

Autodesk® Scaleform®

CRI Movie Encoder Command Line Tool Overview

This document describes the CRI Encoder command line tool for use in Scaleform Video.

Author: Vladislav Merker
Version: 1.02
Last Edited: January 18, 2013

Autodesk®
GAMEWARE 

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Autodesk® Scaleform® 4.3

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How to Contact Autodesk Scaleform:

Document	CRI Movie Encoder Command Line Tool Overview
Address	Scaleform Corporation 6305 Ivy Lane, Suite 310 Greenbelt, MD 20770, USA
Website	www.scaleform.com
Email	info@scaleform.com
Direct	(301) 446-3200
Fax	(301) 446-3199

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1 Overview

The Scaleform® Video™ solution is powered by the CRI Movie™ codec for playing quality videos on PCs and game consoles. Before playing the video files, the AVI videos must be converted into USM format using the Scaleform encoder tool since Scaleform Video handles only external files loaded in CRI format. The console application version of the CRI Movie encoder is a command-line tool to create CRI Movie data. This document describes how to use the tool and what arguments are required for encoding.

2 Input/output Files

The following lists the input files used for encoding and the output file produced.

- **Input files**
 - Video material files
 - Audio material files
 - Subtitle information files
 - Cuepoint information file
- **Output files**
 - CRI Movie data (.usm)

2.1 Video Material Files

2.1.1 Video Material Specifications

An AVI file containing uncompressed video and audio tracks is recommended for video material. Additionally, sequential numbered still image files can be used for video material.

Recommended Video Material Specifications	
Item	Description
File Type	Microsoft AVI (supports file larger than 2GB).
Audio Track	Uncompressed PCM format (equivalent to WAVE).
Video Track	Uncompressed RGB format (equivalent to BMP).

Video Material Specifications	
Item	Description
File Type	AVI file (*1). Sequential numbered still image files.
Color Depth	24-bit / 32-bit colors.
Image Size	[min]72x72, [max] 4088x4088, in 8x8 pixel blocks (*2).
Frame Rate	60 /59.94 /50 /30 /29.97 /25 /24 /23.976 fps (*3).
Pixel aspect Ratio	[Widescreen TV] Square pixel (*4) [Normal TV] D1 pixel

[Notes]

- (*1) This tool uses the DirectShow interface, and therefore can basically handle any AVI files that will play on Windows Media Player. No warranty is made as to the capability of properly encoding those AVI files. Some AVI files cannot be read or cannot be completely encoded, depending on the codec that is used. (The codec must correctly respect the specifications of the DirectShow filters.)
- (*2) Image size should be in 16x16 pixel blocks for PlayStation 2 movies.
- (*3) Recommended frame rate is 29.97 fps.
Video material with low frame rate like 15 fps can be handled, although it's not standard.
- (*4) Special video material is needed to make Wii movies for widescreen TV.

2.1.2 Sequentially Numbered Still Image File Specifications

Sequentially numbered still image files are when each frame in a movie is saved as a still image file in sequential order. The CRI encoder tool handles sequentially numbered still images under the following specifications:

Video Material Specifications	
Item	Description
Format	1) 24-bit / 32-bit color BMP (uncompressed). 2) 24-bit / 32-bit color TGA (uncompressed / run-length).
Image Size	[min]72x72, [max] no limitation (in 8x8 pixel blocks).
File naming rule	<ul style="list-style-type: none"> 1) "base name" + "number" + ".extension" E.g., OK> abc001.bmp, abc002.bmp, abc003.bmp, ... E.g., NG> abc001def.bmp, abc002def.bmp, abc003def.bmp, ... 2) Carry is applied E.g., OK> abc998.bmp, abc999.bmp, abc1000.bmp, ... 3) Missing files will be skipped E.g., OK> abc001.bmp, abc004.bmp, abc008.bmp, ...

2.2 Audio Material Files

Audio material for a movie can be specified in either one of the following ways:

- Using an audio track contained in the AVI file, or
- Specifying audio material files separately from video material files.

Specifications of audio material are given below:

Recommended Video Material Specifications	
Item	Description
File Type	Waveform of WAVE or AIFF formats.
Format	16-bit Linear PCM (uncompressed).
Number of Channels	Stereo or mono.
Sampling Frequency	Supported up to 48kHz.

2.3 Subtitle Information Files

When subtitles are required for a movie, a subtitle information file should be prepared. This is a text file that describes when to display subtitles (character string).

2.3.1 Format of a Subtitle Information File

1. The time unit (integer) is defined at the first line.
2. At the second line or greater, the start time (INTIME), ending time (OUTTIME) and the subtitle content are defined in a line and these data are separated by ',' (comma).
3. The start time (ending time) divided by the time unit is in seconds.
4. Display interval does not include the ending time.
5. ',' (comma) in the subtitle content is processed as a character.
6. The line starting from ';' (semi-colon) is processed as a comment.
7. Supported character codes are ASCII, Shift JIS, UTF-8 and UTF-16 (UTF-16LE).
The content is put into a movie without modification.

2.3.2 Subtitle Information File Examples

Example 1

Subtitle information is written based on the playback time.

In this example, the time unit is 1000. Each subtitle content is displayed for a period of 0 – 2 sec, 5 - 7.5 sec, and 7.5 – 10 sec, respectively.

```
;INTIME, OUTTIME, Subtitle, Comment  
1000  
0, 2000, FirstMessage.  
5000, 7500, Second Message.  
7500, 10000, Third Message.
```

Example 2

Subtitle information is written based on the frame number.

For example, if the time unit is 29970 for 29.97 fps, the display interval for one frame is 1000, and the number of displayed frames is $29.97 \times 1000 = 29970$.

In this example, the time unit is 29970. Each subtitle content is displayed for a period of 0 – 100 frame, 150 – 200 frame, and 200 – 250 frame, respectively.

```
;INTIME, OUTTIME, Subtitle, Comment  
29970  
0, 100000, FirstMessage.  
150000, 200000, Second Message.  
200000, 250000, Third Message.
```

2.4 Cuepoint Information File

"Cuepoint" is a feature to place timing information (event points) into a movie. Upon reaching the timing during playback that is defined for each event point, the callback function is invoked. And "Cuepoint Information File" is a text file defining these event points.

2.4.1 Format of a Cuepoint Information File

1. The time unit (integer) is defined at the first line.
2. At the second line or greater, "Time", "Value", "EventPointName" and String" are defined in a line and these data are separated by ',' (comma).
3. The first parameter "Time" specifies when to publish an event and "Time" divided by the time unit becomes seconds.

4. The second parameter "Value" is numerical value which can be used in an application.
5. The third parameter "EventPointName" is the name of the event point.
6. The fourth parameter "String" is a character string which can be used in an application. The library does not analyze this parameter and it should be handled by the application.
7. The line starting from ';' (semi-colon) is processed as a comment.
8. Supported character codes are ASCII, Shift JIS, UTF-8 and UTF-16 (UTF-16LE).

2.4.2 Cuepoint Information File Example

Example 1

In this example, the time unit is 1000.

Events are published at 0, 5, 7, 8, 15, and 25 seconds, respectively.

Strings for event point #3 and #4 are separated by comma and they should be analyzed on the application side.

```
;Time, Value, EventPointName, String
1000
0,0,navi1
5000,0,navi2
7000,1,evpt1,param,test
8000,1,evpt2,param1,300,param2,500
15000,0,navi3
15000,1,evpt3
25000,0,navi4
```

3 Basic Usage of the CRI Encoder

To start the program, open an MS-DOS command prompt, and enter the command in the following format.

```
[Format] medianoche [-subcommand=param1[,param2,...]]  
[Input]  subcommand : subcommand  
          param#      : subcommand parameter
```

Example:

Create a CRI Movie file "sample.usm" by encoding an input AVI file "sample.avi"

```
> medianoche -in=sample.avi -out=sample.usm
```

3.1 Subcommands

"Subcommand" is a command option that tells the program what process should be performed. For example, it specifies input files, output files, and operation modes.

3.1.1 File Subcommands

Subcommands	Description
in	Specifies Input Video File.
out	Specifies Output Movie File.
video##	Specifies Input Video File.
alpha##	Specifies Alpha File.
audio##	Specifies Audio File.
mca**_##	Specifies Audio File for Surround Movie.
subtitle##	Specifies Subtitle Information File.
cuepoint	Specifies Cuepoint Information File.

3.1.2 Video Editing Subcommands

Subcommands	Description
crop	Crop part of the original image.
scale	Scale up/down the original image.

3.1.3 Video Encode Setting Subcommands

Subcommands	Description
bitrate	Bitrate (bits per second).
br_range	Bitrate Range for Variable Bitrate Control.
framerate	Frame rate.
hcfilter	High compression filter.
gop_i	Number of I-pictures in GOP (group of pictures).
gop_p	Number of P-pictures in GOP.
gop_b	Number of B-pictures in GOP.
gop_closed	Closed GOP.
detectsc	Scene change detection.
ms_fullpel_still	Motion search in full pel for still parts.

3.1.4 Audio Encode Setting Subcommands

Subcommands	Description
hca	Encode audio material for HCA codec.
hca_quality	Sound quality when encoding as HCA.

3.1.5 Miscellaneous Subcommands

Subcommands	Description
cleanup	Delete intermediate files.
work_dir	Sets the working directory.
debug	Outputs the debug information.
preview	Display the preview screen.

3.2 Subcommand Specifications

3.2.1 Files Subcommands

in: Specify Input Video File

[Format] -in=filename

```
[Input]      filename : input video file  
[Function]   Specifies input video file.
```

This subcommand is commonly used and provides an alternative to the video subcommand.

Example: Specifies sample.avi as an input video file.

```
> medianoche -in=sample.avi -out=sample.usm
```

out: Specify Output Movie File

```
[Format]      -out=filename  
[Input]       output : output movie file (usm file)  
[Function]   Specifies output file name.
```

This subcommand is commonly used. Specify output file name with the file extension "usm".

Example: Specifies sample.usm as output file name.

```
> medianoche -in=sample.avi -out=sample.usm
```

video: Specify Input Video File

```
[Format]      -video##=filename  
[Input]       filename : video file  
              ##       : video track number (## = 00)  
[Function]   Specifies input video file.
```

1. Video files: For details about video file, see Sec 2.1.
2. Video track number: Please be sure to specify **00** for video track number. Currently, other track numbers are not supported.

Example: Assigns an AVI file *smpvid.avi* to track 00.

```
> medianoche -video00=smpvid.avi -audio00=smpaud.wav -out=sample.usm
```

alpha: Specify Alpha File

```
[Format]      -alpha##=filename  
[Input]       filename : alpha file  
              ##       : alpha track number (## = 00)  
[Function]   Specifies input alpha file.
```

When creating an alpha movie, specify an AVI file containing the alpha channel to encode.

1. Alpha track number: Please be sure to specify 00 for alpha track number. Currently, other track numbers are not supported.

Example: Assigns an alpha channel in an AVI file *smpvid.avi* to track 00.

```
> medianoche -video00=smpvid.avi -audio00=smpaud.wav -out=sample.usm \
   -alpha00=smpvid.avi
```

audio: Specify Audio File

```
[Format]      -audio##=filename
[Input]       filename : audio file
              ##       : audio track number (## = 00 - 31)
[Function]    Specifies input audio file.
```

1. Audio files: For details about audio file, see Sec 2.2.

2. Audio track number:

- The track number specified here is used as audio track number for CRI Movie file.
- When using only one audio file, use track number 00.
- Up to 32 audio files can be specified.

Example: Assigns music file, English voice file and Japanese voice file to track 00, 01 and 02, respectively.

```
> medianoche -video00=smpvid.avi -out=sample.usm \
   -audio00=music.wav -audio01=voice_en.wav -audio02=voice_ja.wav
```

mca: Specify Audio File for Surround Movie

```
[Format]      -mca**_##=filename
[Input]       filename : audio files
              **       : audio track number
              ##       : audio channel number (## = 00 - 05)
[Function]    Specifies audio file for surround movie
```

1. Audio files:

- To create surround movie, audio material files corresponding to speaker positions are required.
- All of material files for surround movie should be mono data.

2. Channel number:

- Speaker positions are not omission. Please be sure to specify material files for all the positions.
- The following table shows the mapping of channel number and speaker position for surround movie.

Channel Number	Speaker Position
00	LEFT
01	RIGHT
02	LEFT Surround
03	RIGHT Surround
04	CENTER
05	LFE

Example: Assigns audio files for surround movie to track 0.

```
> medianoche -video00=smpvid.avi -out=sample.usm \
    -mca00_00=f1.wav -mca00_01=fr.wav -mca00_02=sl.wav -mca00_03=sr.wav \
    -mca00_04=c.wav -mca00_05=lfe.wav
```

subtitle: Specify Subtitle Information File

[Format] -subtitle##=filename
 [Input] filename : subtitle information file
 ## : subtitle channel (## = 00 - 15)
 [Function] Specifies subtitle information file.

1. Subtitle information file: For details about the subtitle information file, see Sec 2.3.
2. Subtitle channel number: Up to 16 subtitle information files can be specified.

Example: Specifies English and Japanese subtitle information files for channel 00 and channel 01, respectively.

```
> medianoche -video00=smpvid.avi -audio00=smpaud.wav -out=sample.usm \
    -subtitle00=subttl_en.txt -subtitle01=subttl_ja.txt
```

cuepoint: Specifying Cuepoint Information File

[Format] -cuepoint=filename
 [Input] filename: cuepoint information file
 [Function] Specifies cuepoint information file.

For details about cuepoint information file, see Sec 2.4.

Example:

```
> medianoche -in=sample.avi -out=sample.usm -cuepoint=sample_cuepoint.txt
```

3.2.2 Video Editing Subcommands

crop: Crop part of the Original Image

[Format] crop=crx,cry,crw,crh
[Input] crx: X coordinate of cropped image against the original image
 cry: Y coordinate of cropped image against the original image
 crw: Image width after cropping
 crh: Image height after cropping
[Function] Crops a part of original image.

Any values are allowed, as long as the cropped image is inside of the original image.
The default is no cropping.

Example: Crops video at (0,0) with width 640 and height 480.

```
> medianoche -in=sample.avi -out=sample.usm -crop=0,0,640,480
```

scale: Scales up/down the Original Image

[Format] scale=scw,sch
[Input] scw : the width of resized image
 sch : the height of resized image
[Function] Scales up/down the original image by averaging pixel value

Default is no scaling.

Example: Resizes to video with width 640 and height 480.

```
> medianoche -in=sample.avi -out=sample.usm -scale=640,480
```

3.2.3 Video Encode Setting Subcommands

bitrate: Bitrate

[Format] -bitrate=rate
[Input] rate: bitrate [bps]
[Function] Specifies the bitrate of output movie file in bps (bits per second).

When this subcommand is not specified, the movie file with the highest quality will be output without retrying the encoding.

Default: 3000000bps.

Example: Set the bitrate to 6Mbps.

```
> medianoche -video00=smpvid.avi -audio00=smpaud.wav -out=sample.usm \
    -bitrate=6000000
```

br_range: Bitrate Range for Variable Bitrate Control

[Format] -br_range=min,max
[Input] min: minimum bitrate [bps]
 max: maximum bitrate [bps]
[Function] Sets the bitrate range with minimum and maximum values for variable
 bitrate control.
Default: min=0bps, max=3000000bps

Example: Set the bitrate range with min=0bps and max=3000000bps.

```
> medianoche -video00=smpvid.avi -audio00=smpaud.wav -out=sample.usm \
    -br_range=0,3000000
```

framerate: Frame Rate

[Format] -framerate=decfr
 -framerate=fr_num,fr_den
[Input] decfr: frame rate in decimal number
 fr_num: numerator of frame rate in fractional number
 fr_den: denominator of frame rate in fractional number
[Function] Specifies movie frame rate (fps).

The following two formats are available:

1. In the decimal representation: -framerate=29.97
2. In the fractional representation: -framerate=30000/1001

Up to 60 fps can be specified. When omitted, original frame rate of video material is used.

Example: Specifies 29.97 fps for movie frame rate.

```
> medianoche -video00=smpvid.avi -audio00=smpaud.wav -out=sample.usm \
    -framerate=29.97
```

hcfilter: High Compression Filter

[Format] -hcfilter=fltype

```
[Input]      fltype: high compression filter type
            ON:    always on
            OFF:   always off
            AUTO: automatically applies when it's applicable. (Default)
[Function]  Applies high compression filter for video encoding.
```

High compression filter is effective especially for encoding at lower-bitrate.

3.2.4 GOP (Group of Pictures) Subcommands

The GOP is a group of successive pictures within a coded video stream. Each coded video stream consists of successive GOPs. From the pictures contained in it, the visible frames are generated.

A GOP can contain the following picture types:

- I-picture or I-frame (intra coded picture) - reference picture, which represents a fixed image and is independent of other picture types. Each GOP begins with this type of picture.
- P-picture or P-frame (predictive coded picture) - contains motion-compensated difference information from the preceding I- or P-frame.
- B-picture or B-frame (bidirectionally predictive coded picture) - contains difference information from the preceding and following I- or P-frame within a GOP.

gop_i: Number of I-pictures in GOP

```
[Format]      -gop_i=count
[Input]       count: number of I pictures in GOP
[Function]   Specifies number of I pictures in GOP
```

By adjusting GOP length and number of pictures for each picture type (I, P, B) in GOP, the movie quality can be improved.

- The more I pictures are used, the less decoding load can be.
But data amount of I picture is larger than other picture types.
- Default: 1

gop_p: Number of P-pictures in GOP

```
[Format]      -gop_p=count
[Input]       count: number of P pictures in one GOP
[Function]   Specifies number of P pictures in one GOP
```

By adjusting GOP length and number of pictures for each picture type (I, P, B) in GOP, the movie quality can be improved.

- P picture has intermediate data size between I picture and B picture.
- Default: 4

gop_b: Number of B-pictures in GOP

[Format] -gop_b=count
[Input] count: number of B pictures in one GOP
[Function] Specifies number of B pictures in one GOP

By adjusting GOP length and number of pictures for each picture type (I, P, B) in GOP, the movie quality can be improved.

- The more B pictures are used, the higher movie compression ratio will be because more video information will be allocated in the same bitrate. But decoding load will become higher.
- Default: 2

gop_closed: Closed GOP

[Format] -gop_closed=sw
[Input] sw: switch for the closed GOP
 ON: closed GOP (Default)
 OFF: non closed GOP
[Function] Enables the closed GOP.

When enabling closed GOP, the GOP sequence becomes independent from other GOP's and can be easily edited.

detectsc: Scene Change Detection

[Format] -detectsc=sw
[Input] sw: switch for the scene change detection
 ON : (Default)
 OFF:
[Function] Enables the scene change detection.

When detecting change of cut scenes, an I-picture is automatically inserted.

By inserting an I-picture at the start of the new scene, the image quality immediately after scene change can be improved.

3.2.5 Audio Encode Setting Subcommands

hca: Encode audio source for HCA codec

```
[Format] -hca=sw
[Input]   sw: switch for HCA encoding
          ON: Encode as HCA
          OFF: Not encode as HCA (Default)
[Function] Specifies whether or not to encode audio source as HCA codec.
```

When setting this option as disabled, encode audio source with ADX codec.

hca_quality: Sound quality when encoding as HCA

```
[Format] -hca_quality=count
[Input]   count: Selects encoding quality from the following 5 values
          5 = Highest
          4 = High      (default)
          3 = Medium
          2 = Low       (high compression)
          1 = Lowest    (highest compression)
[Function] Set sound quality for HCA encoding.
```

Rough relationship between encoding quality value and compression rate is shown below:

Quality	Mono	Stereo or more
5	1/4	1/4
4	1/6	1/6
3	1/8	1/8
2	1/10	1/12
1	1/12	1/16

3.2.6 Miscellaneous

ms_fullpel_still: Motion Search in Full Pel (full pixel) for Still Parts

```
[Format] -ms_fullpel_still=sw
[Input]   sw: switch for the motion search in full pel for still parts
          ON:
          OFF: (Default)
```

[Function] Specifies whether or not to perform motion search in full pel for still parts.

When setting this option as enabled, motion search is performed in half pel (half pixel distances) for moved parts and in full pel for still parts.

This option will suppress fluctuations in dark scenes but subtle motion may not be reproduced.

cleanup: Delete intermediate files

[Format] -cleanup=sw

[Input] sw = switch for deleting intermediate files

ON: Delete (Default)

OFF: Not delete

[Function] Specifies whether to delete intermediate files that are created during encoding process.

When set to OFF, CRI Movie video files (.usv) and CRI Movie audio files (.usa) are left in the same folder where the CRI Movie file (.usm) exists.

Default setting is ON (to delete).

work_dir: Sets the working directory

[Format] -work_dir=dirname

[Input] dirname : working directory

[Function] Sets the working directory to create intermediate files for encoding process.

If the working directory is not specified, intermediate files are created in the same directory as the input files.

debug: Output debug information

[Format] -debug=sw

[Input] sw = switch for outputting debug information

ON: Display debug info.

OFF: No debug info. (Default)

[Function] Enables to output debug information.

Default setting is OFF (no debug info).

preview: Display preview screen

[Format] -preview=sw

[Input] sw = switch for displaying preview screen
 ON: Display (Default)
 OFF: Not display

[Function] Specifies whether or not to display the preview screen that appears
 during encoding process.

Default setting is ON (to display).