

ENCODING VIDEO FOR BLU-RAY USING H264/AVC

Description:

Here is part of specification that apply when encoding with H264/AVC codec, all parameters showed here are not guessing, it's based on original Blu-Ray specification, which are not available in public.

It is about settings that are for creating 100% compliant Blu-Ray structures.

shon3i

Source:

Post (<http://forum.doom9.org/showthread.php?t=154533>) written by shon3i (<http://www.chaptergen.co.nr/>) on Doom9's forum (<http://www.doom9.org/>).

Abbreviation:

AVC: Advanced Video Coding

MPEG: Motion Picture Experts Group

FPS: Frame Per Second

DAR: Display Aspect Ratio

P/I: Progressive/Interlaced

GOP: Group Of Pictures

DVD: Digital Video Disc

BD: Blu Ray Disc

VBV: Video Buffer Verifier

SAR: Sample Aspect Ratio

SMPTE: Society of Motion Picture and Television Engineers

NAL-HDR: Signal HRD information

HDR: High Dynamic Range

General Constraints for MPEG-4/AVC

Allowed Resolutions/Framerates

Primary video streams				Secondary video streams			
Resolution	FPS	DAR	P/I	Resolution	FPS	DAR	P/I
1920 or 1440x1080	23.976	16:9	Progressive	1920 or 1440x1080 720x480	23.976	16:9 16:9 or 4:3	Progressive
	24.000	16:9	Progressive	1920 or 1440x1080 720x480	24.000	16:9 16:9 or 4:3	Progressive
	25.000	16:9	Interlace	1920 or 1440x1080 720x576	25.000	16:9 16:9 or 4:3	Interlace
	29.970	16:9	Interlace	1920 or 1440x1080 720x480	29.970	16:9 16:9 or 4:3	Interlace
1280x720	23.976	16:9	Progressive	1280x720 720x480	23.976	16:9 16:9 or 4:3	Progressive
	24.000	16:9	Progressive	1280x720 720x480	24.000	16:9 16:9 or 4:3	Progressive
	50.000	16:9	Progressive	1280x720 720x576	50.000 25.000	16:9 16:9 or 4:3	Progressive
	59.940	16:9	Progressive	1280x720 720x480	59.940 29.970	16:9 16:9 or 4:3	Progressive
720x576	25.000	16:9 4:3	Interlace	720x576	25.000	16:9 4:3	Interlace
720x480	29.970	16:9 4:3	Interlace	720x480	29.970	16:9 4:3	Interlace

Allowed Levels, Profiles, Reference Frames, VBV

Primary Video Rules

Video Format	FPS	P/I	Level	Max Bitrate for BD (1 sec GOP allowed)	Max Bitrate for DVD (1 sec or 2 sec GOP Allowed) Max Bitrate for BD (with 2 sec GOP allowed)	Max Buffer size BD	Max Buffer size DVD	Max Ref Frames	Max Frames in 1 sec. GOP	Max Frames in 2 sec. GOP	Slices	
1080	23.976	P	4.1	40000	15000	30000	15000	4	24	48	4	
	24.000	P							24	48		
	25.000	I							25	50		
	29.970	I							30	60		
	23.976	P	4.0	24000					24	48	1	
	24.000	P							24	48		
	25.000	I							25	50		
	29.970	I							30	60		
720	23.976	P	4.1	40000	15000	30000	15000	6	24	48	4	
	24.000								24	48		
	50.000								50	100		
	59.940								60	120		
	23.976	I	4.0	24000					24	48	1	
	24.000								24	48		
	25.000								50	100		
	59.940								60	120		
576	25.000	I	4.1	40000	15000	30000	15000	6	25	50	4	
			4.0	24000								
			3.2	24000								
			3.1	16800							5	1
			3.0	12000								
			3.0	12000								
480	29.970	I	4.1	40000	15000	30000	15000	6	30	60	4	
			4.0	24000								
			3.2	24000								
			3.1	16800							1	
			3.0	12000								
			3.0	12000								

Secondary Video Rules

Note: In case of 1080 and 720 resolutions same rules apply as Primary video, while 576 and 480 resolutions have stricter parameters showed in table:

Video Format	FPS	P/I	Level	Max Bitrate for BD (1 sec or 2 sec GOP allowed)	Max Bitrate for DVD (1 sec or 2 sec GOP Allowed)	Max Buffer size BD	Max Buffer size DVD	Max Ref Frames	Max Frames in 1 sec. GOP	Max Frames in 2 sec. GOP	Slices
576	25.000	P ----- I	3.2	8000	8000	12000	12000	5	25	50	1
	23.976								24	48	
480	24.000	P ----- I	3.2	8000	8000	12000	12000	6	-----		1
	29.970								30	60	

Simple Aspect Ratio

Resolution	SAR (DAR 16:9)	SAR (DAR 4:3)
1920x1080	1:1	—
1440x1080	4:3	—
1280x720	1:1	—
720x576	16:11	12:11
720x480	40:33	10:11

Color Characteristics

Video Format	Colour Primaries	Transfer Characteristics	Matrix Coefficients
1080	BT.709-5	BT.709-5	BT.709-5
720	BT.709-5	BT.709-5	BT.709-5
576	BT.470 BG	BT.470 BG	BT.470 BG
480	SMPTE 170M	SMPTE 170M	SMPTE 170M

Other Required Parameters

8-bit (4:2:0) Colorspace is only allowed

Main and High profiles are allowed

Maximum 3 B-Frames is allowed

NAL-HRD Type 2 capable encoder is needed