GV-VMS V15.11 Supports H.265 GPU Decoding

Applied to

GV-VMS V15.11.0.0

Summary

It takes both Intel Skylake platform and GV-VMS V15.11 to enable the highly efficient H.265 GPU decoding on video images. This technical notice starts out to define the minimum system requirements for H.265 GPU decoding and secondly elucidates the maximum number of channels supported by GV-VMS under dual and single streams. The third part suggests the total frame rate supported by a single hard disk. The last section expounds the high efficiency of H.265 codec: the significantly reduced bitrates enabled by H.265 GPU decoding contribute to fast streaming between devices.

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1. Minimum System Requirements for H.265 GPU Decoding

H.265 codec is celebrated for its small file size and bitrate. To enjoy this new video compression standard, the following hardware and software specifications are absolutely crucial to perform H.265 GPU Decoding.

CPU		6th Generation Intel Core i3 / i5 / i7 Desktop Processor (Skylake)
Operating System	64-Bit	Windows 7 / 8 / 8.1 / 10 / Server 2008 R2 / Server 2012 R2
Resolution		3 MP / 4 MP / 5 MP
Graphics Card		On-board VGA
Note: If you have both on-board VGA and external VGA installed, the on-board VGA must be connected to a monitor for the on-board VGA to be enabled.		

2. Maximum Number of Channels Supported by GV-VMS

2.1 Dual Streams with GPU Decoding

The chart below specifies the number of channels supported when you use GV-VMS V15.11.0.0 to connect to 3 MP / 4 MP / 5 MP IP cameras under dual streams.

CPU	Resolution			Codec	Total FPS Supported	Full-Frame Channels Supported	CPU Usage	Virtual Memory Usage
Intel Skylake Core i7 6700K (16 GB RAM)	3 MP (30 fps)	Main Stream	2048 x 1536	H.265	1920	64 CH	23%	6.49 GB
		Sub Stream	640 x 480	H.264				
	4 MP (25 fps)	Main Stream	2560 x 1440	H.265	1600	64 CH	21%	6.2 GB
		Sub Stream	640 x 360	H.264				
	5 MP (30 fps)	Main Stream	2592 x 1944	H.265	1920	64 CH	25%	6.44 GB
		Sub Stream	640 x 480	H.264				

2.2 Single Stream with GPU Decoding

The chart below specifies the number of channels supported when you use GV-VMS V15.11.0.0 to connect to 3 MP / 4 MP / 5 MP IP cameras under single stream.

CPU	Resolution	Codec	Total FPS Supported	Full-Frame Channels Supported	CPU Usage	Virtual Memory Usage
Intel Skylake Core i7 6700K (16 GB RAM)	3 MP (30 fps) — 2048 x 1536	H.265	600	20 CH	6%	5.45 GB
	4 MP (25 fps) — 2560 x 1440	H.265	525	21 CH	9%	6.26 GB
	5 MP (30 fps) — 2592 x 1944	H.265	390	13 CH	4%	5.28 GB

Note: The performance tests (section 2.1 & 2.2) were conducted with the following conditions:

1. Round-the-clock recording mode with live view only, while remote connections and video analysis features being disabled.
2. The panel resolution of 1920 x 1080 and 64-ch screen divisions (8 x 8) used.
3. The limits of CPU usage set to around 70%.

The test results may vary based on various factors, including actual environment and bitrates.

2.3 Test Environment

The total frame rate and number of full-frame channels supported were obtained using the following bitrates and test PC.

Bitrate used for the test		
3 MP	Main Stream: 2048 x 1536	5.35 Mbit/s
	Sub Stream: 640 x 480	1.71 Mbit/s
4 MP	Main Stream: 2560 x 1440	7.74 Mbit/s
	Sub Stream: 640 x 360	1.7 Mbit/s
5 MP	Main Stream: 2592 x 1944	6.73 Mbit/s
	Sub Stream: 640 x 480	1.79 Mbit/s

PC specifications used for the test	
OS	64-bit Windows 7
Motherboard	MSI Z170 PC MATE
CPU	Core i7 6700K 4.00 GHz
Chipset	Intel Z170
RAM	UMAX DDR4 2400 4 GB x 4
On-board VGA	Intel HD Graphics 530

3. Hard Disk Limitations

The hard disk performance can greatly affect GV-VMS's performance. When the size of transmitted data is large and exceeds the transfer rate of a hard disk, you may encounter problems such as time gaps, frame dropping and high hard disk failure rate. To avoid these problems and have the maximum performance out of GV-VMS, you should note the total recording frame rate that you can assign to a single hard disk, as listed below.

Frame rate limit in a single hard disk

Video Resolution	H.265	
	Frame Rate (fps)	Bitrate (Mbit/s)
3 MP	660	5.35
4 MP	550	7.74
5 MP	660	6.73
Note: The Hard Disk Limitations were obtained using the bitrate listed above and hard disk below: **WD Caviar Black, WD1002FAEX (SATA 6 GB/s), 64 MB cache**. For details, see http://wdc.com/global/products/specs/?driveID=792&language=1		

The frame rate limit is based on the resolution and codec of video sources. The higher video resolution, the lower frame rate you can assign to a single hard disk. In other words, the higher frame rate you wish to record, the more hard disks you need to install on your system.

For example, if you want to connect 64 units of GV-VD5700 and record at 5 megapixel resolution, you will need at least 4 hard disks. The calculation and hard disk assignments are shown below.

Specification of GV-VD5700	30 fps at 5 MP with H.265
Frame rate limit for one hard disk	660 fps at 5 MP with H.265
Number of hard disks required for recording	4 hard disks (30 fps x 64 units) / 660 fps
Hard disk assignments	1st hard disk for Windows OS 2nd hard disk for recording channels 1-22 3rd hard disk for recording channels 23-43 4th hard disk for recording channels 44-64
Note: It is strongly recommended to use separate hard disks for installing Windows operating system and for storing recorded files.	

4. The Advantage of H.265 Codec: Bitrates Saved by H.265 Codec

The following tests are conducted on H.265 cameras, GV-BL3700, GV-BX4700 and GV-BL5700, under different lighting conditions. Compared with H.264 codec, H.265 codec saves up to 45% bitrates for 3 MP H.265 IP Camera and 41% bitrates for 4 MP H.265 IP Camera; selecting H.265 codec promises up to 35% of bitrate reduction for 5 MP H.265 IP Camera.

Models	FPS	Codec	Bitrate (Mbit/s)		
			Sufficient Lighting	Low Lux	WDR
GV-BL3700 (3 MP)	30	H.265	2.45	0.59	1.11
		H.264	3.52	0.66	2.02
		H.265 saves	30%	11%	45%
GV-BX4700 (4 MP)	25	H.265	2.82	0.74	1.05
		H.264	4.02	0.79	1.78
		H.265 saves	29%	6%	41%
GV-BL5700 (5 MP)	30	H.265	3.01	0.62	1.31
		H.264	4.03	0.64	2.02
		H.265 saves	25%	3%	35%