



CYPHER FOR DIGITAL MEDIA

## VOD ENCODING SPECIFICATION

VERSION: 3.6

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## Revision History

Version	Date	Description	By
3.6	4/11/2011	Added Android Phone sample profile	Alex Lee

## 1. PURPOSE

The purpose of this document is to describe the encoding requirements for content protected by Widevine Cypher in an open network environment (delivery via OTT or Internet).

## 2. TERMS AND ABBREVIATIONS

- **Asset** - Physical media such as an H.264-encoded movie
- **Catcher** - A temporary storage device used to collect on- demand files and request missing parts (due to unreliable transport) prior to provisioning of content to the video delivery servers
- **Container** - A container format is a computer file format that can contain various types of data, compressed by means of standardized audio/video codecs
- **Content** - Assets and metadata files

## 3. VIDEO REQUIREMENTS FOR NORMAL PLAY FILES (1X OR REGULAR)

- H.264 video format in MP4 container.
- Both CBR (constant bitrate) and VBR (variable bitrate) are supported.
  - Widevine recommends CBR.
- **IDR frame separation – 3 seconds or less (lowest value consistent with good image quality)**
  - **All files must have closed GOPs and identical IDR frame structure.**
    - **Key frames must be at exact regular intervals across all bitrates.**
  - **Associated with the Key Frame Interval value.**
    - **Key Frame Interval = (Video FPS) x (GOP separation in seconds)**
    - **e.g. 24 x 3 = 72**
- One file for each bitrate that will be used for adaptive streaming playback.  
For example:
  - Movie1\_500k.mp4
  - Movie1\_700k.mp4
  - Movie1\_1000k.mp4
  - Movie1\_1500k.mp4
  - Movie1\_2000k.mp4
  - Movie1\_1000k\_trickplay.mp4

#### 4. VIDEO REQUIREMENTS FOR TRICK PLAY FILE

- H.264 video format in MP4 container.
- IDR frame separation – 1 second or less
- Recommended bitrate of 1000 kbps



### 5. VIDEO REQUIREMENTS FOR SINGLE BITRATE FILES

- H.264 video format in MP4 container.
- Optimized for streaming
  - i.e. audio and video interleaved
- 'moov' atom should immediately follow the 'ftyp' atom.
- Chunks should contain no more than 1 second worth of sample data.
- Associated audio and video samples should be within 2 seconds of each other.

### 6. AUDIO REQUIREMENTS FOR ALL TYPES OF FILES

- AAC profiles:
  - AAC Main (ID 1)
  - AAC LC (ID 2)
  - AAC SSR (ID 3)
  - T/F (ID 4)
- Since the content may need to be decoded on any number of devices, it is strongly suggested that the least common denominator, AAC LC (Low Complexity) be used.
- Number of channels: 1...7
- Sampling rates: all supported by AAC
- Sample size: all supported by AAC
- Dolby Digital Plus / E-AC-3
  - Single substream

## 7. BEST PRACTICES

Encoding specifications vary per device – ranging from recommended video resolution, frame rates, H.264 profiles and audio bitrates.

Depending on native device support, Widevine supports the following:

1. Varying (mixed) video resolutions
2. Varying frames per second
3. Varying audio bitrates and quality

### 7.1. BENEFITS OF A SINGLE ENCODING PROFILE

1. Encode once, play on multiple devices
2. One-time encrypted asset
  - a. Lower storage, content aggregation requirements

### 7.2. CONSIDERATION OF A SINGLE ENCODING PROFILE

Encoding profile must be compatible across all target platforms. This generally results in the following:

- a. Identical video resolution and frames per second.
- b. Identical audio bitrate.

### 7.3. BENEFITS OF SEPARATE ENCODING PROFILES (PER DEVICE)

Able to best match the content playback capabilities of the target platform.

### 7.4. CONSIDERATION OF SEPARATE ENCODING PROFILES (PER DEVICE)

Different profiles per device will result in multiple copies of the same content, each specific to the device it is encoded for.

- a. Incur additional encoding processing overhead to generate the bitrates for encryption and packaging.
- b. Additional storage and content aggregation requirements.

## 8. SAMPLE ENCODING PROFILES

### 8.1. BLU-RAY / TELEVISION CE DEVICES – FIXED RESOLUTION, FIXED AUDIO

Resolution (SD)	Frame Rate	IDR Frames (secs)	Video Bit Rate	Profile	Entropy Coder	Video Mode	Audio Channels	Audio Bit Rate	Audio Sample Rate	Audio Codec
720x480 (Trickplay)	24	1	700	Main 3.1	CABAC	CBR	L,R	128	44.1	AAC-LC
720x480	24	3	700	Main 3.1	CABAC	CBR	L,R	128	44.1	AAC-LC
720x480	24	3	1000	Main 3.1	CABAC	CBR	L,R	128	44.1	AAC-LC
720x480	24	3	1500	Main 3.1	CABAC	CBR	L,R	128	44.1	AAC-LC
720x480	24	3	2000	Main 3.1	CABAC	CBR	L,R	128	44.1	AAC-LC

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Resolution (HD)	Frame Rate	IDR Frames (secs)	Video Bit Rate	Profile	Entropy Coder	Video Mode	Audio Channels	Audio Bit Rate	Audio Sample Rate	Audio Codec
1920x1080 (Trickplay)	24	1	2000	Main 4.0	CABAC	CBR	L,R	128	44.1	AAC-LC
1920x1080	24	3	2000	Main 4.0	CABAC	CBR	L,R	128	44.1	AAC-LC
1920x1080	24	3	4000	Main 4.0	CABAC	CBR	L,R	128	44.1	AAC-LC
1920x1080	24	3	6000	Main 4.0	CABAC	CBR	L,R	128	44.1	AAC-LC
1920x1080	24	3	8000	Main 4.0	CABAC	CBR	L,R	128	44.1	AAC-LC

## 8.2. APPLE IOS (IPAD, IPHONE 4) – FIXED RESOLUTION, MIXED AUDIO

This content is playable on Apple platforms only.

Resolution	Frame Rate	IDR Frames (secs)	Video Bit Rate	Profile	Entropy Coder	Video Mode	Audio Channels	Audio Bit Rate	Audio Sample Rate	Audio Codec
Image 640x360	9.99	3	< 24	Main 3.1	CABAC	Capped VBR	Mono	40	22.05	AAC-LC
640x360	9.99	3	200	Main 3.1	CABAC	Capped VBR	Mono	40	22.05	AAC-LC
640x360	19.98	3	400	Main 3.1	CABAC	Capped VBR	Mono	40	22.05	AAC-LC
640x360	29.97	3	800	Main 3.1	CABAC	Capped VBR	Mono	40	22.05	AAC-LC
640x360	29.97	3	1200	Main 3.1	CABAC	Capped VBR	L,R	128	44.1	AAC-LC
640x360	29.97	3	2400	Main 3.1	CABAC	Capped VBR	L,R	128	44.1	AAC-LC

## 8.3. ANDROID PHONES (v1.6 – 2.x)

This content is playable on Android OS 1.6 – 2.3 platforms only.

Resolution	Frame Rate	IDR Frames (secs)	Video Bit Rate	Profile	Entropy Coder	Video Mode	Audio Channels	Audio Bit Rate	Audio Sample Rate	Audio Codec
640x360	30	3	< 700	Baseline 3.0	CABAC	Capped VBR	Stereo	128	44.	AAC-LC

## 8.4. APPLE IOS (IPAD, IPHONE 4) – MIXED RESOLUTION, MIXED AUDIO

This content is playable on Apple platforms only.

Resolution	Frame Rate	IDR Frames (secs)	Video Bit Rate	Profile	Entropy Coder	Video Mode	Audio Channels	Audio Bit Rate	Audio Sample Rate	Audio Codec
Image 320x180	9.99	3	< 24	Main 3.1	CABAC	Capped VBR	Mono	40	22.05	AAC-LC
320x180	9.99	3	200	Main 3.1	CABAC	Capped VBR	Mono	40	22.05	AAC-LC
640x360	19.98	3	400	Main 3.1	CABAC	Capped VBR	Mono	40	22.05	AAC-LC
640x360	29.97	3	800	Main 3.1	CABAC	Capped VBR	Mono	40	22.05	AAC-LC
640x360	29.97	3	1200	Main 3.1	CABAC	Capped VBR	L,R	128	44.1	AAC-LC
768x432	29.97	3	2400	Main 3.1	CABAC	Capped VBR	L,R	128	44.1	AAC-LC
1280x720	29.97	3	3600	Main 3.1	CABAC	Capped VBR	L,R	128	44.1	AAC-LC