



IP Device Integration Notes

Article ID: V1-16-01-19-t

Release Date: 1/19/2016

Revision Date: 6/5/2020

Applied to

GV-VMS V15.10.1.0

Summary

The document consists of three sections:

1. The total frame rate and the number of channels GV-VMS can support based on different CPU types, graphics cards and resolutions
2. Workarounds to increase total frame rates supported by GV-VMS
3. The total frame rate supported by a single hard disk

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1. Total Frame Rate and Number of Channels Supported

The tables below show the total frame rates and number of channels GV-VMS V15.10.1.0 can support with CPU usage under approximately 70% to ensure performance and stability. The test results vary according to the CPU types (Core i7, Core i5 and Core i3), the graphics cards used, and the resolution set on the connected IP camera.

Also shown in the tables is the number of full-frame channels GV-VMS can support. Note that the maximum number of frames per channel differs at different resolutions. Full-frame at 1.3 ~ 12 MP resolutions are defined as follows:

- **1.3 MP:** 30 fps per channel
- **2 MP:** 30 fps per channel
- **3 MP:** 20 fps per channel
- **4 MP:** 15 fps per channel
- **5 MP:** 10 fps per channel
- **8 MP:** 30 fps per channel (single stream)
25 fps per channel (dual streams)
- **12 MP:** 15 fps per channel

The following tables are available:

- [Table 1](#): **Dual Streams** with CPU or GPU Decoding (64 ch, H.264 codec)
- [Table 2](#): **Single Stream** with GPU Decoding (64 ch, H.264 codec)

CPU Decoding vs GPU Decoding

A higher total frame rate can be achieved if your CPU or external VGA supports **GPU decoding**. Note that GPU decoding only supports H.264 codec and note the different resolution limitations:

- **Intel Sandy Bridge Chipsets** only support GPU decoding of 1 MP to 2 MP videos
- **Intel Ivy Bridge / Haswell / Haswell Refresh / Skylake Chipsets** and **External VGA (NVIDIA)** support GPU decoding of 1 MP to 12 MP videos

Note:

1. GPU decoding is only supported when using NVIDIA graphics cards with compute capability 3.0 or above and memory 2 GB or above.
 2. If you have both on-board VGA and external VGA installed, the on-board VGA must be connected to a monitor in order for the on-board VGA to be enabled.
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Single Stream vs Dual Streams

When IP devices are set to **dual streams**, the total frame rate supported is increased because you can select lower resolution for live view and set the other stream to high quality video for recording. CPU usage is affected by live view decoding not recording.

Under dual streams, **CPU decoding** is used for 1.3 MP ~ 5 MP cameras, because the sub stream resolution is less than 1 MP and not supported by GPU decoding. For 8 MP and 12 MP cameras, **GPU decoding** is used because the resolution of the sub stream is 1 MP. Refer to table 1 for test results of dual stream with CPU or GPU decoding.

	<u>Main Stream (Recording)</u>	<u>Sub Stream (Live View)</u>
1.3 MP	1.3 MP (1280 x 1024)	CIF (320 x 256): CPU decoding
2 MP	2 MP (1920 x 1080)	CIF (448 x 252): CPU decoding
3 MP	3 MP (2048 x 1536)	CIF (320 x 240): CPU decoding
5 MP	5 MP (2560 x 1920)	CIF (320 x 240): CPU decoding
8 MP	8 MP (3840 x 2160)	1 MP (1280 x 720): GPU decoding
12 MP	12 MP (4000 x 3000)	1 MP (1024 x 768): GPU decoding

If your IP device does not support dual streams, refer to table 2 for test results of single stream with GPU decoding.

RAM

When using GPU decoding, higher RAM can increase the total frame rate supported. When using CPU decoding and single stream, however, the total frame rate supported is usually limited by CPU loading, and not affected by RAM.



1.1 Table 1: Dual Streams with CPU or GPU Decoding (64 ch, H.264 codec)

Core i7

CPU	Graphics Card	Resolution	Total FPS Supported	Full-Frame Channels Supported	CPU Usage	Virtual Memory Usage
Intel Skylake Core i7 6700K	Intel On-board (HD 530)	1.3 MP	1920	64 CH	21%	3.36 GB
		2 MP	1920	64 CH	36%	3.39 GB
		3 MP	1280	64 CH	17%	3.36 GB
		5 MP	640	64 CH	14%	3.4 GB
		8 MP	750	30 CH	40%	5.57 GB
		12 MP	840	56 CH	64%	8.49 GB
	NVIDIA GT730 (2 GB RAM)	8 MP	625	25 CH	21%	3.32 GB
		12 MP	540	36 CH	42%	4.33 GB
	NVIDIA GTX970 (4 GB RAM)	8 MP	700	28 CH	41%	3.88 GB
		12 MP	660	44 CH	56%	4.89 GB
	Intel On-board (HD 530) + NVIDIA GT730 (2 GB RAM)	8 MP	700	28 CH	32%	5.09 GB
		12 MP	840	56 CH	54%	8.07 GB
	Intel On-board (HD 530) + NVIDIA GTX970 (4 GB RAM)	8 MP	800	32 CH	35%	5.44 GB
		12 MP	840	56 CH	54%	8.09 GB
	NVIDIA GTX960 x 2 (2 GB RAM)	8 MP	850	34 CH	32%	4.69 GB
		12 MP	780	52 CH	55%	5.81 GB
Intel Haswell Core i7 4770	Intel On-board (HD 4600)	1.3 MP	1920	64 CH	40%	3.32 GB
		2 MP	1920	64 CH	58%	3.38 GB
		3 MP	1280	64 CH	33%	3.36 GB
		5 MP	640	64 CH	28%	3.39 GB
		8 MP	625	25 CH	50%	4.81 GB
		12 MP	660	44 CH	58%	6.85 GB
	NVIDIA GT730 (2 GB RAM)	8 MP	500	20 CH	33%	3.33 GB
		12 MP	480	32 CH	49%	4.08 GB
	NVIDIA GTX970 (4 GB RAM)	8 MP	600	24 CH	46%	3.58 GB
		12 MP	540	36 CH	58%	4.33 GB
	Intel On-board (HD 4600) + NVIDIA GT730 (2 GB RAM)	8 MP	675	27 CH	44%	4.85 GB
		12 MP	705	47 CH	61%	6.88 GB
	Intel On-board (HD 4600) + NVIDIA GTX970 (4 GB RAM)	8 MP	775	31 CH	54%	5.22 GB
		12 MP	735	49 CH	71%	7.12 GB
	NVIDIA GTX960 x 2 (2 GB RAM)	8 MP	675	27 CH	36%	4.15 GB
		12 MP	600	40 CH	47%	5 GB



Core i5

CPU	Graphics Card	Resolution	Total FPS Supported	Full-Frame Channels Supported	CPU Usage	Virtual Memory Usage
Intel Skylake Core i5 6600K	Intel On-board (HD 530)	1.3 MP	1920	64 CH	45%	3.29 GB
		2 MP	1920	64 CH	63%	3.35 GB
		3 MP	1280	64 CH	36%	3.34 GB
		5 MP	640	64 CH	31%	3.33 GB
		8 MP	750	30 CH	66%	5.4 GB
		12 MP	720	48 CH	71%	7.29 GB
	NVIDIA GT730 (2 GB RAM)	8 MP	500	20 CH	40%	3.33 GB
		12 MP	540	36 CH	73%	4.32 GB
	NVIDIA GTX970 (4 GB RAM)	8 MP	700	28 CH	72%	3.88 GB
		12 MP	555	37 CH	73%	4.39 GB
	Intel On-board (HD 530) + NVIDIA GT730 (2 GB RAM)	8 MP	700	28 CH	51%	4.99 GB
		12 MP	765	51 CH	73%	7.34 GB
	Intel On-board (HD 530) + NVIDIA GTX970 (4 GB RAM)	8 MP	800	32 CH	56%	5.35 GB
		12 MP	780	52 CH	73%	7.46 GB
NVIDIA GTX960 x 2 (2 GB RAM)	8 MP	825	33 CH	55%	4.63 GB	
	12 MP	660	44 CH	69%	5.3 GB	
Intel Haswell Core i5 4670	Intel On-board (HD 4600)	1.3 MP	1920	64 CH	65%	3.4 GB
		2 MP	1680	56 CH	71%	3.11 GB
		3 MP	1280	64 CH	56%	3.33 GB
		5 MP	640	64 CH	43%	3.4 GB
		8 MP	625	25 CH	74%	4.66 GB
		12 MP	600	40 CH	70%	6.16 GB
	NVIDIA GT730 (2 GB RAM)	8 MP	500	20 CH	55%	3.33 GB
		12 MP	450	30 CH	69%	3.93 GB
	NVIDIA GTX970 (4 GB RAM)	8 MP	600	24 CH	71%	3.57 GB
		12 MP	480	32 CH	72%	4.09 GB
	Intel On-board (HD 4600) + NVIDIA GT730 (2 GB RAM)	8 MP	650	26 CH	70%	4.69 GB
		12 MP	600	40 CH	73%	5.86 GB
	Intel On-board (HD 4600) + NVIDIA GTX970 (4 GB RAM)	8 MP	675	27 CH	74%	4.79 GB
		12 MP	600	40 CH	72%	5.87 GB
NVIDIA GTX960 x 2 (2 GB RAM)	8 MP	650	26 CH	62%	4.09 GB	
	12 MP	570	38 CH	71%	4.85 GB	



Core i3

CPU	Graphics Card	Resolution	Total FPS Supported	Full-Frame Channels Supported	CPU Usage	Virtual Memory Usage
Intel Haswell Core i3 4130	Intel On-board (HD 4400)	1.3 MP	1320	44 CH	69%	2.74 GB
		2 MP	1110	37 CH	70%	2.56 GB
		3 MP	1020	51 CH	72%	2.96 GB
		5 MP	590	59 CH	71%	3.2 GB
		8 MP	475	19 CH	68%	3.99 GB
		12 MP	465	31 CH	72%	5.15 GB
	NVIDIA GT730 (2 GB RAM)	8 MP	400	16 CH	39%	2.98 GB
		12 MP	360	24 CH	72%	3.51 GB
	NVIDIA GTX970 (4 GB RAM)	8 MP	475	19 CH	67%	3.25 GB
		12 MP	360	24 CH	72%	3.53 GB
	Intel On-board (HD 4400) + NVIDIA GT730 (2 GB RAM)	8 MP	500	20 CH	71%	4.25 GB
		12 MP	495	33 CH	69%	5.12 GB
	Intel On-board (HD 4400) + NVIDIA GTX970 (4 GB RAM)	8 MP	500	20 CH	72%	4.25 GB
		12 MP	495	33 CH	74%	4.94 GB
	NVIDIA GTX960 x 2 (2 GB RAM)	8 MP	600	24 CH	72%	3.93 GB
		12 MP	495	33 CH	69%	4.54 GB



1.2 Table 2: Single Stream with GPU Decoding (64 ch, H.264 codec)

Core i7

CPU	Graphics Card	Resolution	Total FPS Supported	Full-Frame Channels Supported	CPU Usage (%)	Virtual Memory Usage
Intel Skylake Core i7 6700K	Intel On-board (HD 530)	1.3 MP	1560	52 CH	22%	9.03 GB
		2 MP	1050	35 CH	12%	8.05 GB
		3 MP	720	36 CH	10%	9.99 GB
		4 MP	630	42 CH	13%	12.11 GB
		5 MP	440	44 CH	8%	13.62 GB
		8 MP	330	11 CH	3%	5.64 GB
		12 MP	210	14 CH	3%	7.95 GB
	NVIDIA GT730 (2 GB RAM)	1.3 MP	270	9 CH	2%	2.2 GB
		2 MP	180	6 CH	1%	2.07 GB
		3 MP	120	6 CH	1%	2.14 GB
		4 MP	75	5 CH	1%	2.12 GB
		5 MP	120	12 CH	27%	2.69 GB
		8 MP	30	1 CH	1%	1.62 GB
		12 MP	60	4 CH	21%	2.25 GB
	NVIDIA GTX970 (4 GB RAM)	1.3 MP	960	32 CH	45%	3.2 GB
		2 MP	720	24 CH	31%	3.07 GB
		3 MP	400	20 CH	18%	3.11 GB
		4 MP	300	20 CH	32%	3.23 GB
		5 MP	190	19 CH	35%	3.34 GB
		8 MP	120	4 CH	1%	2.28 GB
		12 MP	60	4 CH	1%	2.45 GB
Intel On-board (HD 530) + NVIDIA GT730 (2 GB RAM)	1.3 MP	750	25 CH	6%	4.75 GB	
	2 MP	630	21 CH	4%	5.21 GB	
	3 MP	380	19 CH	3%	5.89 GB	
	4 MP	300	20 CH	4%	6.36 GB	
	5 MP	190	19 CH	2%	6.56 GB	
	8 MP	300	10 CH	3%	5.32 GB	
	12 MP	210	14 CH	4%	7.98 GB	



CPU	Graphics Card	Resolution	Total FPS Supported	Full-Frame Channels Supported	CPU Usage (%)	Virtual Memory Usage
Intel Skylake Core i7 6700K	Intel On-board (HD 530) + NVIDIA GTX970 (4 GB RAM)	1.3 MP	1800	60 CH	39%	9.01 GB
		2 MP	1320	44 CH	27%	8.01 GB
		3 MP	880	44 CH	13%	9.54 GB
		4 MP	780	52 CH	20%	12.7 GB
		5 MP	480	48 CH	12%	13.01 GB
		8 MP	300	10 CH	4%	5.31 GB
		12 MP	210	14 CH	3%	7.99 GB
	NVIDIA GTX960 x 2 (2 GB RAM)	1.3 MP	1080	36 CH	30%	3.75 GB
		2 MP	720	24 CH	29%	3.28 GB
		3 MP	400	20 CH	34%	3.25 GB
		4 MP	255	17 CH	32%	3.18 GB
		5 MP	160	16 CH	34%	3.25 GB
		8 MP	120	4 CH	1%	2.28 GB
		12 MP	60	4 CH	1%	2.45 GB
Intel Haswell Core i7 4770	Intel On-board (HD 4600)	1.3 MP	1560	52 CH	31%	8.68 GB
		2 MP	1050	35 CH	18%	7.79 GB
		3 MP	720	36 CH	16%	9.66 GB
		4 MP	630	42 CH	19%	11.8 GB
		5 MP	440	44 CH	18%	13.29 GB
		8 MP	270	9 CH	4%	4.85 GB
		12 MP	210	14 CH	7%	7.82 GB
	NVIDIA GT730 (2 GB RAM)	1.3 MP	270	9 CH	4%	2.19 GB
		2 MP	180	6 CH	2%	2.06 GB
		3 MP	120	6 CH	2%	2.12 GB
		4 MP	75	5 CH	1%	2.1 GB
		5 MP	80	8 CH	18%	2.39 GB
		8 MP	30	1 CH	1%	1.61 GB
		12 MP	30	2 CH	1%	1.9 GB
	NVIDIA GTX970 (4 GB RAM)	1.3 MP	720	24 CH	34%	2.9 GB
		2 MP	600	20 CH	29%	2.89 GB
		3 MP	400	20 CH	28%	3.09 GB
		4 MP	240	16 CH	23%	2.95 GB
		5 MP	150	15 CH	26%	3.03 GB
		8 MP	120	4 CH	1%	2.25 GB
		12 MP	60	4 CH	1%	2.43 GB



CPU	Graphics Card	Resolution	Total FPS Supported	Full-Frame Channels Supported	CPU Usage (%)	Virtual Memory Usage
Intel Haswell Core i7 4770	Intel On-board (HD 4600) + NVIDIA GT730 (2 GB RAM)	1.3 MP	750	25 CH	10%	4.58 GB
		2 MP	630	21 CH	9%	5.08 GB
		3 MP	380	19 CH	7%	5.7 GB
		4 MP	300	20 CH	7%	6.12 GB
		5 MP	190	19 CH	6%	6.43 GB
		8 MP	300	10 CH	8%	5.23 GB
		12 MP	210	14 CH	7%	7.85 GB
	Intel On-board (HD 4600) + NVIDIA GTX970 (4 GB RAM)	1.3 MP	1800	60 CH	58%	8.74 GB
		2 MP	1320	44 CH	36%	7.83 GB
		3 MP	880	44 CH	26%	9.32 GB
		4 MP	780	52 CH	30%	12.28 GB
		5 MP	480	48 CH	21%	12.74 GB
		8 MP	300	10 CH	7%	5.22 GB
		12 MP	210	14 CH	7%	7.85 GB
	NVIDIA GTX960 x 2 (2 GB RAM)	1.3 MP	960	32 CH	28%	3.98 GB
		2 MP	690	23 CH	32%	3.25 GB
		3 MP	320	16 CH	23%	3.02 GB
		4 MP	180	12 CH	15%	2.87 GB
		5 MP	120	12 CH	26%	2.95 GB
		8 MP	120	4 CH	3%	2.25 GB
		12 MP	60	4 CH	1%	2.42 GB



Core i5

CPU	Graphics Card	Resolution	Total FPS Supported	Full-Frame Channels Supported	CPU Usage (%)	Virtual Memory Usage
Intel Skylake Core i5 6600K	Intel On-board (HD 530)	1.3 MP	1560	52 CH	43%	8.75 GB
		2 MP	1050	35 CH	26%	7.87 GB
		3 MP	720	36 CH	19%	9.81 GB
		4 MP	630	42 CH	21%	11.92 GB
		5 MP	440	44 CH	19%	13.36 GB
		8 MP	270	9 CH	5%	4.88 GB
		12 MP	195	13 CH	4%	7.43 GB
	NVIDIA GT730 (2 GB RAM)	1.3 MP	270	9 CH	5%	1.9 GB
		2 MP	180	6 CH	3%	2.07 GB
		3 MP	120	6 CH	3%	2.14 GB
		4 MP	75	5 CH	1%	2.12 GB
		5 MP	120	12 CH	48%	2.67 GB
		8 MP	30	1 CH	1%	1.58 GB
		12 MP	60	4 CH	37%	2.24 GB
	NVIDIA GTX970 (4 GB RAM)	1.3 MP	960	32 CH	71%	3.2 GB
		2 MP	720	24 CH	53%	3.06 GB
		3 MP	400	20 CH	29%	3.09 GB
		4 MP	300	20 CH	53%	3.25 GB
		5 MP	190	19 CH	57%	3.32 GB
		8 MP	120	4 CH	2%	2.28 GB
		12 MP	60	4 CH	2%	2.44 GB
Intel On-board (HD 530) + NVIDIA GT730 (2 GB RAM)	1.3 MP	750	25 CH	11%	4.62 GB	
	2 MP	630	21 CH	12%	5.11 GB	
	3 MP	380	19 CH	7%	5.82 GB	
	4 MP	300	20 CH	7%	6.27 GB	
	5 MP	190	19 CH	6%	6.5 GB	
	8 MP	300	10 CH	8%	5.26 GB	
	12 MP	210	14 CH	7%	7.91 GB	



CPU	Graphics Card	Resolution	Total FPS Supported	Full-Frame Channels Supported	CPU Usage (%)	Virtual Memory Usage
Intel Skylake Core i5 6600K	Intel On-board (HD 530) + NVIDIA GTX970 (4 GB RAM)	1.3 MP	1680	56 CH	61%	8.23 GB
		2 MP	1320	44 CH	47%	7.87 GB
		3 MP	880	44 CH	28%	9.4 GB
		4 MP	780	52 CH	41%	12.48 GB
		5 MP	480	48 CH	22%	12.81 GB
		8 MP	300	10 CH	7%	5.26 GB
		12 MP	210	14 CH	8%	7.9 GB
	NVIDIA GTX960 x 2 (2 GB RAM)	1.3 MP	1080	36 CH	54%	3.75 GB
		2 MP	720	24 CH	47%	3.3 GB
		3 MP	400	20 CH	58%	3.25 GB
		4 MP	255	17 CH	53%	3.19 GB
		5 MP	160	16 CH	56%	3.25 GB
		8 MP	120	4 CH	3%	2.28 GB
		12 MP	60	4 CH	1%	2.45 GB
Intel Haswell Core i5 4670	Intel On-board (HD 4600)	1.3 MP	1560	52 CH	49%	8.4 GB
		2 MP	1050	35 CH	30%	7.6 GB
		3 MP	720	36 CH	24%	9.46 GB
		4 MP	630	42 CH	26%	11.59 GB
		5 MP	440	44 CH	32%	13 GB
		8 MP	270	9 CH	7%	4.78 GB
		12 MP	195	13 CH	8%	7.31 GB
	NVIDIA GT730 (2 GB RAM)	1.3 MP	270	9 CH	6%	2.18 GB
		2 MP	180	6 CH	7%	2.07 GB
		3 MP	120	6 CH	5%	2.13 GB
		4 MP	75	5 CH	3%	1.8 GB
		5 MP	80	8 CH	26%	2.38 GB
		8 MP	30	1 CH	2%	1.62 GB
		12 MP	30	2 CH	1%	1.91 GB
	NVIDIA GTX970 (4 GB RAM)	1.3 MP	720	24 CH	48%	2.88 GB
		2 MP	600	20 CH	41%	2.89 GB
		3 MP	400	20 CH	40%	3.1 GB
		4 MP	240	16 CH	34%	2.94 GB
		5 MP	150	15 CH	40%	3.01 GB
		8 MP	120	4 CH	4%	2.27 GB
		12 MP	60	4 CH	3%	2.44 GB



CPU	Graphics Card	Resolution	Total FPS Supported	Full-Frame Channels Supported	CPU Usage (%)	Virtual Memory Usage
Intel Haswell Core i5 4670	Intel On-board (HD 4600) + NVIDIA GT730 (2 GB RAM)	1.3 MP	750	25 CH	13%	4.51 GB
		2 MP	600	20 CH	13%	4.93 GB
		3 MP	380	19 CH	12%	5.6 GB
		4 MP	300	20 CH	10%	6.05 GB
		5 MP	190	19 CH	9%	6.36 GB
		8 MP	300	10 CH	12%	5.15 GB
		12 MP	210	14 CH	9%	7.76 GB
	Intel On-board (HD 4600) + NVIDIA GTX970 (4 GB RAM)	1.3 MP	1470	49 CH	68%	7.11 GB
		2 MP	1230	41 CH	52%	7.16 GB
		3 MP	800	40 CH	35%	8.32 GB
		4 MP	765	51 CH	48%	12 GB
		5 MP	470	47 CH	32%	12.26 GB
		8 MP	300	10 CH	13%	5.15 GB
		12 MP	210	14 CH	11%	7.78 GB
	NVIDIA GTX960 x 2 (2 GB RAM)	1.3 MP	960	32 CH	45%	3.63 GB
		2 MP	690	23 CH	54%	3.25 GB
		3 MP	320	16 CH	43%	2.99 GB
		4 MP	180	12 CH	24%	2.87 GB
		5 MP	120	12 CH	38%	2.94 GB
		8 MP	120	4 CH	4%	2.28 GB
		12 MP	60	4 CH	1%	2.44 GB



Core i3

CPU	Graphics Card	Resolution	Total FPS Supported	Full-Frame Channels Supported	CPU Usage (%)	Virtual Memory Usage
Intel Haswell Core i3 4130	Intel On-board (HD 4400)	1.3 MP	1320	44 CH	67%	7.38 GB
		2 MP	1020	34 CH	63%	7.41 GB
		3 MP	1050	35 CH	41%	9.26 GB
		4 MP	600	40 CH	52%	11.1 GB
		5 MP	430	43 CH	59%	12.78 GB
		8 MP	270	9 CH	12%	4.79 GB
		12 MP	195	13 CH	13%	7.31 GB
	NVIDIA GT730 (2 GB RAM)	1.3 MP	270	9 CH	9%	1.9 GB
		2 MP	180	6 CH	7%	2.07 GB
		3 MP	120	6 CH	5%	2.13 GB
		4 MP	75	5 CH	4%	2.12 GB
		5 MP	80	8 CH	43%	2.38 GB
		8 MP	30	1 CH	1%	1.61 GB
		12 MP	30	2 CH	2%	1.91 GB
	NVIDIA GTX970 (4 GB RAM)	1.3 MP	660	22 CH	71%	2.81 GB
		2 MP	540	18 CH	47%	2.78 GB
		3 MP	340	17 CH	29%	2.92 GB
		4 MP	240	16 CH	54%	2.94 GB
		5 MP	150	15 CH	67%	3 GB
		8 MP	120	4 CH	5%	2.28 GB
		12 MP	60	4 CH	3%	2.44 GB
Intel On-board (HD 4400) + NVIDIA GT730 (2 GB RAM)	1.3 MP	750	25 CH	29%	4.5 GB	
	2 MP	600	20 CH	26%	4.93 GB	
	3 MP	380	19 CH	19%	5.6 GB	
	4 MP	300	20 CH	16%	6.05 GB	
	5 MP	190	19 CH	17%	6.33 GB	
	8 MP	270	9 CH	13%	4.82 GB	
	12 MP	195	13 CH	14%	7.35 GB	



CPU	Graphics Card	Resolution	Total FPS Supported	Full-Frame Channels Supported	CPU Usage (%)	Virtual Memory Usage
Intel Haswell Core i3 4130	Intel On-board (HD 4400) + NVIDIA GTX970 (4 GB RAM)	1.3 MP	1140	38 CH	71%	5.64 GB
		2 MP	960	32 CH	66%	5.63 GB
		3 MP	760	38 CH	61%	7.88 GB
		4 MP	645	43 CH	67%	10.15 GB
		5 MP	470	47 CH	69%	12.3 GB
		8 MP	270	9 CH	18%	4.82 GB
		12 MP	195	13 CH	17%	7.35 GB
	NVIDIA GTX960 x 2 (2 GB RAM)	1.3 MP	930	31 CH	69%	3.59 GB
		2 MP	600	20 CH	50%	3.12 GB
		3 MP	320	16 CH	68%	2.99 GB
		4 MP	180	12 CH	36%	2.86 GB
		5 MP	120	12 CH	67%	2.95 GB
		8 MP	120	4 CH	5%	2.44 GB
		12 MP	60	4 CH	3%	2.45 GB

Note: The performance tests (Table 1 & 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.



1.3 Test Environment

The total frame rate and number of full-frame channels supported based on CPU usage were obtained using the following bitrate and test PC.

Bitrate used for the test		
1.3 MP	Main Stream: 1280 x 1024	5.05 Mbit/s
	Sub Stream: 320 x 256	1.35 Mbit/s
2 MP	Main Stream: 1920 x 1080	7.01 Mbit/s
	Sub Stream: 448 x 252	1.73 Mbit/s
3 MP	Main Stream: 2048 x 1536	10.48 Mbit/s
	Sub Stream: 320 x 240	1.4 Mbit/s
4 MP	Main Stream: 2048 x 1944	11.65 Mbit/s
5 MP	Main Stream: 2560 x 1920	16.48 Mbit/s
	Sub Stream: 320 x 240	1.02 Mbit/s
8 MP	Main Stream: 3840 x 2160	14.13 Mbit/s
	Sub Stream: 1280 x 720	3 Mbit/s
12 MP	Main Stream: 4000 x 3000	14.47 Mbit/s
	Sub Stream: 1024 x 768	2.2 Mbit/s

PC specifications used for the test	
Test Computer 1	
OS	64-bit Windows 7
Motherboard	MSI Z170 PC MATE
CPU	Core i7 6700K 4.00 GHz
Chipset	Intel Skylake
RAM	UMAX DDR4 2133 4 GB x 2
On-board VGA	Intel HD Graphics 530
External VGA	NVIDIA Graphics Card
Test Computer 2	
OS	64-bit Windows 7
Motherboard	ASUS Z97-K
CPU	Core i7 4770 3.40 GHz
Chipset	Intel Haswell
RAM	Kingston DDR3 1600 4 GB x 2
On-board VGA	Intel HD Graphics 4600
External VGA	NVIDIA Graphics Card



Test Computer 3	
OS	64-bit Windows 7
Motherboard	GA-Z170-HD3P
CPU	Core i5 6600K 3.50 GHz
Chipset	Intel Skylake
RAM	Micron Ballistix DDR4 2133 4 GB x 2
On-board VGA	Intel HD Graphics 530
External VGA	NVIDIA Graphics Card
Test Computer 4	
OS	64-bit Windows 7
Motherboard	ASUS Z97-K
CPU	Core i5 4670 3.40 GHz
Chipset	Intel Haswell
RAM	Kingston DDR3 1600 4 GB x 2
On-board VGA	Intel HD Graphics 4600
External VGA	NVIDIA Graphics Card
Test Computer 5	
OS	64-bit Windows 7
Motherboard	ASUS Z97-K
CPU	Core i3 4130 3.40 GHz
Chipset	Intel Haswell
RAM	Kingston DDR3 1600 4 GB x 2
On-board VGA	Intel HD Graphics 4400
External VGA	NVIDIA Graphics Card



2. Workarounds to Increase Total Frame Rates

If your CPU capacity is lower than **Core i7**, **Core i5** or **Core i3** but wish to reach high frame rates, you can use dual streams or sacrifice the resolution as a workaround.

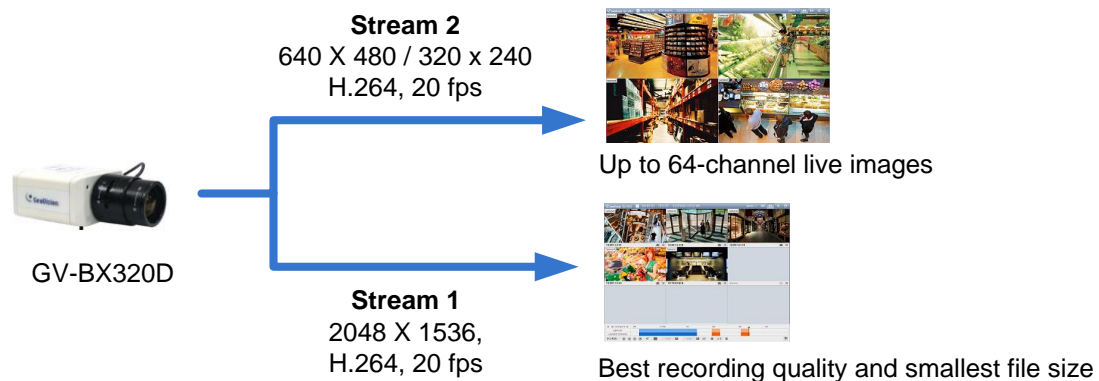
2.1 Using Dual Streams

If you are unable to reach the desired frame rate, it is highly suggested to use the dual-stream function if available on your IP device.

GeoVision IP Cameras feature dual streams, capable of delivering two video streams in different resolution, codec and frame rate. **Using dual streams, you can lower the resolution of live images, but set the recording to megapixel resolution for high quality images and to H.264 codec for small file size.**

Here we use GV-BX320D as an example. You can set Stream 1 and Stream 2 to different resolution.

- **Stream 1 (recording) settings:** Select 2048 x 1536 (3 MP) resolution for the best recording quality, and select H.264 codec for the smallest file size.
- **Stream 2 (live view) settings:** Select either 640 x 480 (VGA) or 320 x 240 (CIF) resolution depending on your CPU capacity. Higher resolution requires more CPU resource.



2.2 Decreasing Resolution

If your IP device does not support the dual-stream function, you may consider decreasing the image resolution. Decreasing the image resolution can reduce CPU usage and allows the GV-VMS to achieve higher frame rates.



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.264		MJPEG	
	Frame Rate	Bit Rate	Frame Rate	Bit Rate
1.3 MP (1280 x 1024)	660 fps	5.05 Mbit/s	300 fps	32.26 Mbit/s
2 MP (1920 x 1080)	660 fps	7.01 Mbit/s	210 fps	44.93 Mbit/s
3 MP (2048 x 1536)	440 fps	10.48 Mbit/s	140 fps	38.67 Mbit/s
4 MP (2048 x 1944)	330 fps	11.65 Mbit/s	105 fps	40.53 Mbit/s
5 MP (2560 x 1920)	220 fps	16.48 Mbit/s	80 fps	30.4 Mbit/s
8 MP (3840 x 2160)	550 fps	14.13 Mbit/s	96 fps	58.52 Mbit/s
12 MP (4000 x 3000)	330 fps	14.47 Mbit/s	56 fps	65.98 Mbit/s

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-FD5300 and record at 5 megapixel resolution, you will need at least 4 hard disks. The calculation and hard disk assignments are shown below

Spec. of GV-FD5300	10 FPS at 5 MP with H.264
Frame rate limit for one hard disk	220 FPS at 5 MP with H.264
No. of hard disks required for recording	3 hard disks (10 FPS x 64 units) / 220 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

In terms of codec, H.264 has much better compression ratio and much smaller file size than MJPEG. Therefore, the video streaming compressed with H.264 has much lower bitrate and thus allows more frame rate.

Note: It is strongly recommended to use separate hard disks for installing Windows operating system and for storing recorded files.
