IP Device Integration Notes

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Applied to

GV-System version 8.5.3

Naming and Definition

GV-System	GeoVision Analog and Digital Video Recording Software. In the document, GV-System also indicates **Multicam System**, **GV-DVR System**, **GV-NVR System** and **GV-Hybrid DVR System** at the same time.

Summary

The document consists of four sections:

1. The total frame rate GV-System can support based on different CPU types, codec and resolutions
2. Workarounds to increase total frame rates supported by GV-System
3. The total frame rate supported by a single hard disk
4. The test environment including the computer specifications, hard disk, and bit rate of the video source used to obtain the test results.

1. Total Frame Rate Supported

Below are the total frame rates GV-System can support with CPU usage under approximately 70% to ensure performance and stability. The total frame rate varies depending on the CPU types (e.g. Core i7, Core i5, Core i3 or Core 2 Quad), the resolution and compression method (codec) set on the connected IP camera.

When IP devices are set to **dual streams**, the total frame rate supported is increased because you can select lower resolution and codec for live view and set the other stream to high quality video for recording.

In addition, a higher total frame rate can be achieved if your CPU supports **GPU decoding**. GPU decoding can only decode 1.3 MP and 2 MP video sources. When using 32-bit OS, the total frame rate supported is reduced due to limited memory capacity.

Dual Streams

CPU	Resolution	Codec	Total Frame Rate (FPS)	CPU Usage (%)	GV-System Memory Usage (MB)
Core i7 2600K	1.3 MP (1280 x 1024)	H.264	960	15	1524
		MJPEG	960	24	1800
	2 MP (1920 x 1080)	H.264	960	19	1531
		MJPEG	960	28	1811
	3 MP (2048 x 1536)	H.264	640	12	1540
		MJPEG	640	18	1788
	5 MP (2560 x 1920)	H.264	320	9	1513
		MJPEG	320	17	1852
Core i5 2500K	1.3 MP (1280 x 1024)	H.264	960	34	1783
		MJPEG	960	50	1851
	2 MP (1920 x 1080)	H.264	960	42	1786
		MJPEG	960	60	1890
	3 MP (2048 x 1536)	H.264	640	19	1772
		MJPEG	640	38	1874
	5 MP (2560 x 1920)	H.264	320	13	1773
		MJPEG	320	30	1877
Core i3 2120K	1.3 MP (1280 x 1024)	H.264	960	43	1710
		MJPEG	960	67	1784
	2 MP (1920 x 1080)	H.264	960	58	1717
		MJPEG	720	67	1594
	3 MP (2048 x 1536)	H.264	640	22	1705
		MJPEG	640	46	1747
	5 MP (2560 x 1920)	H.264	320	18	1704
		MJPEG	320	30	1828
Core 2 Quad Q9400	1.3 MP (1280 x 1024)	H.264	960	69	1673
		MJPEG	480	67	1292
	2 MP (1920 x 1080)	H.264	660	70	1487
		MJPEG	420	68	1257
	3 MP (2048 x 1536)	H.264	640	46	1641
		MJPEG	440	69	1447
	5 MP (2560 x 1920)	H.264	320	33	1696
		MJPEG	290	70	1603

Single Stream

CPU	Resolution	Codec	Total Frame Rate (FPS)	CPU Usage (%)	GV-System Memory Usage (MB)
Core i7 2600K	1.3 MP (1280 x 1024)	H.264	450	68	1363
		MJPEG	600	69	1368
	2 MP (1920 x 1080)	H.264	270	72	1251
		MJPEG	540	68	1368
	3 MP (2048 x 1536)	H.264	200	68	1348
		MJPEG	400	70	1434
	4 MP (2048 x 1944)	H.264	165	71	1455
		MJPEG	285	68	1429
	5 MP (2560 x 1920)	H.264	180	68	1892
		MJPEG	300	71	1741
Core i5 2500K	1.3 MP (1280 x 1024)	H.264	330	71	1329
		MJPEG	450	70	1266
	2 MP (1920 x 1080)	H.264	210	75	1221
		MJPEG	330	70	1200
	3 MP (2048 x 1536)	H.264	140	66	1250
		MJPEG	240	70	1259
	4 MP (2048 x 1944)	H.264	120	72	1329
		MJPEG	180	70	1280
	5 MP (2560 x 1920)	H.264	130	70	1633
		MJPEG	170	69	1423
Core i3 2120K	1.3 MP (1280 x 1024)	H.264	180	60	1081
		MJPEG	240	64	1062
	2 MP (1920 x 1080)	H.264	120	67	1044
		MJPEG	240	63	1063
	3 MP (2048 x 1536)	H.264	80	56	1043
		MJPEG	180	66	1121
	4 MP (2048 x 1944)	H.264	75	68	1129
		MJPEG	135	66	1127
	5 MP (2560 x 1920)	H.264	90	70	1360
		MJPEG	130	67	1242

Core 2 Quad Q9400	1.3 MP (1280 x 1024)	H.264	180	72	1096
		MJPEG	300	66	1068
	2 MP (1920 x 1080)	H.264	120	74	1062
		MJPEG	240	72	1036
	3 MP (2048 x 1536)	H.264	80	66	1086
		MJPEG	180	74	1089
	4 MP (2048 x 1944)	H.264	60	63	1106
		MJPEG	135	72	1100
	5 MP (2560 x 1920)	H.264	70	66	1291
		MJPEG	120	69	1179

Single Stream with GPU Decoding

CPU	Resolution	Codec	Total Frame Rate (FPS)	CPU Usage (%)	GV-System Memory Usage (MB)
64-Bit					
Core i7 2600K	1.3 MP (1280 x 1024)	H.264	930	69	2588
	2 MP (1920 x 1080)		660	70	2642
Core i5 2500K	1.3 MP (1280 x 1024)		840	69	2664
	2 MP (1920 x 1080)		600	69	2611
Core i3 2120K	1.3 MP (1280 x 1024)		810	67	2701
	2 MP (1920 x 1080)		570	69	2675
32-Bit					
Core i7 2600K	1.3 MP (1280 x 1024)	H.264	570	72	1505
	2 MP (1920 x 1080)		360	71	1290
Core i5 2500K	1.3 MP (1280 x 1024)		420	73	1248
	2 MP (1920 x 1080)		270	68	1233
Core i3 2120K	1.3 MP (1280 x 1024)		150	69	1291
	2 MP (1920 x 1080)		60	48	1207

Note:

1. The test results were obtained using a panel resolution of 1920 x 1080 and 32-channel screen division. The results may vary based on various factors, including actual environment and bitrates.
2. GPU decoding test results were obtained using **Intel Sandy Bridge chipset**.

2. Workarounds to Increase Total Frame Rates

If your CPU capacity is lower than **Core i7**, **Core i5**, **Core i3** or **Core 2 Quad** but wish to reach high frame rates, you will need to sacrifice the codec or resolution as a workaround.

2.1 Changing Compression Method

The better compression method you use for video streaming, the more CPU resource is required to perform **decoding** for live images. The CPU capacity required to **decode** live images is: **H.264 > MJPEG** or **MPEG4**. Therefore, changing the codec from H.264 to MJPEG or MPEG4 can greatly increase the total frame rate supported without exceeding 70% CPU usage.

2.2 Using Dual Streams

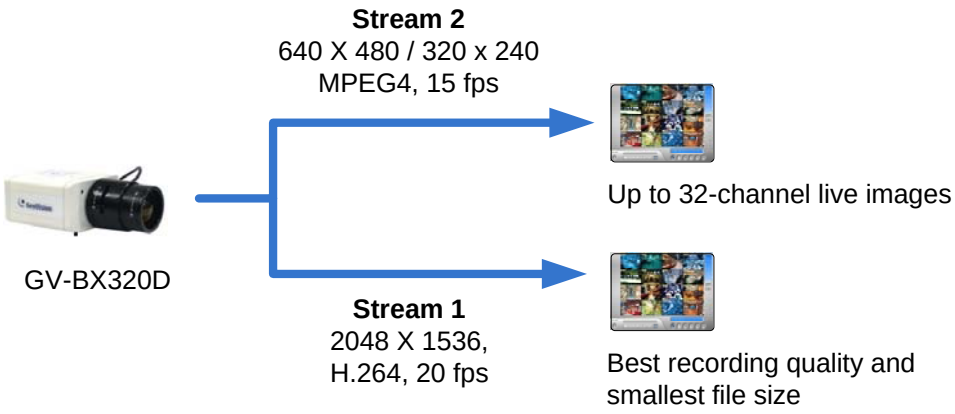
If the total frame rate cannot be sufficiently increased even after you change the codec, it is highly suggested to use the dual-stream function if available on your IP device.

The **GeoVision H.264-series cameras** feature dual streams, capable of delivering two video streams in a different resolution, codec and frame rate. Using dual streams, you can lower the resolution and codec for live images, but still get the best recording quality at megapixel resolution and the smallest file size compressed with H.264 codec.

Here we use GV-BX320D as an example for dual streaming settings:
On GV-BX320D, you can set Stream 1 and Stream 2 to use different resolution and codec.

- **Stream 1 (recording) settings:** Select 2048 x 1536 (3 MP) resolution for the best recording quality, and 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.

Selecting either MPEG4 or MJPEG is depended on your network condition. Codec with higher compression ratio needs less bandwidth. MPEG4 has higher compression ratio than MJPEG. Therefore, it is recommended to select MPEG4 for network (Internet or LAN) applications.



2.3 Decreasing Resolution

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

3. Hard Disk Limitations

The hard disk performance can greatly affect GV-System'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, high failure rate of a hard disk and etc. To avoid these problems and have the maximum performance out of GV-System, 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 when connecting to analog cameras

Software Compression		
Video Resolution	**MPEG4**	
	NTSC	**PAL**
CIF	960 FPS	800 FPS
VGA/D1	480 FPS	400 FPS
Turbo VGA	416 FPS	400 FPS
Turbo D1	352 FPS	320 FPS

Note:

1. The above data was determined using the default codec MPEG4 and hard disks with average R/W speed above 110 MB/s.
2. The data for Turbo VGA and Turbo D1 was determined using GV-1480A Card.

Hardware Compression		
Video Resolution	**H.264**	
	NTSC	**PAL**
D1	480 FPS	400 FPS

Note: The above data was determined using the default codec H.264, default quality level Q3 and hard disks with average R/W speed above 110 MB/s.

Frame rate limit in a single hard disk when connecting to IP cameras

Video resolution	H.264		MJPEG	
	Frame Rate	Bit Rate	Frame Rate	Bit Rate
5 MP (2560 x 1920)	220 FPS	8.5 Mbit/s	80 FPS	30.4 Mbit/s
4 MP (2048 x 1944)	330 FPS	10.4 Mbit/s	105 FPS	40.53 Mbit/s
3 MP (2048 x 1536)	440 FPS	9.83 Mbit/s	140 FPS	38.67 Mbit/s
2 MP (1920 x 1080)	660 FPS	12.59 Mbit/s	210 FPS	44.93 Mbit/s
1.3 MP (1280 x 1024)	660 FPS	6.16 Mbit/s	300 FPS	32.26 Mbit/s
Note: The data above was determined using the bit rate listed above and hard disks with average R/W speed above 110 MB/s.				

The frame rate limit is based on the resolution and codec of video sources. The higher video resolution you want, 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.

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 bit rate and thus allows more frame rate.

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

Here are examples of different recording solutions:

- **Using 2 hardware compression GV-4008 Cards, only connecting analog cameras:**

  If you want to have a total of 480 FPS and make a record at D1 resolution, you will need 2 hard disks. The calculation and hard disk assignments are given below:

Spec. of two (2) GV-4008 Cards	480 FPS for total 16 channels at D1 with H.264
Frame rate limit for one hard disk	480 FPS at D1 with H.264
No. of hard disks required	1 hard disk (480 FPS / 480 FPS)
Hard disk assignments	1st hard disk for Windows OS 2nd hard disk for 1-16 channel recording

- **Using 2 software compression GV-1480A Cards, only connecting analog cameras:**

  If you want to have a total of 480 FPS and make a record at D1 resolution, you will need at least 2 hard disks. The calculation and hard disk assignments are given below:

Spec. of two (2) GV-1480A Cards	480 FPS for total 32 channels at D1 with MPEG4
Frame rate limit for one hard disk	480 FPS at D1 with MPEG4
No. of hard disks required	1 hard disk (480 FPS / 480 FPS)
Hard disk assignments	1st hard disk for Windows OS 2nd hard disk for 1-32 channel recording

- **Connecting IP cameras only:**

  If you want to connect 32 units of GV-BX520D and record at 5 megapixel resolution, you will need at least 3 hard disks. The calculation and hard disk assignments are given below:

Spec. of GV-BX520D	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	2 hard disks [(10 FPS x 32 units) / 220 FPS)]
Hard disk assignments	1st hard disk for Windows OS 2nd hard disk for channel 1-16 recording 3rd hard disk for channel 17-32 recording

- **Using 2 hardware compression GV-4008 Cards, connecting a mix of analog and IP cameras:**

  If you want to record 16 analog cameras at D1 resolution and connect 16 units of GV-BX110D, you will need at least 3 hard disks. The calculation and hard disk assignments are given below:

Spec. of two (2) GV-4008 Cards	480 FPS for total 16 channels at D1 with H.264
Spec. of 16 units of GV-BX110D	480 FPS for total 16 units (30 FPS x 16), at 1.3 MP with H.264
Frame rate limit for one hard disk	480 FPS at D1 with H.264, and 660 FPS at 1.3 MP with H.264
No. of hard disks required	2 hard disks (480 FPS / 480 FPS + 480 FPS / 660 FPS)
Hard disk assignments	1st hard disk for Windows OS 2nd hard disk for 1-16 channel recording 3rd hard disk for 17-32 channel recording

4. Test Environment

PC specifications used for the test	
Test Computer 1	
OS	Windows 7 Ultimate SP1
Motherboard	ASRock Z68 Extreme4
CPU	Core i7 2600K
Chipset	Intel Z68
RAM	DDR3 4 GB x 2
S/W version	GV-System V8.5.3
Test Computer 2	
OS	Windows 7 Ultimate SP1
Motherboard	Gigabyte GA-H67A-UD3H-B3
CPU	Core i5 2500K
Chipset	Intel H67
RAM	DDR3 4 GB x 2
S/W version	GV-System V8.5.3
Test Computer 3	
OS	Windows 7 Ultimate SP1
Motherboard	Gigabyte GA-H61M-USB3-B3
CPU	Core i3 2120K
Chipset	Intel H61
RAM	DDR3 4 GB x 2
S/W version	GV-System V8.5.3
Test Computer 4	
OS	Windows 7 Ultimate SP1
Motherboard	Asus P5QL PRO
CPU	Core 2 Quad Q9400
Chipset	Intel P43
RAM	DDR2 1 GB x 2
S/W version	GV-System V8.5.3

Bitrate applied for the test of total frame rate		
	H.264	MJPEG
5 MP (2560 x 1920)	8.5 Mbit/s	30.4 Mbit/s
4 MP (2048 x 1944)	10.4 Mbit/s	40.53 Mbit/s
3 MP (2048 x 1536)	9.83 Mbit/s	38.67 Mbit/s
2 MP (1920 x 1080)	12.59 Mbit/s	44.93 Mbit/s
1.3 MP (1280 x 1024)	6.16 Mbit/s	32.26 Mbit/s

Types of hard disk used for the test of hard disk limit
WD Caviar Black, WD1002FAEX (SATA 6 GB/s), 64 MB cache
For details, see http://wdc.com/global/products/specs/?driveID=792&language=1