.2.2. Dynamic Controls

- **CODECAPI_AVEncVideoForceKeyFrame**

Skype for Business requires the generation of a SPS NAL unit, PPS NAL unit and IDR frame.

- **CODECAPI_AVEncVideoTemporalLayerCount**

Skype for Business requires that the addition or deletion of a temporal enhancement layer must not introduce an IDR frame when SPS is not changed.

¹⁷ The 4th least significant bit (D3) of `bmSupportedRateControlModes` corresponds to Global VBR without underflow (H.264 `low_delay_hrd_flag` = 0).

¹⁸ The least significant bit (D0) of `bmSupportedSyncFrameTypes` corresponds to IDR frame preceded with SPS and PPS headers.

¹⁹ The least three significant bits of `bmSVCCapabilities` (D2-D0) correspond to max number of temporal layers minus 1.

- **CODECAPI_AVEncVideoEncodeQP**

Skype for Business requires the support of QP control via this property and `CODECAPI_AVEncVideoSelectLayer`. Before using `CODECAPI_AVEncVideoEncodeQP`, `CODECAPI_AVEncCommonRateControlMode` must be first set to `eAVEncCommonRateControlMode_Quality`. H.264 USB cameras must support separate QP control for different frame types (i.e., I, P and B). Once applied, the QP value of a layer/frame type shall remain unchanged until another `SetValue` request comes in.

- **CODECAPI_AVEncVideoSelectLayer**

This property specifies which layer the `CODECAPI_AVEncVideoEncodeQP` `SetValue()` applies to. The default value is 0 (i.e. the base layer).

- **CODECAPI_AVEncVideoUsage**

Skype for Business requires the support of `UCConfig Mode 0` (1) and `UCConfig Mode 1` (2).

- **CODECAPI_AVEncMPVProfile**

Skype for Business requires the support of `eAVEncH264VProfile_UCConstrainedHigh` and `eAVEncH264VProfile_ConstrainedBase`.

- **CODECAPI_AVEncCommonRateControlMode**

Skype for Business requires the support of `eAVEncCommonRateControlMode_LowDelayVBR`.

- **CODECAPI_AVEncCommonBufferSize, CODECAPI_AVEncCommonMeanBitRate**

Skype for Business requires that changes of buffer size or mean bitrate must not introduce an IDR frame.